The Value of Technology Versus Nature

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Abstract

An emerging set of public policy debates concern the limits of humanity's control over nature. These include topics such as wildlife conservation, human enhancement, genetic modification of crops, artificial habitats, de-extinction, synthetic biology, built environment planning, and various strands of bioethics. Attitudes towards such topics are not well explained by the standard 2-dimensional political model favored by political scientists of i) a left/right economic spectrum and ii) a liberal/authoritarian social spectrum. I pose a new, orthogonal, spectrum to fill the void. It is a spectrum of value held for, on the one hand, Nature, and on the other, Technology. Though this requires further clarification, roughly speaking, what is in opposition is not Nature and Technology's respective instrumental value (value as means to ends), but rather their intrinsic value (value as ends in themselves). The 'Nature' end of the spectrum incorporates the sentiments of many environmental ethicists. The 'Technology' end, though intuitive for some, has received minimal theoretical attention, which I attempt to rectify with my own arguments. I go on to argue, contra environmental ethics, that it is the intrinsic value of technology that ought to be preferred. The thesis thus mounts an intrinsic objection to the Romantic-era-inspired 'deep ecology' in favor of a modern Enlightenment-inspired advocation of technological progress.

Acknowledgements

Declaration of Originality: I confirm that this is entirely my own work.
Signed: Benjamin Steyn

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Chapter 1 - Introduction and Aims

There is a new jumble of political questions rearing their heads in the 21st century. Each of these new questions has a lively discourse of its own, but no common thread has been articulated. This jumble of questions is around the value we place on the natural world, and on humanity's technological endeavours. They are about the limits that ought or ought not to be placed on human control of nature, and the preservation of natural spaces and processes. They are questions that have always been part of political discourse to some extent, but have risen in importance now as technological advancement gives us more and more potential to alter fundamental biology at a macroscopic and microscopic level. They are questions like, but by no means limited to, the following:

Is it important that humanity protects animals, plants, and their natural habitats? Is it important to conserve wildernesses such as forests, jungles and coral reefs? Do we advocate genetic modification of crops? Should the solution to climate change be predominantly technological, for instance using geoengineering to alter the weather artificially, or come from humans reducing their impact on the world? It is important for taxpayers to fund blue-skies feats of innovation and engineering, and prioritise this over spending the same money to improve basic public services

like health, education and defence? Should we strive for Artificial General intelligence? Should we make tweaks to our own brain chemistry for purposes other than medicine? Should we be able to choose the colour of our babies' eyes and hair, and screen it for genetic defects? Should we be able to change our biological sex? Is it inherently worse to live in a virtual reality simulation? Genetic engineering will soon allow us to de-extinct a woolly mammoth using DNA frozen during the ice age. Should we bring back these creatures? ...and what if the same question was posed for de-extincting our humanoid relative, the Neanderthal? And what of cloning human beings? Or growing them outside a womb?

Each of these questions will be pregnant with many considerations of ethical value, such as for the value of 'human welfare'. For instance, many consider the existential risks posed by the rapid acceleration of artificial intelligence (e.g. Bostrom, 2002); the importance of nature conservation to human health (McKinnon et al, 2016); and the risks to human welfare posed by not innovating to solve climate change (IPCC, 2022). Each question will also bear in some way on overtly political values. What will be the distributional economic impact of allowing human enhancement technologies to enter a free market (Sparrow, 2016)? What will be the impact on individual liberty if states wield the power of AI (Müller, 2021)? What does social media do for the integrity of a community (Gruzd, 2013)?

But these questions are also united by one common thread of value consideration. In all cases, these questions evoke visceral, emotional, principled reactions (both positive and negative) to do with the activity's status as a natural or technological affair. It is these visceral reactions that I will advance that are telling of a value (or disvalue) for these matters in their own right - a valuation separate from human welfare - narrowly defined - and separate from the political values already mentioned.

Nature and technology are political matters, because they concern the use of public resources, legislation, governance, and strategy. However, as a society, we are relatively unpracticed in our treatment of these issues as overtly political. Nature and technology are both areas of public policy that, as a UK civil servant, I have had the pleasure of working on. On numerous occasions, and in different roles, I have seen how people can talk past each other due to a failure to distinguish between their principled and practical concerns for nature and technology.

While working in the UK Government's International Marine Team on marine biodiversity conservation and ocean plastic pollution, I found a split in opinions amongst stakeholders. There were those for whom marine nature ought to be treated purely as a commonly owned economic resource, as typified in the popular jargon 'ecosystem services' (DEFRA, 2011). Coral reefs have a quantifiable monetary value in providing tourism, flood defences, carbon sequestration, and in providing breeding grounds for fish, who in turn, are economically valuable as food (Woodhead et al, 2019).

For others, however, the relationship with the ocean is better described as a deep love and fascination. I found many times in government where it is an open question whether or not we should apply economic evaluation criteria to a decision, such as whether to invest UK Aid

budget to save coral reefs in Indonesia. For the ocean lovers, the notion of reducing such decisions to economics was often either abhorrent, absurd, or a drastic undervaluation. Indigenous communities in the south pacific worship the ocean as a deity - we can't conveniently collapse such appreciation to a monetary value (see also Partha Dasgupta's UK Government Review into the Economics of Biodiversity (2021) for a similar case study of the sacredness of the river Ganges in India). Sometimes such tensions would rise to the surface for a ministerial decision, and it is not uncommon for an environment minister to see beyond the reduction of nature to an ecosystem service, but day-to-day actions of officials will sometimes unwittingly and unintentionally rule on this ideological question in particular circumstances, either one way or the other.

More recently, while working in the UK Government's Directorate for Science, Research and Innovation, I have seen a divergence of views similar in structure. There are those who are principled advocates of technological endeavour, for no other reason than because it is an exciting quest for humanity to be on. They want to invest public money in space travel, artificial enhancement, quantum computing and all sorts regardless of the clear public benefit. Humanoid robotics is a paradigmatic case: there seem to be some economic benefits (personable household assistants for the elderly, for instance), but compared to other emerging technologies, they seem to garner a disproportionate sense of wonder and fascination among researchers, policymakers, and in some cases the public. Others, meanwhile, are more narrowly interested in these technological endeavours only to the extent that they create economic prosperity or serve some other need such as national defence, and others still have strong reservations about the thought of technological advance.

In the case of both nature and technology policymaking then, it is not clearly articulated whether we are undertaking the endeavours in question for the sake of some ultimately economic or social end, or whether, in addition to this, these activities are more fundamentally valuable for their own sake.

Nature and Technology Intrinsic Value Spectrum

My core claim in this thesis is that a political spectrum exists that explains some significant proportion of the variance in attitudes to many nature and technology questions. This spectrum is, loosely, for now, a spectrum with at one end a high value placed on nature (or naturalness) for its own sake, and on the other, high value placed on technology (or technological endeavour) for its own sake. Justifying that this is indeed a single spectrum, I have to show that there is a genuine conflict here. I also have to show that this spectrum is orthogonal (i.e. logically and statistically independent) to other well-trodden spectrums such as economic left/right.

The axiological underpinning of my proposed spectrum is rooted in the notion of intrinsic value. Intrinsic value is, very roughly for now, the value placed on some object or state of affairs as an end in itself, or as mentioned above, for its own sake. Intrinsic value contrasts with extrinsic value, of which the key type is instrumental value: the value we place on objects or states of affairs as a means to an end or for the sake of something else (Zimmerman and Bradley, 2019).

There are many other things that philosophers have argued might be intrinsically valuable including happiness, beauty/aesthetic merit, knowledge, truth, friendship, love, consciousness (Frankena, 1973, pp.87-88).

We will see later that usage of the concept of intrinsic value needs much refining. But the basic instrumental/intrinsic distinction should ward off a knee-jerk response: it is undeniable that an instrumental value for either technology or nature is not at odds with either instrumental or intrinsic value for the other. Naturalists will most likely be strong advocates of technologies like solar panels or wind farms because they reduce the pace of climate change, and so protect their desiderata: nature.

We might likewise assume technologists place some value on nature as an inspiration to technological endeavours, known as biomimicry. The inventor of Velcro credited the hooked hairs of insects as his inspiration, and similarly the Wright Brothers based their winning flight designs on birds (Goddard, 2022). But again, this is technologists valuing nature instrumentally. In other cases, the two may find some common-ground - solar panels might be valued by technologists as an instance of a successful well-designed technological pursuit; and by naturalists for saving natural processes from climate change.

Nature and technology debates resemble other political debates in being multi-faceted, and any given policy in the real world might be advocated by both sides for different reasons, in pursuit of different instrumental and intrinsic values. The complex web of instrumental and intrinsic values involved in nature and technology debates can never be fully reduced to a single spectrum. However, I will advance that conflicts between intrinsic attitudes to nature and technology do provide strong reasons for action in a variety of cases, and will matter even more in a volatile age of environmental destruction and rampant technological progress.

Before embarking, I will begin by surveying the current conceptual landscape.

Current Conceptual Landscape - Nature

The discipline of environmental ethics is built around the distinction between intrinsic vs. instrumental value. This is broadly conceived as a debate between eco-centrists: those who intrinsically value nature, and anthropocentrists: those who don't (Brennan and Lo, 2021).

Philosophers, economists, and policymakers alike recognise that parts of nature are instrumentally valuable to economic welfare (narrowly conceived). Nature offers us raw materials, food, human habitats, tourist income generators, and providers of other ecosystem services like carbon sequestration. Less obviously, and depending on one's ethical framework, Nature might be instrumentally valuable in other ways to other intrinsically valuable ends. Nature inspires scientific endeavour, and so is an instrument and substrate for knowledge; it offers mountains and rocky crags that are instrumental to leading a life involving an intrinsically valuable 'adventure'; and might provide instances of tranquil and quiet sanctuary, an instrument to the intrinsically valuable 'peace and security'.

But over and above the instrumental benefits that might occur, the eco-centrists think nature (or parts thereof) might be bearers of value for its own sake, regardless of any human interactions with it. Richard Sylvan (née Routley) gives us a nice way to get into the general headspace of valuing nature intrinsically. In his famous 'Last Man' thought experiment, he poses a scenario whereby a man commits gratuitous harm to flora and fauna, but he is the last man on earth in a post-apocalyptic future. Routley intends the reader to intuit that it is wrong for the Last Man to harm nature, even if there are no human consequences, and thus, nature has intrinsic value (Routley, 1973).

Others have offered similar arguments: Holmes Rolston III considers intrinsic value for the African Butterfly not to be killed by a collector (1975), and Robin Attfield (1981) considers a specific 'last man' scenario on whether he should chop down a tree, positing intrinsic value for the tree. But precisely what it means for nature (or parts of nature) to be valued intrinsically, and so precisely what it is about the actions of the last man that is supposedly wrong, requires further examination. This will be the subject of Chapter 2.

Assuming for a moment that this intrinsic value exists, how does one weigh it against instrumental value? Controversially, but perhaps pragmatically, some environmental economists seek to proxy this extra value by teasing out figures for the public's 'willingness to pay' for an environmental good, as if it were a market good. For instance, non-market valuation methods have been used to generate a willingness to pay measures for threatened, engaged and rare species (Sagoff, 2007).

Many think this type of endeavour makes a category mistake. A 'willingness to pay' methodology is a confused attempt to draw out what is actually a property that is *irreducible* to economic value. It is equivalent to me asking: "how much would you be willing to pay to buy your own dad?". While it is true that in, say, a hostage or ransom situation, one may be forced to throw out a figure, one might think that this is nevertheless not sufficient. In fact, the answer is just indeterminate because we wouldn't think it right for me to put a price on him. Approaching environmental policy this way nevertheless gives some non-zero valuation, which is perhaps needed in a world of public choice decision-making which is, for wider institutional reasons, reliant on reductionistic cost-benefit analysis models (Sagoff, 2007) (Brennan and Lo, 2021).

The anthropocentrism vs. ecocentrism dichotomy is partially helpful in clarifying environmental policy debates. However, I find there to be a key problem with this conception. It hinges on a single intrinsic value for nature, which either is held (ecocentrism) or is not (anthropocentrism). Anthropocentrism, defined in the negative, is a rather empty concept. There is no positive conception of what an anthropocentrist stands for. It is indeterminate whether the anthropocentrist *hates* nature or is simply *ambivalent* to it. This contrasts what we might standardly call political spectrums (left vs. right , liberal vs. communitarian), where each side represents a substantive and positive normative stance that is directly incompatible with the position on the other side.

Current Conceptual Landscape - Technology

Meanwhile, when it comes to political value for technology, there is not such a well-ordered discourse or unifying metacommentary. Kerschner and Ehlers (2016) captures attitudes to technology in four broad categories, building on Mitcham (1994)'s three categories. Within each are multiple sub-categories:

> ***Category 1: Technology Optimist:*** *A broadly positive stance towards technology, of which three sub-types are identified.*
> ***The Technophile:*** *fascinated about everything technological and cannot imagine why anyone would be critical towards it. Adopts technologies enthusiastically and expects them to improve life and solve social problems.*
> ***The Technocrat:*** *The technocrat goes further than the technophile, believing in rule by experts or that decision-makers should be selected based on their specialised, technological knowledge and rule accordingly. It is believed that this would greatly improve efficiency and reduce socio-economic "irrationalities".*
> ***Entropy optimism:*** *The entropy optimist has the following rationale: Unlimited economic growth is an "axiomatic necessity" to rid society of most social evils like poverty, overpopulation and pollution. Technological progress justifies the assumption of perfect substitutability of the factors of production, which feed this unlimited economic growth.*
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> ***Category 2: Technology Romanticism:*** *A "romantic uneasiness" (Mitcham, 1994) about technology, also feelings of ambiguousness towards it.*
> ***Ambiguous Aversion:*** *Martin Heidegger expresses ambiguity, when he argues that technology invites its questioning and also has to be questioned in order to experience it (to exist).*
> ***Ambiguous appropriation:*** *implies that hopes associated with technology are emphasised while (as in (a)) it remains unclear how to treat or govern technology.*
> ***Post-Normal Science:*** *We have an incomplete understanding of the technology transfer process, there is high complexity, ignorance, risk and uncertainty of technology deployment.*
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> ***Category 3: Technology Determinism:*** *This category summarises a view popular in the field of Science and Technology Studies (STS), which is broadly that technological change is a self-developing system, progressing according to its own laws, which are not simply socio-economic and political.*
> ***Automatic:*** *For Ellul (1980) and Mumford (1970) technological change is seen as automatic or at least "quasi-automatic"; "autopoietic" or "autonomous" from human agency. The technological system (Ellul, 1980) or the mega-machine (Mumford, 1970, 1967) is self-augmenting and difficult or impossible to control.*
> ***Social Forces:*** *Technologies can also be seen as changing through social forces which means they rest on "social constructions" to a similar degree as they are "technological constructions" and thus technology is socially shaped.*
> ***Evolution:*** *Evolutionary approaches towards technology can be deterministic. Although it is widely held that evolution is open-ended, it is not questioned whether technologies*

are good or bad. Rather the focus is on the mechanisms that drive technological change, which can be portrayed as deterministic.

***Category 4: Technological Scepticism:** A broadly negative stance towards technology. **Simple scepticism:** implies that technology has to prove that it does not have drawbacks that cannot (readily or fundamentally) be mitigated. Therefore, risk assessment is needed to determine the potential dangers of a particular technology.*
***Technophobia:** Postmodern worldviews, which reject the optimism of modernity. Deterministic pessimists expect a totalitarian nightmare founded on technological development. Technological pessimism could also mean a luddite rejection of all new technologies. Technopessimistic environmentalists argue that technology always involves the creation of non-natural substances and activities, which can damage or disrupt natural ecological cycles. The only hope for a sustainable future would be in reverting to simpler "low-tech-no-tech" lifestyles, integrating the human economy with ecological cycles and applying traditional knowledge.*
***Entropy Pessimism — Malthusianism:** Criticism of economic growth forms a special case of pessimistic attitudes, which often relates to biophysical limits and thermodynamics.*

In the production of this framework, Kerschner and Ehlers (2016) and Mitcham (1994) have given an excellent historical analysis of previous scholarship and thought on the subject of attitudes towards technology. With regards to the history of technological attitudes, I have nothing more to contribute over and above what has been said.

However, what this framework lacks is any significant explanatory power. In faithfully capturing many historical attitudes in their varying machinations, the framework is quite messy and complicated. It's not clear what the relations are between categories - are any mutually exclusive? Can one hold many to be true at once? The attempt to tie up views into these four broad categories is also uncomfortably loose: "romantic uneasiness" does not to me seem similar enough to "feelings of ambiguousness" to fall within one umbrella. Neither do the 'automatic' and 'social forces' positions on technological determinism, which offer opposing views.

The biggest problem is that the framework is trying to capture at once both intrinsic and instrumental attitudes to technology. Technophilia and technophobia are categories which seem to be hinting most at intrinsic value/disvalue. On the other hand, Entropy optimist and Entropy pessimist stances both only show an instrumental value for or against technology respectively. For the former, the overriding pursuit of economic growth has been determined as what we ought to pursue, technology is just an instrument (means) to that end. For the latter, inevitable planetary constraints make it futile and dangerous to pursue infinite technological advance. Being a technology optimist (pessimist) - in Kerscher's terminology, seems to amount to both an optimistic (pessimistic) risk outlook, but also to a principled support (opposition). But obviously, these things can be picked apart: I am excited about AI, but I also acknowledge the risks are high.

The view termed 'The Technocrat' seems to be out of place here. Technocracy's prefix is derived directly from the Greek, tekhne, meaning skill, and not via tekne's other offspring, 'technology'. Technocracy is defined as *"a government or social system that is controlled or influenced by experts in science or technology; the fact of a government or social system being influenced by such experts"* (CUP, 2021). We will discuss definitions of technology in detail later, but for now it should be easy to see that a penchant for technocracy is not an attitude towards technology as in cars, laptops, fridges etc. Rather, this is an attitude about the role of technical experts (perhaps in the field of technology but not limited to it) in influencing the work of government. It is logically consistent to suppose that a technocratic government can pursue any particular normative direction it wants. It is an orthogonal matter to that of attitudes to technology itself. It is logically possible to have a luddite technocracy. Perhaps, with our civil service's long term failure to invest in IT and automation, this is the reality.

I am also sceptical that 'Simple Scepticism' is a meaningful category. All people across the framework would be 'simple sceptics' in that they wouldn't reasonably object to a risk assessment on new technologies, and don't want to blow up the earth. This sensibleness is not in conflict at all with any of the other positions.

Furthermore, some positions on this list are not even normative at all, but rather are purely descriptive about technology and its role in society. The entire Determinist category, and sub-categories of the Romantic that argue change in technology transfer is 'complex and not well understood' are stances on empirical questions concerning technological progress. These views are orthogonal to both intrinsic and instrumental normative stances, and so it seems we are here trying to capture at least three dimensions in one go.

As noted, in this thesis, we are to be concerned mainly with matters of intrinsic value for technology.

Current Conceptual Landscape - The Nexus of Nature and Technology

A recent compendium of essays by David Kaplan called Philosophy, Technology, and the Environment (2017) claims to be one of the first of its kind in bringing together heavyweight philosophers from both 'Eco-Phil' and 'Phil Tech' subdisciplines. Given this book's claim to originality in combining such perspectives, I take it to be a good representation of the loose and embryonic discourse at the nexus of these topics as it stands.

Kaplan begins the book noting the dearth of literature at this nexus *"Technology and the environment are like two sides of the same coin: Each is fully understood only in relation to the other. Yet, despite the ample overlap of questions concerning technology and the environment, the two philosophical fields have developed in relative isolation from each other. Even when philosophers in each field address themselves to similar concerns, the research tends to be parallel rather than intersecting, and the literatures remain foreign to one another."*

So far, so good. But soon after, the problems set in. Kaplan's core claim, also endorsed by others across the anthology, is that disciplines of phil-tech and eco-phil share a common goal: to protect the environment from ecological collapse and climate change, and so, the two disciplines ought to become one.

The general assumption here is that the axiological debate with respect to technology is entirely captured in the question: *"Is technology i) value-neutral, Or ii) is it intrinsically insidious?"*. For some, such as Philip Brey and Ibo Van De Poel, technology's high instrumental value in pursuit of environmental protection ought to mean it should be embraced among those who value nature. Others in the volume such as Don Ihde, Kyle Whyte, Ryan Gunderson and Brett Clark continue the tradition of 1970's SPS thinkers like Jacques Ellul and Martin Heidegger in advancing that technology is in fact intrinsically insidious. Many in the book take the step that unites the ecological and technological discourses in noting that an intrinsic disvalue for technology implies a value for its opposite: nature (though this metaphysical relationship between the two is only explored at a very surface level, and we are often left wanting, as pointed out in Vogel's review (2017)).

Both these 'value-neutral' and 'intrinsically insidious' stances on technology are consistent with a high value for nature. And therefore, it is no surprise that Kaplan declares the two disciplines of eco-phil and phil-tech share a common purpose. But a notion completely ignored by the heavyweights in Kaplan's book, is a third possibility: that technology might itself be a source of positive intrinsic value, just like others have said the same of nature, as well as other things like love, knowledge, artistic works, friendship etc.

Seeing nothing uniquely valuable in technology itself, the book assumes it is the goal of Phil Tech to help out with other areas of axiological importance, i.e. the extreme welfare and natural losses associated with the climate crisis. There is no doubt that technology, and so the philosophy of technology, might well bear on questions of climate crisis resolution, in the same way as the sub-disciplines of aesthetics and epistemology might bear on moral questions. But, like aesthetics and epistemology, doesn't the Philosophy of Technology have its own distinct realm of virtues to understand? And are we sure that these are completely in line with the views of radically anti-technology environmental philosophers?

Conclusion

On the nature side, we inherit a general debate on whether or not nature has intrinsic value. On the technology side, we inherit no well-ordered conceptual framework. We also have an embryonic discourse which rightly observes the inherent link between the two areas of inquiry, but in a way which does not consider a positive perspective on technology. This gives clear motivation to try to re-conceive the political value present in these topics in a more systematic and unifying way.

In chapters 2,3, and 4, I will be taking intimate profiles of the two sides to better understand intrinsic value propositions around nature and technology. This will give much-needed context

for Chapter 5, where I introduce more properly the notion of a political value spectrum, and consider how intrinsic value for technology and for nature are incompatible.

Chapter 6 and 7 then zoom in on one specific and interesting policy debate playing out along this spectrum: should we embrace human enhancement biotechnologies? In chapter 8, I supply my own normative stance on the spectrum, with a further supporting argument.

Chapters 9 and 10 move from philosophy to political science, as I gather empirical evidence of public and policymaker attitudes to the topics discussed. Without empirical study, it is an open question whether I can claim that the theoretical spectrum is descriptive of what people's attitudes actually are today. Or, alternatively, whether I should be using it in an epistemically prescriptive way.

Chapter 2 - Nature's Intrinsic Value

It is difficult to specify the value of nature, but even more so, the nature of value.

As made clear earlier, my theoretical framework will be defined in terms of intrinsic value, not instrumental value. But this doesn't get us very far. One cannot avoid making philosophical enemies in wielding the term 'intrinsic value', as it has been used in so many different ways. Though environmental ethicists commonly wield the term without much clarification, it will pay dividends here to do so.

This is predominantly a descriptive chapter, rather than a normative one. I will be mainly trying to report charitably upon the claims other philosophers have made about why and how nature is intrinsically valuable. But I also aim to make original contributions to environmental ethics in the production of a neat organising framework for different types of intrinsic value positions, and in re-interpreting some positions into coherence on my chosen framework.

What is Intrinsic Value?

At a very rough approximation, as noted in Chapter 1, philosophers mainly agree that intrinsic value is value for something 'for its own sake', or, 'as an end in itself'. It is often defined in opposition to instrumental value, value for something as a means to some other end. As it stands, the term could be applied as a purely descriptive psychological claim, for instance, I intrinsically value my own health in that I value it for its own sake, not only because it is contributory to some further good. Psychologists similarly talk about 'intrinsic motivation' (Sansone & Harackiewicz, 2000). For instance, I am intrinsically motivated to do philosophy because it is 'its own reward', and not as a means to some other reward (e.g. job prospects).

But when philosophers use the term, they are not merely saying that an individual values something for its own sake, but that the valued thing is objectively valuable (or ought to be seen as such) in some grander ethical sense, i.e. its existence makes the world a better place (Zimmerman and Bradley, 2019). As noted in Chapter 1, many sorts of things have been argued by philosophers to be of intrinsic value: utility, knowledge, beauty, life or humans or persons, love, culture, equality, friendship etc. (Frankena 1973, pp. 87–88). These things all share a common feature, that they seem to at least some people to be fundamentally good in a way that is difficult to reduce or explain in terms of some further type of good.

For a classical utilitarian, all of these good things are ultimately instrumental towards a single intrinsically valuable property: utility (Zimmerman and Bradley, 2019). The fact that instances of different values can be commensurated into one common denominator, and so easily compared, is a key advantage of utilitarianism. It coheres with our intuitions that values can sometimes be traded off against one another in real life situations. But many philosophers are value-pluralists, citing many of these things on Frankena's list as distinct and incommensurable realms of value (Mason, 2018). Pluralism captures the rivaling intuition that in many cases, we would not think it worth gaining any amount of X (say, an aesthetic pleasure) at the expense of Y (say, a moral wrongdoing). There are many complex in-between positions trying to preserve both the commensurability and distinctness of values from within utilitarian and pluralistic accounts (see Chang (1997), Sen (1980), Nien-He Hsieh (2005), Wiggins (1997) and Williams, (1981)).

These debates concern the number of, and commensurability between, intrinsic values. But what of the concept of intrinsic value itself? While the above description is commonly understood, there are lots of ambiguities which have led some recent philosophers to question whether the concept is coherent, and/or whether there are really multiple concepts at play. Consider two *prima facie* problems:

An originator of intrinsic value, GE Moore (1922, p.260) said that one feature of intrinsic value is that it is a kind of value possessed by something *"solely in virtue of its intrinsic properties"*. The goodness is present in the thing itself, independent of relations to other things. Moore suggests that intrinsic value is a kind of value that something would continue to have even if it were alone in the universe. But Shelley Kagan points out that we might value certain objects *for their own sake*, but for their extrinsic, or relational, properties, not their intrinsic properties. For instance, the pen used by Abraham Lincoln to sign the Emancipation Proclamation has a value for its own sake (i.e. not merely as a writing instrument)special value, not because of properties of the pen in isolation, but because of relational properties, that it was used for a certain historical event, which history has judged to be significant (Kagan 1998, p.285). Does this show that Moore is wrong to say intrinsic value is only for intrinsic properties?

A second problem is offered by T.M. Scanlon. An entailment of Moore's concept of intrinsic value is that if something is intrinsically valuable, we ought to promote or bring about or maximise the amount of it in the world, all else being equal. Scanlon argues that if anything is intrinsically valuable, human beings ought to be. And yet this does not necessarily flow from this thought that it is good to *maximise* human life (Scanlon, 1998, p.104). A similar thought comes from Anderson: *"respect for humanity as an end in itself does not demand that we bring more humans into existence or minimize their deaths. [...] Since there are no generally valid practical maximizing principles for intrinsic value, we say that intrinsic value cannot be increased by increasing the number of its bearers."*. Does this show that Moore is wrong that intrinsic value entails maximisation?

Ben Bradley, in 'Two Concepts of Intrinsic Value' (2006), shows that these and other disputes are dissolved if we split the concept of intrinsic value into two, along the separate lineages of its early originators: G.E. Moore, whose modern proponents include Ross, Chisholm, Harman, Feldman, Tolhurst, Lemos, Zimmerman; and Immanuel Kant whose modern proponents are Korsgaard, Anderson, Scanlon.

Bradley is not claiming that one conception is preferable to, or more coherent than, the other, but rather argues that the concepts play very different roles in an ethical framework and could both be true simultaneously. Kantian intrinsic value is invoked to suggest a certain object (namely a human, or as we will go on to see in this thesis, an *animal*) is worthy of some consideration, reverence or respect as an end in itself, that it ought to not be treated as a mere means. Meanwhile, Moorean intrinsic value is more properly the subject of axiology (value theory). The Moorean is interested in guiding action towards maximising certain states of affairs, namely those with positive value in them and minimising those with negative value in them. While the Moorean project attempts a value calculus, with a type of value that is additive, admits of degrees and can be positive or negative, the Kantian project is about the existence or non-existence of a binary property (Bradley, 2006, p122).

Bradley argues that we must be clear what sorts of things are the possessors of intrinsic value. For Moore and his followers, the bearers of intrinsic value are what Bradley calls 'fine-grained entities', essentially, things that happen or obtain: states of affairs, events, tropes, property-instantiations, propositions, or facts about the world. Meanwhile, for Kant and his

followers, value accrues to 'coarse-grained entities', concrete objects that exist, such as people, animals, communities. Bradley notes that Kant himself sometimes said only 'good wills' have intrinsic value, but at other times said all rational beings have it. Bradley interprets Kant as holding two different sorts of (Kantian) intrinsic value, one duty to indiscriminately respect all humans, the other to have reverence towards a good will for its own sake.

Bradley does not give detailed accounts of what sorts of entities make up the two sides. For instance, he says,Beyond these ostensive definitions for fine-grained and coarse-grained entities, Bradley is a little murky on the necessary and sufficient conditions: "*It is not obvious what all these [fine-grained entities] have in common, except that some such things (rather than, say, physical objects or people) are the sorts of things that make up lives, worlds, and other common objects of axiological evaluation.".* However, it seems to me that Bradley's description could equally apply to the Kantian intrinsic value set, for instance, 'people' are things that can make up other objects of axiological evaluation, such as 'communities'. Nevertheless, I think the divide is relatively clear and in my view best summarised thus: Fine-grained entities are 'states of affairs", coarse-grained entities are 'objects'.

This fine grained/coarse grained distinction diffuses Kagan's pen critique: while Kantians place intrinsic value on objects, and so couldn't see the object of a pen as being valuable in isolation, like pens, for Moore, what is valuable is not the pen itself, but the state of affairs that situates the pen in its context. The Moorean notion of 'intrinsic value for intrinsic properties' remains intact, as although the pen's emancipatory history is an extrinsic property of the pen, both the pen and its history are intrinsic properties of the particular state of affairs that holds Moorean intrinsic value. Kagan's pen is not therefore a true counterexample to Moorean intrinsic value.

Bradley also points out other differences between Mooreans and Kantians. When something has Moorean intrinsic value, someone has a good reason to try to promote it, or preserve it, or make it true, or bring it into existence. Adding something with Moorean intrinsic value to the world makes the world or a life or an outcome better (other things equal). Moorean intrinsic value can be added up and maximised, and it is the sort of thing that comes in degrees. On the other hand, Kantian intrinsic worth is more about something being befitting of the attitude of respect, esteem, concern or love, but an object having this attribute doesn't necessarily demand a duty to create more of it.

We should see that this distinction diffuses Scanlon's and Anderson's critiques. They have been applying the maximisation principle not to states of affairs as Moore intended, but to objects, in this case people, as Kantians do. They are right that it is possible to value something (or someone) for its(/their) own sake without it entailing that we should want more of it. This possibility is realised in the separate concept of Kantian Intrinsic Value. The Moorean sense remains unchallenged.

Bradley's paper builds on a previous attempt at classifying types of intrinsic value given by Christine Koorsgaard. In 'Two Distinctions in Goodness' (1983) she argues that the common dichotomy of intrinsic vs instrumental value is false. Rather, these are each one side of two separate distinctions in value: First, intrinsic value vs. extrinsic value, where what is at stake is whether the things that make an object valuable are intrinsic properties of the object or extrinsic properties. Second, value as an end vs. as a means, where what is at stake is whether or not something is valued as an instrument to, or contributor to, some other value, or is valued for its own sake. Similar to Kagan's pen, Korsgaard gives the example of a mink coat as holding value due to extrinsic properties, but nevertheless holds value as an end, because it can be an

'aspirational item to own'[1]. Korsgaard proceeds to discuss how similar conceptions of intrinsic value can be seen in Kant and Moore.

Again, Bradley's arguments challenge Korsgaard's in numerous ways. First, as we saw in resolving the Kagan's pen case, Bradley interprets Moore as applying intrinsic value not to objects, but to fine-grained entities like 'states-of-affairs'. A given state-of-affairs captures within its intrinsic properties all of the intrinsic and extrinsic properties of the *objects* involved in whatever the scenario is. In other words, while the Mink coat is, on Korsgaard's terminology, extrinsically valuable as an end, on Bradley's interpretation of Moore, the mink coat and the surrounding conditions that make it satisfy an aspirational urge collectively constitute an intrinsically valuable state-of-affairs.

Second, Bradley challenges Korsgaard's interpretation of Kant, attributing to Kant a Moorean type intrinsic value. Korsgaard (p. 180) notes: *When Kant says that the only thing good without qualification is a good will, he means that the good will is the one thing or kind of thing for which the world is always a better place, no matter "what it effects or accomplishes."* . Bradley (p.126) responds questioning whether Kant could have really meant this. "*This is an incredible claim. Would a world be better for the existence of one additional good will, if the effect of its existence were the extermination of the human race, including many other good wills?"* Bradley suggests a more fitting interpretation is not that the good will is value-adding in a Moorean sense, but rather that it is always deserved of a certain *respect* whatever the circumstances.

Third, Bradley points out the importance to Mooreans of the '*ceteris paribus*' (all else being equal) principle. Mooreans do not claim, as Korsgaard does, that intrinsic value means unconditional value, that is, always making the world a better place whatever the circumstances. Something may have intrinsic value even if that value is swamped by countervailing disvale. For instance, a funny but offensive joke may have aesthetic value but moral disvalue.

Broadly agreeing with Bradley's paper, both in its primary argument and in its rejection of other analyses, I will proceed to adopt his Kantian/Moorean distinction and apply it to the field of environmental ethics. We will see more clearly by the end that the differing sorts of environmental value further corroborate Bradley's claim that we are dealing with two different sorts of thing. While I adopt Bradley's distinction and not Korsgaard's two distinctions, if it were strongly felt that the objects of intrinsic value ought to be 'objects' and not 'states of affairs', then the following chapter could proceed relatively similarly with superficial changes, i.e. by being labelled 'intrinsic value *and* extrinsic non-instrumental value for nature', and by discussing the value of objects rather than states of affairs. This however would remain less semantically faithful to those philosophers discussed who have framed their arguments as being about intrinsic, not extrinsic, value.

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[1] I don't personally find this very convincing as an end, as while I agree there might be some end involved in the notion of 'aspirations being achieved', I don't think the mere owning of an item is morally worthy, but this is a personal value judgment as someone who is not particularly materialistic in this sense. Perhaps Korsgaard could have chosen a more universally agreeable example, for instance, a friendship (valuable as an end in itself) but one rooted in historical circumstance (extrinsic properties).

Intrinsic Value Axiology in Environmental Ethics

Commonly in philosophy, ongoing debates about the fundamental nature of concepts don't stop those in more applied settings weidling the concepts in question. Environmental Ethics boomed in the 80s and 90s, with many making claims about the intrinsic value of nature or parts thereof. And much of this work precedes major developments in axiology, for instance Bradley's 2006 paper, and as a result, much of the literature plays relatively fast and loose with the concept of intrinsic value.

That said, John O'Neill (1992) has attempted a systematic examination of the usage of intrinsic value environmental ethics. O'Neill first observes that some environmental ethicists have incorrectly interpreted intrinsic value as meaning 'objective value'. O'Neill cites the example of: Naess and Rothenberg in *Ecology, Community and Lifestyle*, who initially define 'intrinsic value' as value which is 'independent of our valuation' (p.11). I find this type is also held by Brian Norton and J Baird Callicott, who both want to motivate the category Norton terms 'non-anthropocentric intrinsic value' (Norton, 1992). Arguing that intrinsic value does not imply objective value, O'Neill points out that we can still make sense of the ascription of intrinsic value judgements within a meta-ethical anti-realist framework. Take, for instance Stevenson's emotivist account of intrinsic value:

"'X is intrinsically good' asserts that the speaker approves of X intrinsically, and acts emotively to make the hearer(s) likewise approve of X intrinsically."

O'Neill notes that there is no reason here why X cannot be filled with bio-centric attitudes. He concludes that intrinsic value discussions in environmental ethics should be treated as meta-ethically neutral - the metaethical is "logically independent" of the ethical. And that intrinsic value positions can be held whatever the metaethics.

While O'Neill is right to point out that intrinsic value isn't synonymous with objective value, it is more accurate to say that subjectivist metaethics can give an account of intrinsic value *judgements*, but not an account of intrinsic value, as by definition, the emotivist does not believe the existence of intrinsic value existing out there in the world beyond the psychological states of valuers.

O'Neill also discusses whether intrinsic value can accrue only to an object for its intrinsic properties or also its relational properties. He rejects what he terms the "Moorean sense of intrinsic value" for being overly restrictive, as we may indeed value its contingent properties like its beauty or rarity. Without the benefit of Bradley's paper here, we can see that O'Neill falls victim to misinterpreting Moore. On Bradley's account, Moore is better interpreted as not attributing intrinsic value to objects at all, but to fine grained states of affairs, in which an object and its properties may be taken in sum.

Most of all, O'Neill's framework is deficient for not distinguishing between Kantian and Moorean approaches as Bradley has more recently done. Momentarily we will see why it is not right to bundle together the views of those like Robin Attfield who values animals and trees as moral agents, and Robert Elliot, who values 'naturalness', an abstract descriptor of certain states of affairs.

Besides O'Neill, Karen Green (1996) also offers a systematic application of Korsgaard (1983)'s two Distinctions in Goodness to the field of environmental ethics. Green's key point is that much

of nature that we want to say is valuable for its own sake cannot be 'intrinsically valued' as it involves value for the natural objects' extrinsic properties, for instance, the rarity of a breeding pair of Cape Barren geese. Noting Bradley, we can see that such instances in fact *can* be intrinsically valued as states of affairs, not objects. Green's paper, while generally instructive for how it applies an axiology to environmental ethics, must now be seen as deficient in virtue of the problems of the framework it applies. A new, post-Bradley application of intrinsic value axiology to environmental ethics is desirable, at least for Bradley sympathisers like me.

My final observation is about the general conduct of environmental philosophers engaging in axiology. Both Green and O'Neill are concerned with how axiological claims about nature's value can 'survive' meta-ethical anti-realism. While O'Neill, citing Stevenson, concludes that intrinsic value positions can be held about nature regardless of metaethic, he sees a subjectivist metaethic as an inherently unstable basis for an environmental ethic, and this is part of his motivation for adopting a neo-aristotelian virtue ethics approach. Green meanwhile much more strongly rejects a subjectivist metaethic as an unstable basis for an environmental ethic. For instance, take these two passages:

> B*y using the notion of intrinsic value to express this, philosophers have developed positions which are open to a number of meta-ethical and practical objections. The view that there are objective values in nature, which are independent of human interests, <u>is better served</u> by an environmental philosophy which sees most value in nature as objective, extrinsic value (p.31, 1996, emphasis added).*

> *The problem is that if things have value in virtue of their being valued the natural decision procedure for determining action with regard to these values becomes democratic consensus or market demand. Particular beautiful paintings are valued as ends by some people, and not valued as ends by others. A painting will be deemed beautiful by some people and trite, or ugly, by others. Since this is the case, if we have a dispute over the preservation of some particular painting, a fresco, let us say, which is to be demolished for the sake of an apartment block, there seems to be little that we should do, in order to determine its value, other than discover how much it is (P.38, 1996).*

As an aside, on the second extract, I think Green is too quick here to equate subjective valuations with *market* valuings. The whole endeavour of intrinsic value philosophy supposes that humans do intuit some non-market value, and that will influence whether or not nature is preserved. Even on her analogy to art, we often protect art and culture regardless of market demand, such as when we make art free to access in taxpayer and donor funded museums.

But more importantly, the problem here with both passages is that in my view we should not be engaged in activistic philosophy. The question ought not to be, as Green effectively states, "what is the best strategy to fortify my belief in Nature's value as objective and timeless?" but rather it should be "what is true?". Where she says the view that there are objective values in nature are 'better served…' should views be *served* by adopting certain metaethical stances, or is it the other way round? A good faith meta-ethics should not be fuelled by a desire to ground a particular belief in objectivity, that is begging the question. One's desire to find objective basis for their beliefs is understandable, but this itself can be explained in subjectivist terms. The inherently pro-nature motivations of those engaged in environmental ethics may be one reason why the claims of later chapters have not been examined i.e. that indeed many humans will indeed value something that opposes nature, and this is in some sense valid.

The rest of this chapter is an attempt to categorise environmental ethicists' usage of the term intrinsic value, according to Bradley's Moorean/Kantian distinction. For the most part, the philosophers pre-date Bradley's distinction. But I extend the principle of charity by fitting them with one or the other to bring as much of environmental ethics as possible into coherence with the current state of intrinsic value debate.

Moorean Intrinsic Value in Environmental Ethics

The following section describes those assertions of nature's intrinsic value that best fit what Bradley describes as the Moorean version of intrinsic value. Within this section there are two important subtypes to discuss: intrinsic value for the *suis generis* property of 'naturalness', and intrinsic value for other properties commonly associated with natural objects.

Naturalness

A common idea is that the property of naturalness is intrinsically valuable.

Defining Naturalness

Let us consider some things that we typically might want to consider natural. A forest. A hippopotamus. A geological formation on a distant planet. A person's talent for running. What unites these things?

In "Dimensions of Naturalness", Helena Siipi gives a thorough account of the term in a full variety of senses (2008). The sense of relevance here is what Siipi calls 'History Based (Un)Naturalness': where whether or not an entity is natural depends on the history and origin of the entity, in particular, how it came into being and what modifications it has gone through. In this sense of the term, there is consensus that what is 'natural' broadly hinges on independence from human activity. For my examples: The forest is natural as it is land uncultivated by humans. The hippopotamus is an animal with a clear evolutionary lineage involving no human selective breeding. The geological formation forms with no human intervention. That someone's running ability can be described as a 'talent' implies the person has not tried to actively cultivate it, but rather it has been endowed by nature. Naturalness in this sense is to be contrasted with 'artificial': something that is the result of human activity. Contrast the examples above with a shopping centre; a domestic dog; a hole in the ozone layer; a person's ability to speak french.

Recall a criterion of Moorean intrinsic value is that it is a value for something for its intrinsic properties. The definition above shows naturalness is necessarily a *relational* property of objects. It depends on the presence (or lack thereof) of human beings. How then can we value naturalness intrinsically? Like for Kagan's Lincoln Pen example, Bradley's paper helps us find the answer: what is intrinsically valuable is not the object itself (the forest, the hippopotamus, the geological formation, the talent for running), but rather the *state of affairs* in which objects hold the relational property of naturalness (e.g. the state of affairs in which a forest is left untouched by humans; the state of affairs in which a hippopotamus is allowed to lead a natural life; the fact a planet remains isolated from human incursion; the fact that someone's talent for running was natural and not produced by artificial enhancements).

Philosophers disagree which human activities will qualify as interfering with an entity's naturalness/artifactualness. We might begin with a stringent condition that naturalness is a 'total independence from the intervention of human beings'. But various philosophers point out that anthropogenic pollution and climate change, which have now affected all corners of the globe, mean that every place on earth is now in some sense human modified (McKibben 1989; Katz 1997 103-4). Bernard Williams (1995) points out that there is a paradox in even delineating certain areas as 'nature', e.g. national parks, as even the act of protection is a human act. A strict 'no humanity' approach would then be too exclusive to be useful.

Noting the stringency, but wanting to maintain a binary distinction between naturalness and non-naturalness, Siipi notes how many thinkers have given variants of a slightly weaker claim, that naturalness is independence from certain *types* of human activities. If only a certain subset of human activities affect naturalness, what is this subset?

Attempting to answer this question is where we glide from the mere descriptive attempt to define nature, to the normative attempt to define it in a way that is consistent with our intuitions about precisely what *ought to* be preserved. The attempt to define the concept is bound together with the valuing of it.[2]

On matters of animal captivity, Tom Weston (1992) gives a nice example: Environmentalist David Brower, in rejecting the conservation of condors in captivity, said *"Condors are 5% flesh and bones and 95% place"*. For Brower, extricating the condor from its habitat made it to a great extent unnatural, and for this reason, a misguided attempt at nature conservation. Here we can see two axes of potential disagreement. One might agree or disagree that nature is intrinsically valuable, but also, among those who do Weston's intuitions about natural intrinsic value, one could still contend that in fact 'condors are 51% flesh and bones and 49% place', concluding on balance that it is beneficial to preserve them in captivity than extinct them.

In the seminal book "Faking Nature" (1982), Elliot offers a scenario where we are deciding whether to allow a company to mine a woodland, which involves destroying it, on the condition that they regrow the wildlife after. He begins by positing his strawman, the Restoration Thesis, which assumes that this mining is permissible, so long as the wildlife re-grown is of the same amount and type as before.

Elliot thinks the Restoration Thesis is insufficient, likening the attempt to brand this restoration as 'nature' to a forgery. A forged painting, while sharing exactly the same physical characteristics as the original, is less valuable. We not only care about the physical characteristics, but also the provenance, history and authenticity of the painting. The restoration thesis is tantamount to forgery, says Elliot, in faking the proper processes that ought to have produced the woodland, namely natural ones.

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[2] We will return to this point in detail in Chapter 3. For now, see similar normative motivations in debates over definitions in debates about what 'science' is, or what distinguishes science from pseudoscience, where we want to link the definition to normative epistemological claims about good epistemic practice, and not allow the quacks to don the label of 'science' and the social cachet which comes with it (Hansson, 2017).

Others have followed suit. Kekok Lee (1999) argues that natural entities (both organisms and inert matter) are more morally considerable than artifacts because they possess the 'ontological value of independence', while artifacts are created by humans with explicit intention to serve their own interests and ends. Meanwhile, Holmes Rolston (1986) (2011) argues that what is valuable about natural entities is their having human-independent evolutionary processes.

Are these debates all-or-nothing affairs? Does the condor in captivity lose *all* its naturalness (and hence natural intrinsic value)? Does the regeneration project have *any* naturalness (and hence natural intrinsic value)? Or are the regenerated landscape and the captive condor only as valuable as, say, a carpark? The answers will depend on whether naturalness/artifactualness is viewed as a binary distinction, or on a continuum.

Elliot himself is one of many subscribing to a continuum view of naturalness: that something can be more or less natural depending on the amount of human activity involved in an entity's history. He thus concedes that the regeneration project holds *some* natural value (Elliot, 1982, 1992). Eric Katz also values naturalness intrinsically. But unlike Elliot, in his own work (1992) and in direct response to Elliott (1998), he argues that it is more an all-or-nothing matter. Human attempts to mimic the natural world inevitably exhibit a human technological domination over nature, in a way that is in fact offensive to nature, and so we cannot produce anything of real naturalness ourselves.

Following what appears to be a critical mass of recent environmental ethicists as listed in Siipi (ibid.), I endorse the continuum view and reject Katz's. It seems intuitive to think that selective breeding practices, which have been practised for hundreds of years, are less natural than wild animal breeding, but more natural than artificial insemination, which in turn, is more natural than lab-grown meat, which in turn is more natural than a future lab-grown super-protein. The fact that a given one of these methods of meat production might have a measure of human artifice doesn't prevent us from valuing its residual naturalness.

Though endorsing the continuum view, I will continue to use the commonsensical descriptors 'natural' and 'artifactual' to describe those objects that fall very clearly on one side though, as we will see later in the discussion of the naturalness of human beings and biotechnology, this can occasionally be a fuzzy matter.

Wildness and Naturalness

Naturalness hinges upon some 'absence of human intervention'. But there is another term which crops up often: 'Wild(ness)' and 'wilderness'. Puzzlingly, there is clearly huge conceptual overlap between wild(ness)/wilderness and nature when used in the environmental ethics context. And yet, many seem to juggle the two terms concurrently and without acknowledgement of the crossover:

For instance, Hettinger and Throop (1999) define, and subsequently intrinsically value, 'wildness' as follows:

> *As we use the term, something is wild in a certain respect to the extent that it is not humanized in that respect. An entity is humanized in the degree to which it is influenced, altered or controlled by humans. While one person walking through the woods does little*

to diminish its wildness, leaving garbage, culling deer, or clear cutting do diminish wildness, although in different degrees.

They note in a footnote that:

> *"Although a number of philosophers have appealed to wildness and the related notion of naturalness, there is no uniform agreement on its meaning or justification."*

It is odd that this casual observation of conceptual overlap was made with no effort exerted to rectify it. They then proceed to give multiple arguments for the intrinsic value of wildness, all of which can be incredibly sensibly substituted for naturalness. As is clear from the quote above, they even suggest that wildness can admit of degrees, making it a perfect substitute into Elliott's nature/artifact continuum discussed above.

Meanwhile, Elliot, whose project revolves around defining and valuing naturalness, also often uses wilderness without unpacking the term. for instance in *Faking Nature* he says:

> *The appeal that many find in areas of wilderness, in natural forests and wild rivers depends very much on the naturalness of such places (p.86, 1982)*

If substitutability holds, this translates as: The appeal that many find in areas [untouched by humans], in forests [untouched by humans] and rivers [untouched by humans], depends very much on [the extent to which such places are untouched by humans]. That is just to say the simple statement: 'nature is appealing'. In later work, Elliot (1992) repeatedly uses the phrase "*Wild Nature*". This phrase seems either tautological, or it is a clarification that we are talking about natural objects and not, say, human nature, or the nature of X as in the essential properties of X. But here, in the domain of environmental ethics, this seems redundant.

'Wild*er*ness' might be permissible as a distinct term denoting an extremely natural area, or perhaps it denotes a barren and uninhabited landscape, for instance, a desert or a sterile distant planet. But this is not the sense that Elliot and Hettinger and Throop use. These philosophers are concerned with environmental ethics in the world at large, they endorse the continuum view of nature/artifact. Their concern extends to residual naturalness all the way along the spectrum.

Beyond being a general inconvenience in this area, the failure to observe synonymity - or at least a very close conceptual connection - between 'wild' and 'natural' means we have a parallel discourse that causes confusion. In O'Neill's aforementioned paper he distinguishes between intrinsic value for nature (which, as noted, he incorrectly calls the only Moorean sense), and intrinsic value for relational properties in nature. O'Neill then speaks of 'Wilderness' as a candidate *relational* property (the category we will come on to in a moment):

> *"An object might have value in virtue of its relation with human beings without thereby being of only instrumental value for humans. Thus, for example, one might value wilderness in virtue of its not bearing the imprint of human activity [...]. To say 'x has value because it is untouched by humans' is to say that it has value in virtue of a relation it has to humans and their activities. Wilderness has such value in virtue of our absence."* (p.125, ibid.)

O'Neill has a problem: wilderness and naturalness appear to be the same thing, but he treats them differently in his framework. Is wilderness some additional property, beyond naturalness, and if so, how is it defined? I don't see a difference, and so by assuming that nature and wilderness are broadly equivalent terms, I simplify matters and opt to place all views that intrinsically value wildness/wilderness within a single category. This adds to our category new philosophical company, as many philosophers have argued for the moral significance of wilderness (see a range of views in an anthology *The Wilderness Debate Rages On* (Callicott and Nelson, 2008).

Moorean Intrinsic Value for Relational Properties in Nature

Beyond valuing naturalness, there are other relational or extrinsic properties that natural objects may hold, for instance, their beauty or rarity, or some such, which may comprise intrinsically valuable states of affairs (or, on Koorsgard and Green's terminology, there are natural objects of *extrinsic* value which are valued as ends in themselves). Adopting Bradley's conception, the value here, like in the 'Lincoln's pen' case, is still an intrinsic value for intrinsic properties, as what is being valued here is the state of affairs in which objects have certain relations. i.e. The intrinsic value accrues to the *state of affairs* in which a mountain range is beautiful; or a rainforest is biodiverse.

Robert Elliot argues in a Moorean way that whether something possesses intrinsic value is determined by whether their value-adding properties outweigh their value-subtracting properties (1982, 1992). Any property that is a possible object of approval could potentially be value-adding. Elliot notes that value-adding properties may interact in complex functions rather than simple summations (p.139, 1992). However, he doesn't go into detail about how these functions operate.

In my view, it is worth unpacking how value-adding properties could work in some sort of 'values calculus' (which, recalling Bradley, is possible for a Moorean). In particular, it is important to consider whether the properties stand alone as independently valuable, or whether they are only value-contributing in certain circumstances. To my mind, there are at least three different ways that some property "R" can be value-contributing to a natural object:

Value-Adding: Here, the intrinsic value of a state of affairs regarding an object X owes to X's naturalness and also its R. R is an independently value-adding property, and so there could be an intrinsically valuable state of affairs where there is (high amounts of) R, even if there is no (or low amounts of) naturalness.

Suppose beauty is an intrinsically valuable property. A forest is valuable not because it is natural, but because it is beautiful.

Value-Modifying: Here, R is not independently value-adding, it only increases value to the extent that naturalness is also present in those objects. The property's value depends on it being attached to a *natural* object, it is not an independently valuable property.

Suppose beauty is not an intrinsically valuable property always, but it is an intensifier of value among natural things. A forest is then valuable as a natural beauty.

Value-Interacting: This would be a complex function, whereby it is both true that R is independently value-adding, but also there is a *further* source of value in the fact that R has been realised in a natural object.

Consider two identical woodlands, 1) a natural woodland and 2) an artificial woodland, as in Elliot's Faking Nature example. Now add 3) a natural-but-ugly woodland, that is similar in biomass, but is not as beautiful as the other two.

Both woodlands 1 and 2 share some superficial beauty. Woodlands 2 and 3 share naturalness. Is woodland 2's value simply the superficial beauty of 1 plus the naturalness of 3? No, because this ignores the interaction effect: 1 is made *even more* valuable by the fact that nature created its beauty. This would lead us to conclude that the properties of nature and beauty are value-interacting.

Let us now examine some candidates for R, and for each, let us consider on their behalf which type of value-contributing function is likely to be appropriate. We can start by properly examining Elliot's front-runner suggestion and what we used for our examples here: aesthetic value.

Aesthetic Value

Aesthetic value is often taken to be an intrinsic value (e.g. Parker, 2003; Misra, 2014; Scruton, 2011). There is debate as to whether aesthetic merit, or beauty, is an intrinsic property of certain objects, namely, artworks (though as we will soon see, other things too). Or whether it is a relational property that certain artworks bear to the mental states/attitudes of (actual or potential) observers (Sartwell, 2017). Should we have been using a Kantian account of intrinsic value, this debate would matter more, as the Kantian ascribes intrinsic value to objects themselves e.g. artworks, and would rule out the value occurring in a relational property. However, as the Moorean account ascribes value to *states of affairs*, and not objects, the debate doesn't so much matter. Just as in Kagan's pen example, the fact that beauty is not an intrinsic property of an artwork would not mean we could not describe as intrinsically valuable a state of affairs where the artwork holds a relation of beauty to observers.

It has been recently highlighted as a collective failure of the discipline of analytical aesthetics that it has restricted itself to art and 'the Artworld'. However, various extensions of aesthetics to nature are now thriving (Saito, 2021; Carlson, 2020). A dated and now less popular approach to aesthetically valuing nature is to simply apply the conceptual frameworks of conventional art aesthetics to nature. Dominant in the Nineteenth Century was the 'Picturesque Movement', positing that the natural world can be appreciated as resembling works of art in their subject matter and composition. The worry is that this sort of appraisal is reductionist, appraising nature *qua* art and not *qua* nature (Carlson, 2020).

Natural aesthetics has since stepped out from beyond traditional aesthetics. Still mirroring a classical distinction among theories of art aesthetics, substantive theories of natural aesthetic

can similarly be categorised as 'cognitive' or 'non-cognitive'. Cognitive theories emphasise the importance of knowledge regarding the subject of appreciation. Carlson (ibid.) argues that one requires knowledge of natural sciences (e.g. geology, biology, ecology) to appreciate nature aesthetically, just as art viewers view art with knowledge of art styles, art history, and social context.

Meanwhile, non-cognitive theories emphasise some other component over knowledge. Berleant (1995) holds a general theory of the aesthetic borne of a rejection of traditional Kantian aesthetics' distinctions between artistic object and observer. His engagement aesthetics gives a stronger account of more immersive experiential art. In theatre, sculpture and in reading fiction, the subject is not, as Kant suggested, standing in a disinterested relation to the object, but is rather immersing themselves in it. He observes that this account lends itself well to nature, where we might want to capture not just 'the picturesque', but more visceral, multi-sensory experiences of hiking a woodland trail or paddling a stream. Alternatively, Carroll (1993)'s emphasises emotional arousal as the heart of aesthetic appreciation, while Godlovitch (1994) argues the mystery and incomprehensibility of nature to humans is of aesthetic value.

Now is a good time to point out that there is nothing in our definition of nature that limits it to animals and plants - there is also geology. Barren desert landscapes, icy mountain tops, the Northern Lights, the moon, a stormy sea hitting a craggy rockface, and distant planets in our solar system are all natural objects commonly subject to aesthetic appraisal.

Natural Aesthetics - in what way is it value-contributing?

Aesthetic value is for many philosophers something of importance independent of (and indeed pre-dating) considerations of naturalness. So it seems possible to conceptualise this as a value-adding property of natural objects. Or even, for some it may be that it is only aesthetic value that is contributory here, not naturalness. However, we could also consider some sense of appreciation for a particularly *natural* beauty. It is not merely that a woodland is beautiful, but that nature made it so of its own accord. Perhaps then, for some, beauty is value-modifying. Or, as explained above, it could be that there is an interaction effect here. The beauty of the tree is standalone, but made all the more valuable by the fact that the beauty was achieved through natural causes.

It is worth noting that it is not clear what the limits of the concept of the aesthetic are, assuming it is even one coherent concept (Shelley, 2020). We have above seen that aesthetic appreciation can extend to the world beyond fine art. But then we also admit that appreciation can involve more than a superficial and passive interaction (as seen from the revision from picturesque to modern natural aesthetics), to include for instance the visceral multi-sensory experience of hiking up a mountain. And if, as the cognitivist aesthetic theories do, we admit that an aesthetic appreciation can be 'conceptual' and not related just to pure sensory experience, e.g. in employing facts about biology in our appreciation, then it seems we can aesthetically appreciate a broad range of real-world phenomena.

In what follows, I consider four further relational properties of nature that may contribute to intrinsic value: ecosystem functioning, biodiversity, rarity, and complexity. I will first outline each of these four relational properties before commenting in the round on how all behave in my

proposed 'value calculus'. With the scope of the aesthetic poorly defined, I leave open the idea that these four properties might be considered sub-categories of 'aesthetic value', instead of separate contributors of intrinsic value unto themselves. I will say more on this matter later, but for now, we can essentially remain unconcerned and treat them independently.

Ecosystem Functioning / Integrity

Political theorists like Alasdair MacIntyre, Michael Sandel, Charles Taylor and Michael Walzer critique political liberalism for its individualism, instead placing, what we might call in this context, an intrinsic value on human community relations as opposed to individual autonomy (Bell, 2020). For these thinkers, community is an abstract relational property held to a greater or lesser extent by a set of individuals. I see this as analogous to a claim that has been made in environmental ethics.

Many environmentalists attribute intrinsic value not to individual natural objects, but to the existence or thriving of species, populations, biotic communities, or ecosystems as a whole. Most influential has been J. Baird Callicott, who advocates a holistic valuation of the earth's biotic community. For Callicott, individual community members (e.g. particular instances of plants and animals) only have instrumental value dependent on their contribution to the "integrity, stability, and beauty" of the larger biotic community (Callicott 1980) (Brennan and Lo, 2020).

This approach faces conceptual challenges, and moral challenges in potentially advocating misanthropy when taken to the extreme, as humans are often not well integrated into biotic communities (Brennan and Lo, 2020). But even granting intrinsic value to ecosystems might still lead to various considerations of what is important and good in these ecosystems, and so what our valuation should lead us to do. Is it just the mere existence of biotic communities that is valuable? Leading, presumably, to the prescription that more (e.g. as measured by biomass) is better? Or do we value in particular certain virtues of ecosystems as well as raw biomass?

Biodiversity

Another example is the property of biodiversity, roughly, the diversity within and between species and ecosystems (e.g. CBD,2021). Philosophers and biologists debate a useful definition, as we might advocate different approaches to conservation depending on our relative weighting on variation at different levels of the taxonomic hierarchy. But there must be some such weighting. If we don't give some account that species level diversity is more valuable than just phenotypic diversity (i.e. intra-species diversity), then valuing biodiversity is just tantamount to valuing *all* nature equally, rendering the concept no more useful to conservationism than as another synonym for nature (Sarkar, 2005).

When considering a given natural object's contribution to biodiversity (e.g. in a conservation or culling policy scenario), the answer will be a relational property of the object in question, requiring reference to other objects (where objects are individuals, species, ecosystems, or anything in-between).

Environmental ethicists from anthropocentric, biocentric, and ecocentric holism traditions have, on the whole, placed a very high instrumental value on biodiversity in helping to preserve the "integrity, stability and beauty" of ecosystems (e.g. Callicott). And because a diversity in species may yield new useful features, e.g. new chemical substances of medical significance (Brennan and Lo, 2010). But, Oksanen (1997) notes it is rarely considered an intrinsic value in its own right. One exception is Arne Naess's doctrine of 'Deep Ecology' (Naess, 1989). Naess holds it to be the second of eight self-evident moral principles that the richness and diversity of species on earth is valuable in and of itself.

I do see Naess's point, and I will motivate this view further with my own simple adaptation of Routley's 'last-man' thought experiment (see Chapter 1):

> *Let's suppose the Last Man sets off nuclear bombs, destroying the earth's flora and fauna, but he is one bomb short of blowing up the entire earth's surface. He thus is forced to leave a single area untouched. Let's suppose that he has already wired up much of the earth with explosives, and all that remains are two remote islands, from which he must choose one to save.*

> *Island A has 10,000 creatures living in a self-sustaining community, with a combined biomass of 1000kg, and a combined cognitive activity of 100000 calories per minute, but this community consists of one species of crab, and a single plant. Island B is a smaller self-sustaining community, with half the number of creatures, biomass, and cognitive activity, but it has a diverse range of species.*

Assuming readers care about nature a little, they will hopefully agree with me that he does worse by blowing up island B, which implies in analogous fashion to Routley's original thought experiment, that we hold some additional value for biodiversity.

If valuing biodiversity requires us to promote it as much as possible, then this could conflict with promoting 'nature/naturalness'. As Peter White (2013) notes, biology does not vary at some fixed rate. Levels of genetic variation will depend on variation in circumstances, for instance, species adapting to new climates, separation events, extinctions of other species in an ecosystem etc.. Thus, Nature has some optimal level of diversity, but it need not be maximal diversity.

That said, it is logically possible that promoting some optimal (but non-maximal) level of biodiversity is more valuable than sheer abundance. If we take biodiversity to be an aesthetic property, this is analogous to the way we use evaluative terms like 'intricacy' or 'complexity' in art appraisal. These properties might be valued in some quantity but also disvalued if they become overwhelming.

Notably, value for diversity also expands beyond environmental ethics. Yee (2009) entertains that diversity (of perspective, thought, values etc.) might be intrinsically (as well as instrumentally) valuable, for instance, seeing intrinsic value in having a multicultural society.

Complexity

Complexity might overlap with concepts above like ecosystem integrity and biodiversity. Complexity is often mentioned in the same breath as these other ideas. For instance, in expanding on Arne Naess's second principle of Deep Ecology we mentioned above as value for biodiversity, he goes on to say:

> *More technically, this is a formulation concerning diversity and complexity. From an ecological standpoint, complexity and symbiosis are conditions for maximizing diversity. So-called simple, lower, or primitive species of plants and animals contribute essentially to the richness and diversity of life. They have value in themselves and are not merely steps toward the so-called higher or rational life forms. [...] Complexity, as referred to here, is different from complication. Urban life may be more complicated than life in a natural setting without being more complex in the sense of multifaceted quality.* (Naess and Sessions, 1984)

Meanwhile, the first organisational value of the Society of Conservation Biology is: *"There is intrinsic value in the natural diversity of organisms, the complexity of ecological systems, and the resilience created by evolutionary processes."* (SCB, 2021).

However, it is worth delineating complexity for separate treatment as an intrinsic value, as it may have some more general application outside of environmental ethics. Löschke (2020) broadly accepts the intuition behind complexity being intrinsically valuable, though argues the fundamental value is better labelled 'harmony'. Vidal and Delahaye (2018), in an attempt to create a unifying ethic for extraterrestrial life, intelligent machines and cyborgs, advance that complexity is the fundamental value upon which all ethics rests.

The authors dedicate a chapter to re-interpreting ethical fields to motivate the argument that complexity is the fundamental value. For animal rights, they say:

> *The ethics of organized complexity commands us [...] to respect and protect animals and, in a general way, the living. Interestingly enough, this ethics gives special importance to endangered species, as their individuals carry an organized complexity that will be impossible to recover if the species disappears. The difference of attention to be paid to a living being belonging to a species represented by millions of individuals and a living being existing only in a few copies is naturally taken into account by the ethics of organized complexity.*

From this passage, and another (pg.5, ibid.), it appears that their notion of complexity is quite broad as to encompass terms we have called rarity and biodiversity. I feel it is a shame they have used justification here which relies on rarity being part of complexity. They could have just more straightforwardly argued that natural events, behaviour, and evolutionary processes *just are* complex and this fact itself tends to fill us with awe and wonder.

Rarity

O'Neill supposes that another value-contributing relational property of nature is rarity.

> *"If any property is irreducibly relational then rarity is. The rarity of an object depends on the non-existence of other objects, and the property can not be characterised without reference to other objects. In practical concern about the environment a special status is ascribed to rare entities. The preservation of endangered species of flora and fauna and of unusual habitats and ecological systems is a major practical environmental problem. Rarity appears to confer a special value to an object." (p.124, 1992)*

Green similarly illustrates how different natural states of affairs will have different value depending on rarity:

> *"In the circumstances in which we live, where so much of the earth's surface is exploited, wilderness is valuable. It has become more valuable as it has become rarer. And it does not all have the same value. Some wilderness gains value by being the habitat for many species other wildernesses are less valuable, being less rare or more barren.(P.42, 1996)"*

Maclaurin and Sterelny (2008) note that, in practice, an advocacy for biodiversity will give mathematical weight to protecting rarity: all else being equal, we would care more about preservation for biota where their elimination more directly results in the loss of a species. An entity's contribution to biodiversity might thus be supervenient on its rarity. But (bio)diversity and rarity nevertheless are separate concepts.

Like biodiversity, a conflict arises between this value for rarity, and naturalness itself at the extremes. An extreme concern for the preservation of rare species might not necessitate natural outcomes. Rare species are sometimes going to be relatively unsuccessful ones from an evolutionary perspective. Though the counter argument could be that real world rarity conservation is more concerned with preserving a natural *rate of extinction*, and so focussing attention on species made rare by human intervention.

Aside from the rarity of species, there is also the rarity of nature as a category. Hettinger and Throop (1999) argue that we should value all instances of nature because nature is rare. i.e. it is in dwindling supply. These two types of rarity are not mutually exclusive, something could be valuable as one of very few instances of nature, but also valuable as a particularly rare species amongst what nature does remain.

As with diversity, valuing rarity (both within the object class, and between object classes) seems to be something adding to value considerations outside the field of environmental ethics. We value rare artifacts, rare talents, and rare occasions.

However, I find there to be something odd about the idea that rarity is a Moorean value-adding property, because the rarity of a given thing, assuming we like that thing, does not seem to be something we want to bring about, promote, or create more of.

Rarity intuitively does influence the value equation in some given state of affairs - it seems true, given a basic concern for nature, that we ought to invest extra effort to conserve a rare turtle, tree, or natural phenomenon such as the one-in-17 year flight of the cicadas. Rarity, then, induces us to be more concerned in the instances where it occurs, but it is not a desirable

property we would like to find present in the grand state of affairs that the world sits in. In other words, it is good to preserve the turtle in a state of affairs where it is rare, but not good to preserve the state of affairs in which the turtle is rare.

One viable option is to kick rarity down into the section below on Kantian intrinsic value. Rarity might be value-adding in a way that means it is befitting of an attitude of concern or respect, but not valuable in a way that is additive, and not something to be maximised.

But continuing under a Moorean conception, I find some conceptual resources for giving account of rarity's prima facie value by using the economics concept of 'diminishing marginal returns'. Consider that the logical consequence of increasing concern for rarity, assuming it is something that admits of degrees, is reducing concern for objects characterised by ubiquity. We can say then that an object Q's value is negatively correlated with how much of Q there is around. This is to say, as economists commonly say about pretty much all goods, Q has 'diminishing marginal returns'. Each successive unit of Q confers less value than the unit prior, up to a plateau point where successive units no longer confer any additional value at all.

Re-interpreting the rarity intuition; when there are few turtles around, those which remain are of high value relative to a given unit of the same species when they exist in abundance. And in Hettinger and Throop's case, when there is little *nature* around, one of the few hectares which remain is of high value relative to a given hectare where there is abundance.

We could therefore suppose that rarity adds value in a non-linear fashion. The rarity term in our value equation diminishes in proportion to the ubiquity of the object in question. On this conceptualisation, we preserve the intuition that rare instances of objects are more valuable than common instances all else being equal; but we also preserve the basic Moorean claim that more instances of good things is better. Creating rarity by forcing more things into extinction will increase the relative value of the remaining instances, but will reduce value overall.

What we can now see is some support of Maclaurin and Sterelny (2008)'s claim that an advocacy for biodiversity will give mathematical weight to protecting rarity. The more diverse environmental objects are from one another (e.g. being further apart in a taxonomy of species and sub-species), the less each object is devalued by ubiquity. Meanwhile, a rare instance of an object holds more value as one of a smaller number of tokens who bear the load of the existence of their type (e.g. their species or subspecies).

How are biodiversity, integrity, complexity and rarity value-contributing?

In what sense are the relational properties of ecosystem integrity (community), (bio)diversity, complexity, and rarity (notwithstanding the challenges above) valuable? My intuition here is different from the case of nature's aesthetic value. While it seems at least possible that aesthetic merit is valuable in whatever form it takes, these four properties all seem not to be independently value-adding properties of objects. Consider the states of affairs where there is:

- A *high-integrity community* of criminals (e.g. a mafia).
- A *diverse* range of views about something where there ought to be consensus, like whether or not to commit gratuitous harm to an innocent child.
- A cure for a disease that is only *rare* in availability.

- A *complex* bureaucratic process, or legal thicket.

The relational properties in question don't seem to create desirableness in these states of affairs. It is better to construe these as value-modifiers, acting within a set of objects we already consider valuable, for instance, their naturalness.

Note again that one may also contest that these four properties ought to apply not to naturalness, but instead to the independently valuable 'Aesthetic value' (or indeed any other independently valuable property of the object, though none else have been argued for in this context). With the scope of the realm of The Aesthetic poorly defined, it is very difficult to make progress in this regard.

These difficulties of taxonomising values within either natural or aesthetic intrinsic value is in some sense a microcosm of the general philosophical debate between values pluralists and values monists, who argue over whether and to what extent all of our values commensurate into a single foundational value (or some small number of foundational values). Mason articulates the problem for the value of 'friendship':

> *It is not clear whether there is one thing that is friendship or more than one, so it is not clear whether this is one principle about one thing, or one principle about several things, or whether it is really more than one principle. [...] Questions about what makes individuals individuals and what the relationship is between parts and wholes have been discussed in the context of metaphysics but these issues have not been much discussed in the literature on pluralism and monism in moral philosophy. [...] Part of an investigation into the nature of these things is an investigation into whether there really is one thing or not. (Mason, 2018)*

I will not be wading into this general debate any further, but the point to note is just that we can add our loose package of natural values to Mason's list of values yet to receive proper mereological discussion. We must accept it as indeterminate whether our concepts like biodiversity, rarity, integrity and complexity are all second-order categories of a foundational natural value, or aesthetic value, or sub-components of 'ecosystem integrity', or four distinct realms unto themselves.

Perhaps in response to this type of frustration, Anthony Weston (1992) offers a dissenting view, which is sort of moral analogue to coherentist epistemology: that environmental value domains are non-hierarchical, with no singular fundamental value(s), but rather values form a connected self-justifying web, with justification possible with reference to others in the web. While I'm willing to accept some inevitable fuzziness here, I think Weston's account remains too underspecified to be useful, and that 'naturalness' and 'aesthetic value' occupy a more fundamental position than these other relational properties, which are more parasitic on the presence of these fundamental value domains, as illustrated in my values calculus.

Kantian Intrinsic Value in Environmental ethics

Recall again Bradley's distinction between Moorean and Kantian intrinsic value. Thus far in our discussion, we have been considering the Moorean kind, discussing abstract descriptors of states of affairs of the world (naturalness, beauty, biodiversity, community etc.), that it is good for humans to bring about, maximise, promulgate. But the Kantian kind is different. It applies most commonly to people: Kantian ethics starts from the basis of valuing each human life as an end in itself (Johnson and Cureton, 2019), and also attributes intrinsic worth/value to 'good wills' (Bradely, ibid.). As pointed out by Anderson and Scanlon, this value for human lives and good wills is not the sort that necessary demands we bring about more of, maximise, the number of human lives.

I find that a significant proportion of environmental philosophers are instead pursuing projects of the Kantian kind. They want to treat certain natural objects as subjects of moral concern, by expanding the scope of egalitarian principles we tend to apply to other human beings, to also observe the interests of non-human biota. Paul Taylor (1981) correctly anticipates the general intrinsic value distinction offered by Bradley, by rejecting the term 'intrinsic value' and distinguishing this respect for animal lives as '*inherent worth*', and similarly Tom Regan calls it *'inherent value' (1983)*, though others, including O'Neill, still use the term intrinsic value for valuing parts of nature in this sense.

Theorists have offered different bases on which to grant this personhood/'inherent worth'/inherent value/intrinsic value. In 'The Case for Animal Rights' (1988), Tom Regan, holds a deontological principle that those who are a 'subject-of-a-life' (criteria for this include psychological continuity, sense-perceptions, motives) have a moral right to respectful treatment and not to be harmed. Expanding the circle of concern from fauna to flora, in 'The Good of Trees' (1981), Robin Attfield advances a theory of conativism. For Attfield, all beings which can be harmed or benefited, all which can be said to 'flourish' or have a good for it can hold intrinsic value.

Another basis for affording moral concern to biota, given by Brennan (1984), begins with the observation that natural objects lack an *intrinsic function*. While a dustbin wouldn't be a dustbin if it couldn't store rubbish, natural things are not intentionally designed instruments to satisfy some end. Brennan accepts that animals will have biological functions within wider ecosystems, but animals need not be capable of executing those functions to maintain their identity as those animals. Brennan notes, as in the case of rats, that an animal's function in an ecosystem can be highly adaptable. Brennan equates 'lack of intrinsic function' to the object's having autonomy. Invoking classical liberal thought, autonomy is a value-conferring quality, and thus biota have intrinsic value.

Dale Jamieson (2018) entertains another view, that animals might be the objects of our *love*. Jamieson applies Iris Murdoch's conception of love for another person. One feature of love is the notion of 'quasi-transitive' preferences. This is the idea that if you love someone, you want what they want *for them.* On assumptions similar to the theorists above, we can properly assert that non-humans can have 'wants', and so meet the precondition to being loved. So long as we

think love is a legitimate mental state to act upon, preference quasi-transitivity offers a justification to admit non-human preferences into a moral calculus.

Peter Singer (1975), a utilitarian, famously advances that all sentient creatures are morally considerable beings, as they are recipients of pleasure (utility) and pain (disutility). Excluding them from the moral calculus is, on Singer's view, arbitrary. Singer's position is like that of Regan's, Atfield's and others discussed above in that he considers animals as being deserving of some sort of ethical consideration as persons. Singer sees animals as 'ends in themselves' in the sense that they are bearers of utility.

However, Singer's view does not fit neatly into Bradley's category of Kantian intrinsic worth. As a utilitarian, Singer would think that the only intrinsically valuable thing is utility. Animals are recipients of utility, but as with other humans, they are only valuable in so far as they contribute to an overall utility calculation. Kant's point about intrinsic worth is that persons, rational agents, ought not to be treated ever as 'mere means'. On any utilitarian account, individuals can be treated as mere means (e.g. Trolley problems).

Nevertheless, even a utilitarian will want to have some concept that plays an equivalent function to Kantian intrinsic worth, to distinguish those objects that ought to be considered moral subjects from those that aren't. Bentham's utilitarianism began to consider the suffering of animals, but he also approved of killing and using animals as long as gratuitous cruelty is avoided (Kniess, 2019). Singer took this a step further by placing animals roughly on par with humans for moral consideration (ibid.). With the advent of artificial life, similar questions about the scope of morality are starting to become even more salient.

Non-Natural Biota as Persons

At this point in history, observing the distinction between life and 'natural life' hasn't mattered, as most of life crosses the threshold point for us to loosely consider it natural, but with the rise of synthetic biology, extensions of genetic engineering (beyond the age-old artificial breeding), and perhaps one day, sentient artificial intelligence, this may not soon be so.

Ronald Sandler (2012) considers whether attributions of intrinsic value can be extended to synthetic biology. Translating his position onto my categorisation, he argues that, essentially, while synthetic biology might have less intrinsic value with respect to it having lower naturalness (i.e. Moorean), the 'value for biota as persons' (i.e. Kantian) views are unaffected.

There is clearly a 'good for' beings moving along the natural/artifactual scale. Sandler gives an example of breaking the legs of a dog (a semi-artificial being) being bad, and the fact that there is such a thing as a 'good for' a purely synthetic protocell. It seems arbitrary then for the thinkers of this section not to extend their moral considerations to these sorts of beings. For sentientists like Singer and Regan, the justification for valuing animals stems from cognition, which artificial life can have (Rodogno, 2010). For Conativists like Attfield, it hinges on life, which artificial life, by definition, can have. For Jamieson, Dogs are semi-artificial creatures which are most definitely 'loved'.

For Brennan's view, it is perhaps more debatable, as unlike natural biota, synthetic biota can be created by humans with an intrinsic function. Yet we might think they still hold some measure of autonomy as synthetic beings; humans might create a particularly docile cow, or a microorganism to cure a disease, but for each being, we don't control their each and every movement and cognition. In this regard then, they still hold some autonomy.

Comparing Different Types of Intrinsic Value

Comparing sub-types of Moorean intrinsic value:

On the Moorean account, there is a moral motive to maximise the frequency and intensity of intrinsically valuable states of affairs. We find some tensions between maximising naturalness, and maximising biodiversity, complexity, community (notwithstanding the complication here with 'rarity', as not something to maximise).

Human intervention is often required to preserve endangered species, for instance, placing animals in captivity. This emphasis on protecting the biodiverse comes at the expense of the natural, as we saw in the Condor example at the beginning of this chapter. Similarly, it may be that more human intervention is needed, not less, to ensure biotic communities can be preserved in the face of anthropogenic climate change. For instance, scientists looking to promote the growth of corals that are more genetically resistant to ocean acidification. Or, it could be that human intervention is required to save a rare species from a natural disaster, for instance if a population of rare mountain goats lived on the side of a volcano that was about to erupt. Lastly, aesthetic tastes may demand more active manipulation of the natural environment, for instance, landscaping and gardening.

Inevitably in any list of multiple values, there will be tensions between pursuing them, and one must optimise. But what we can also say about all of these properties is that their total combined value contributions are not necessarily valuable standalone. Biodiversity, complexity, community, rarity (if allowed) seem not to be independently value-adding unless they are relations between objects we already consider valuable, namely, natural objects or objects with aesthetic value. Meanwhile, nature's beauty arguably has a standalone valuable component, but also is arguably enhanced in value because the beauty in question is naturally derived.

The terms we consider modifiers of a natural object's value I will sum up henceforth as terms describing the 'quality' of instances of nature, or, the 'quality' of natural states of affairs.

Comparing Moorean and Kantian Environmental Intrinsic Value:

On the other hand, we can see a clear distinction between the Moorean endeavour of valuing abstract states of affairs concerning nature, and the Kantian ethic of valuing biota as persons. It is logically possible to strongly hold convictions about the former without seeing parts of nature as persons at all, but moreover, treating biota as persons may actively work against the goals of the nature-lover.

It might be the case that what is *good for* a biological entity involves minimising human interference with it (i.e. increasing its naturalness), but it need not be. Animal welfare considerations could well lead us to reduce naturalness in certain circumstances. After 1,000s of years of being bred as human companions, dogs are domesticated animals whose welfare is likely to be improved in human environments rather than wild ones. Moreover, we currently intentionally breed farm animals for, *inter alia*, their docility and slovenliness - traits which would not serve them well if released back into the 'natural habitat' of their closest wild evolutionary ancestors.

One response could be that these species have already been 'doomed' by humans, and we should only focus concern on wild animals. But animal welfarists of the types discussed above are generally concerned with the welfare of domesticated animals, and also have no way to demarcate domesticated animals from non-domesticated as units of moral concern. They are still sentient, and it would be arbitrary to disregard them and not to try and better their circumstances. Moreover, recent studies have suggested that 60% of all mammalian biomass on earth are livestock, 36% are humans, and only 4% are wild mammals (Carrington, 2018). Ignoring livestock seems very ignorant indeed. An animal ethic focussed only on wild animals is almost irrelevant in the 21st century.

It is also not so clear that natural habitats are preferable even for wild animals. However we define the preferences of an individual, natural environments can be places where lots of harm occurs to individual beings. Incidentally, this is the sort of criticism of animal welfarists that led Callicott to embrace whole biotic communities, where such brutality is accepted as a necessary driver of evolution and is good for the ecosystem as a whole. In the seminal "The Hedonistic Imperative", David Pearce (2004) argues that our moral duty to avoid suffering in humans and animals means we ought not only to prevent artificial forms of suffering, but actively innovate with technology to alleviate a natural baseline of suffering in the wild. He suggests we should aim to "reprogram predators" to protect prey, and "civilise the animal kingdom". As Pearce points out, there is nothing in an ethical framework that values animal preferences which rules out such an approach, and consistency demands it be taken. Needless to say this would be anathema to valuers of naturalness like Katz and Elliot.

Moorean intrinsic value entails that we ought to bring about more of the good thing in the world. But, just as Scanlon and Anderson observed for human welfare, having a respect for animal welfare doesn't seem to necessitate that we create more of them. Animal welfarists of course acknowledge that if we close down factory farms, we will have a lower quantity of animals in the world (by design, no habitat could be more efficient than a factory at producing many animals in a limited space). This fact does not seem to threaten the coherence of animal welfarism. Bradley's distinctions are thereby corroborated here.

Meanwhile, it is equally difficult to create a necessary connection between animal welfare and our 'quality' concepts. The animal welfarists base their ethic on the animal's ability to feel pleasure and pain perhaps, but not to comprehend concepts like biodiversity. I can understand that a snail might feel disutility if it is in pain, but why would a snail care if they were rare amongst species? Or care that its nutrients are supplied through a particularly complex cycle of

natural soil regeneration?   How are we to know whether and what it means for a frog to think there is beauty in their bog? When we value the beauty of nature, it is unmistakably from the human gaze. The relational properties we value in natural objects, if they are valuable at all, are unmistakably valuable *to humans* and not to the animals themselves.

Moreover, treating individual biota as persons can be problematic for biodiversity, rarity and ecosystem integrity in circumstances where an invasive species is threatening an incumbent population. Biologist and philosopher Sahotra Sarkar gives many examples of this tension, including a case of stray dogs threatening to eat the eggs of a rare turtle (2005). He criticises Singer's account as entailing the wrong outcome to this scenario, which would be to refrain from culling the dogs and let them run rampant (for many other such arguments see also Brennan and Lo, 2010; 2020).

Ultimately, Kantian and Moorean types of environmental value seem to have a different character different emotional bases. Kantian views require us to hold a sort of empathy with non-human creatures. Moorean views instead require a sort of appreciation of certain descriptive features of the world, which, even if not totally aesthetic, is more analogous to aesthetic appreciation than moral appreciation.

But while the conceptual distinction is clear, and while pursuit of one may offend the other, there doesn't seem to be any reason why an ethic could not feature and optimise for both types of intrinsic value (Bradley notes more generally that the two types are compatible). Although the snail might not have aesthetic preferences about the garden they inhabit, a human in acting could factor into their decision making both the aesthetic preferences of humans toward nature, and also the personhood of the snail.

Perhaps in practice, if one thinks a natural object confers high Moorean intrinsic value, then it may be a useful strategy in the real world if one behaves towards the natural object as if it holds Kantian intrinsic value. For instance, some rivers have achieved legal personhood in Bangladesh and New Zealand. The river ecosystem certainly consists of living organisms, but the river itself is not living. This legal personhood is understood to be a fiction, but a helpful one to ensure nature's conservation (Kramm, 2020).

Adopting the Moorean Stance

I endorse Bradley's position, that while Kantian and Moorean Intrinsic Value are two different things, both can be held within a pluralistic moral framework. I recognise that there is much for the Kantian to say about matters of animal rights, and perhaps the emergent rights of biotic communities.

However, what is at stake in this thesis is questions surrounding the *naturalness* of certain endeavours. As demonstrated above, the Kantian positions described are orthogonal to matters of naturalness. Meanwhile, those who have valued naturalness (and other abstract properties of

natural objects like rarity) tend to have either explicitly referenced themselves as Moorean (e.g. Elliot, 1992) or can be interpreted as such.

Would it be possible to take a Kantian stance on naturalness itself? It seems to me the Kantian intrinsic value arguments discussed hinge on claims about the presence of agency or rationality in a being, or as Kant often put it 'a will'. This agency is missing in things (e.g. a mountain range, a rainforest, a human's talent) which are nonetheless valued for their naturalness.

Or, would it be possible to take a Moorean stance on the value of, say, animal lives? Perhaps yes, but this runs into objections discussed earlier by Anderson and Scanlon: Moorean intrinsic value suggests that we ought to maximise the amount of something. But it doesn't seem to be intuitive that we ought to maximise the amount of animals (for their own sake, as opposed to for instrumental reasons, such as to increase quantities of food).

This again shows that these are a different sort of thing. Choosing to move forward with only Moorean intrinsic value considerations is therefore not a matter of philosophical preference, but a matter of relevance to the argument at hand.

[3]Conclusion

There are numerous ways philosophers have argued that nature (or parts thereof) may be intrinsically valuable. The field of environmental ethics very often employs the notion of intrinsic value without the level of conceptual detail found in parts of theoretical ethics. Perhaps as an applied ethics, this is how things should be. It would be a shame for enquiries to be bogged down.

However, some recent developments in axiology, in particular the work of Ben Bradley, building on Christine Korsgaard, have argued to split the term in two. We have the Moorean sense, which values fine-grained entities in a way that is quantifiable in theory; and the Kantian sense, which values coarse-grained entities such as objects and persons, in a way that is not quantifiable and is more a matter of attributing respect or concern.

Expressions of environmental intrinsic value can be relatively neatly split along this framework. In the Moorean sense, we can value environmentally relevant states of affairs for exhibiting the property of naturalness, or for other relational properties of natural objects like beauty, biodiversity, complexity, community, and, perhaps, rarity. Meanwhile, in the Kantian sense, we can value nature's inhabitants as persons, and attribute them moral concern accordingly.

While one might have a complex moral framework holding both sorts of environmental intrinsic value, one need not do so. Valuing naturalness in many cases leads to different moral prescriptions than valuing particular instances of species as inherently worthy. A nature-lover need not see all objects of their love as persons. And an advocate of animal rights might ultimately see nature as only of instrumental importance, and place more emphasis on technological progress to improve animal lives. We will see later that these distinctions matter.

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[3]

Now we turn to the other side of our embryonic spectrum to consider technology (chapter 3) and the possibility of its intrinsic value (Chapter 4).

Chapter 3 - Defining Technology

Existing Definitions

'Technology' has two distinct senses: abiding by the -ology suffix, it denotes a subcategory of knowledge, that field of study related to manufacturing and engineering. But 'technology' is also more commonly and colloquially used as a descriptor of a certain class of physical objects (phones, cars, laptops etc.) (Mitcham, 1994, p.161).

Most analytical interest in philosophy of technology is dedicated to discussion of the meaning and status of technological knowledge. One definition of Technology in the first sense, controversial within the philosophy of technology discipline, but ubiquitous outside it, is that technology is just '*applied science'.* Applied science is argued, but not unanimously, to be a distinct type of knowledge that is not reducible to propositions (e.g. Dusek, 2006, p.33; Franssen et al, 2018). Side-stepping these debates, here, instead, we are interested in the latter sense of the word, that is, the sense of technology referring to *objects of technology* such as phones, laptops, doorstops and spanners.

Conceptual analysis concerning *objects* of technology has featured within metaphysics discourse on the nature of 'artifacts'. Verbeek and Vermas (2009) note three promising attempts to define 'technical/technological artifacts' which we will consider. Why these philosophers use the terms 'technical or technological artifacts' rather than just '*technology*' seems to be a matter of convenience for their wider discourse on artifacts, and perhaps clarifies the relevant sense of technology from the above paragraph. But given that Verbeek defines technological artifacts as just "*clear-cut manifestations of technology*", and gives no instances of technology that are not technological artifacts, the endeavour is tantamount to just defining technology. For our purposes, we are better off re-constituting the definitions below to isolate 'technology' itself as that which needs defining, but I aim for nothing to be lost in this reformulation.

Risto Hilpinen (1993) begins with a necessary condition for an artifact: *"[a]n object is an artifact made by an author only if the author accepts it as satisfying some sortal description included in his productive intention".* This condition applies also to events and works of art; it can be restricted to technological artifacts by limiting the sortal descriptions to technological ones such

as "material means to achieve practical end x." Unintended by-products of making (e.g. sawdust) or of experiments (e.g. false positives in medical diagnostic tests) are not artifacts for Hilpinen, but "scrap".

Meanwhile, Randall Dipert (1993) begins with the notion of a tool: A tool is an object that *"has been physically modified, intentionally, to serve as a more effective means to an end"*. Dipert then gives his definition of artifact as: *"An intentionally modified tool whose properties were intended by the agent to be recognised by an agent at a later time as having been intentionally altered for that, or some other, use"*. As above, this definition also applies to events and art; technological artifacts are distinguished from those as artifacts that serve *practical* purposes.

Kroes and Meijers (2006) offer a view dubbed the 'dual nature of technical artifacts', where a description must refer both to their status as tangible physical objects, and to the intentions of the people engaged with them - i.e. the maker and the user, both of which concern the artifact's function: i.e. that the artifact is *for* something.

Taking stock of these three definitions, it seems that despite semantic differences, we have a rough cluster of concepts upon which there is agreement. There is however some conceptual clash between terms that needs unpacking:

Artifacts and intentionality
The first concept in play on all accounts is 'artifact'. Dictionary definitions, along with the discussion of artifacts in Chapter 2 as being opposite to nature indicate that, at the very least, an artifact is a physical object that is made by or modified by humans. Not relevant in the philosophical discourse is that the term has, in archeological terminology, referred to man made objects *from antiquity*.

For Dipert and Hilpinen, there is an additional ingredient to artifactual-ness: that the human creation was "intended" to be the way it is. Recall, Hilpinen's artifact is *"[a]n object made by an author only if the author accepts it as satisfying some sortal description included in his productive intention"*. Micro-plastic pollution in the ocean would split the two conceptions - it is a human creation, but not an intentional one. For some, then, it is an artifact, and for others a man-made object but not an artifact. I will term these the 'thin' (made by humans) and 'thick' (*intentionally* made by humans) definitions of artifact.

Henceforth in this project, I will be using only the *thin* definition of artifact, as this better aligns with the conception amongst environmental philosophers of there being a nature/artifact continuum. This is to say, like Robert Elliot and Helena Siipi discussed in Chapter 2, I consider all physical objects sitting along a nature/artifact continuum, I do not conceive there being objects that are neither (i.e. because they are neither natural nor intentionally man-made).

Note that in Chapter 6 I will also be addressing in detail the question of why and whether artifacts must be the product of *humans* as opposed to animals or cyborgs. There is also an open question of what boundaries we place around the types of objects covered by the term artifact. Does it include abstract and ephemeral objects such as ideas, musical performances, and knowledge. This will be covered separately in Chapter 8. But here, let us assume artifact simply refers to tangible physical objects made by humans.

Function and Success

Another concept on all accounts is that technological artifacts have a *function*. A general account of the notion of function is difficult to conceive (the debate is summarised well in Franssen et al, 2018). Broadly, for Dipert and Hilpenen, an object having a function implies it is used 'for something'; that it 'serves a means to an end', or has some purpose.

Prima facie, intentionality and functionality might seem to imply each other. It seems necessary that a designer's intention has some content, that content being an intended function. What sense could we make of a designer's intention without reference to a function? Well, on some conceptions of functionality, works of art or ornamental objects would not qualify as functional and therefore serve as counterexamples.

But in any case, functionality does not imply intentionality. Firstly, a functional object does not need a designer, philosophers and biologists sensibly speak of functions when describing and understanding human and animal body parts, and yet here there is no designer intending these parts to be as they are (Assuming no god, and noting that natural selection is not, properly speaking, an intentional process although we use the idea of intelligent design in an illustrative fashion.) (Franssen et al, 2018). Indeed, Brennan's theory noted in the previous Chapter grounds a definition of what is 'good for' a biological entity in terms of its proper biological function.

Moreover, and more importantly for our current purposes, intentionality does not imply functionality. A designed functional object might not necessarily be *successful* in its intended function. The object might malfunction, depreciate, or be repurposed. Notably, Hilpenen and Dipert's definitions ignore success by only focussing on the function intended by the designer, and not on the actual functionality of the object realised in the world. Meanwhile, Kroes and Meijers's definition *does* make successful functioning a necessary condition by referring to both the designer and the user's intentions.

By making 'technology' indifferent to successful functioning as Hilpenen and Dipert have it, they rule in *junk*. A broken watch that fails quality control in a factory and ends up decomposing on a scrap heap is still technology, so long as the watchmaker intended it to work properly. By making 'technology' entail successful functioning as Kroes and Meijers have it, they rule out junk, reserving the term for a narrower set of intentional artifacts: those that achieve their intended function.

The goal of the next chapter will be to consider the intrinsic value of technology. For this goal, it is preferable that we can employ a simple term to denote the class of objects that are valuable. Without pre-empting that discussion in detail, it should be intuitive to see that it is not sensible to suggest that junk is intrinsically valuable. I will argue that intrinsic value lies in artifacts being successful in performing their intended function. Therefore, it is a convenience to be able to use the simple word 'technology' to refer to this valuable subset of intentional artifacts, and to rule out junk.

But how to draw this definitional boundary is ultimately a matter of semantics. I could, with no logical consequences, proceed by using Hilpenen's permissive definition, and go on to rule out junk by defining as my desiderata a new sub-category like 'Good Technology' or 'valuable technology' or 'good-nology'.

We saw in Chapter 2 how theorists aimed to find a definition of Nature that isolated only the stuff that is intuitively worth protecting (recall the condor - is it natural? Does keeping it in captivity

conserve nature or reduce it?). But we also see parallels to this sort of conceptual clash in other philosophical areas where we are similarly trying to wrestle with the tasks of defining and valuing simultaneously.

Philosophers debate the definition of 'art'. Traditional definitions of art often include 'possessing positive aesthetic properties' as a necessary condition (Adajian, 2022). For instance, Zangwill's 'aesthetic definition of art' requires that an object is intentionally endowed with aesthetic properties (Zangwill 1995), while Eldridge supplies a single necessary and sufficient condition for art: that a thing's form and content is 'satisfyingly appropriate', and this is an aesthetic quality (Eldridge 1985). On the other hand, if positive aesthetic properties make something art, then how can we make sense of bad art (Dickie 2001; Davies 2006, p. 37)? Consider Marcel Duchamp's Fountain - a urinal. He chose this object to make his artistic statement precisely because it did not contain any aesthetic merit. If one wants a definition of art to match how it is used in the world, i.e. without a necessary positive valence, then a definition situating art in terms of historical or institutional characteristics might be an improvement on the aesthetic-rooted definitions (Adajian, 2022).

Similarly, in trying to define the term 'science', say, as distinct from pseudo-scientists, homeopaths, quack doctors, spiritual healers etc., philosophers will vary in the extent to which they incorporate normativity into the definition. Hansson (2017) advances that just as 'pseudo-science' has a negative valence, 'science' generally has a positive one:

> *It would be as strange for someone to proudly describe her own activities as pseudoscience as to boast that they are bad science. Since the derogatory connotation is an essential characteristic of the word "pseudoscience", an attempt to extricate a value-free definition of the term would not be meaningful. An essentially value-laden term has to be defined in value-laden terms. This is often difficult since the specification of the value component tends to be controversial. [...] This problem is not specific to pseudoscience, but follows directly from a parallel but somewhat less conspicuous problem with the concept of science. The common usage of the term "science" can be described as partly descriptive, partly normative. When an activity is recognized as science this usually involves an acknowledgement that it has a positive role in our strivings for knowledge.*

In cases of art and science, some will place restrictive and evaluative criteria within the definition, others will have a more permissive definition which is then supplemented with separate evaluative criteria. Here, in the case of technology, I am stipulating that we should include the restrictive evaluative criteria (i.e. the successful functioning) *within* the concept of technology to be able to make a clean assertion in the next chapter that it is technology that is valuable.

Reconstruction

I will now scoop out the conceptual meat and reconstruct the above definitions, trying to give necessary and sufficient conditions without conceptual overlap.

Artifactual-ness must be a necessary condition. As we've found clear instances where intentionality might be questionable, I think it's important to explicate the *intentional* aspect of technology, and so prize apart the 'thick' notion of artifact into i) the thin notion of artifact,

denoting just 'man-made-ness', plus ii) intentionality. Prizing the two apart is also useful to allow for the nature/artifact continuum.

Technology = Intentional + Artifact_{thin} +....

Next, we add the final condition, that the intentional artifact successfully achieves a function, which again, can be prized apart from intentionality and artifactuality (recall divergence of intended and actual function).

Technology = Intentional + Functional + Artifact_{thin}

Is Technology 'Intentional Functional Artifact'?

Let us now road-test the tripartite definition against some of our intuitive ideas about objects and whether they are technology, and consider some problems which arise.

	Intuitively Technology ?	Intentional ?	Functional ?	Artifact ?	Match between intuitions and definition?
The Apollo 13 Spacecraft	Yes	Yes, it was designed with the intention of flying astronauts to the moon.	Yes, it successfully achieves the purpose of transporting astronauts	Yes, a spaceship is a man-made object	✓
An IPhone	Yes	Yes, it was designed to facilitate a range of electronic communication applications.	Yes, it successfully facilitates a range of electronic communication applications.	Yes, an iphone is a man-made object	✓
A Lake District sunset	No	No	No	No	✓
A human heart	No	No	Yes, it has a biological function of pumping blood around a body	No	✓

Plastic Pollution from Microbeads	No	No, it is an unintended waste/byproduct	No, it serves no commonly accepted function.	Yes? [See Challenge 1 below]	✓
A banana	No	No	Yes, it is consumed by humans to give energy and tastes good.	No? [See Challenge 2]	✓ / ✕
A faulty Microwave in a junkyard	No? [See challenge 1]	Yes, it was designed with the intention of being a household food heating appliance.	No, it sits dormant in a junkyard	Yes	✓ / ✕
My old windows computer, which I have now hacked to run with Linux OS.	Yes [See challenge 3]	Yes, it was designed as a windows-operated computing device.	Yes, it is functionally successful as a linux-operated computing device	Yes	✓
My old computer, which I now use as a doorstop.	Partially? [See challenge 3]	Yes, it was designed with the intention of being a computing device.	Yes, it is functionally successful at holding open my door.	Yes	✓ / ✕
A piece of flint used by cavemen to crack animal bones	Yes	Maybe [See challenge 2]	Yes, it is functional as a bone-cracking device.	Maybe [See challenge 2]	✓ / ✕
A painting, drawing, book	Maybe [See challenge 4]	Yes	Maybe [See challenge 4]	Yes	✓ / ✕
A song, a story, an idea, a language	No	Yes	Maybe [See challenge 4]	No, these are mental objects	✓

A political system/ a scientific theory.	No	Yes	Yes	No, it's a theoretical framework / system of concepts.	✓
A flawed and inaccurate scientific theory	No	Yes	No	No	✓
The first Kendal Mint Cake, The first petri-dish of Penicillin	No? [see challenge 1]	No - both accidental discoveries	Yes	Yes	✓/✗
Today's kendal mint cakes and penicillin	Yes	yes	yes	yes	✓

The table above shows the tripartite definition matches intuitions for a range of objects. Sunsets and scientific theories are not technology, but iPhones and spaceships clearly are. But there are some ambiguous cases to examine.

Challenge 1: Distinguishing Technology from Junk and Accidents

As stated above, for our endeavour of valuing technology, we want a term that isolates 'the good stuff'; the times where an artifact is intentionally made to serve a purpose, and does indeed serve that purpose. This rules out the junkyard microwave, which, at present, is not functional.

It also rules out the very rare category of accidental functional artifacts, for instance, the first-ever Kendal Mint Cake or Penicillin, both of which were created by accident after the spilling of some substances was not attended to overnight. Whatever your intuition on whether or not these things ought to be considered technology, this sort of case remains sufficiently obscure that they should not trouble our definitions.

Challenge 2: Does Artificiality admit of degrees?

As noted in the last Chapter, environmental philosophers have argued for nature and artifacts to be conceived as a continuum. This is corroborated by philosophers of technology (Mitcham, 1994, p.173) (Preston, 2020). There is a clear advantage of admitting that things can be 'more or less' natural, particularly when dealing with what would otherwise be problematic borderline cases for any binary, like regenerated habitats or genetically engineered humans.

The table's example of a banana sits somewhere along this continuum, the fruit itself arguably natural (or more natural than a lab-grown protein bar), but still cultivated intentionally and to certain specifications, picked, packaged in synthetic materials and made purchasable to humans. This makes a supermarket banana semi-artificial and semi-natural. A piece of flint found and then used by hunter-gatherers is similar - not manufactured by humans, but appropriated and used by them.

When assessing where an object falls on the nature/artifact continuum, it is easy to do so in vague and fuzzy terms, but is admittedly difficult to be precise. Some considerations I think might be relevant to this judgement are:

- *What is the object made of and, in turn, how natural are its inputs?*
- *What processes are typically involved in producing instances of the object, and what is the natural/artifactual status of these? (For a natural creative process, think how sand is made through a process of corrosion of stone, brought about by natural tides).*
- *What functions does the object accrue to humans, and how far does this diverge from 'normal functioning'?*

Even if we cannot make an absolute judgement of how natural/unnatural an object is, we can at least begin to make comparative judgements which allow us to test new shifts in artificiality against a body of standardly accepted objects. The evolving set of statutes and case law judgements which comprise the social practice of intellectual property law doesn't assess naturalness *per se*, but it does assess something similar: novelty.

We might think the novelty of a new technology relative to an existing body of technology is a good proxy for its unnaturalness relative to an existing body of objects we are comfortable with. If a technology is novel, this novelty is likely to be either because the object possesses a new physical feature, or allows a user to perform a new function. Both forms of novelty are shifts from nature to artifact. However, novelty and unnaturalness are not equivalent terms. A new technology could be highly novel, but actually only involve a small divergence from a natural process. More obviously, many many instances of technology, for instance all that are unpatented and all duplicates produced by a patent holder, are diminished in novelty.

This said, many of the debates around biological novelty do in practice become debates about the naturalness of activities. As a general rule, legal systems don't allow patenting of 'naturally occurring plants and animals', even when we might properly call them semi-artifacts, due to their extensive human cultivation and rearing. However, since the 1980s, there have been numerous attempts, some successful, to patent living things (Miller, 2008). A seminal and much-discussed case is Diamond Vs. Chakrabarty, where it was successfully argued that a bacterium capable of breaking down crude oil (and so potentially useful for oil spills) was deemed to be 'manufactured' and so patentable (Weiss, 1980).

While this remains a fuzzy matter, our intellectual property practices serve as a useful point of reference to demonstrate the practicability of arguing about relative degrees of naturalness. I am content to follow philosophers in adopting the nature/artifact continuum, and by implication, maintaining that an object is technological based on the extent to which it is artificial.

Challenge 3: The Link Between Intention and Function

We find a set of challenging and odd scenarios where an artifact's intention does not match its function in the context at hand. Should these instances still be classified as technology?

Of course, when we say intentions should match, we should be charitable in conceiving an artifact's 'proper function' at the right level of generality. Bill Gates probably never intended his machine to be specifically used to share videos of cats playing the piano. But this activity is part of the general set of activities of 'sharing information virtually through pixels for, inter alia, entertainment purposes', that Bill Gates did intend the Windows personal computer to be used for. And so in this broader sense, the computer is an intentionally functional artifact, and a clear instance of 'technology'. This is why we might be satisfied for the technology descriptor to hold in the microsoft-to-linux computer case, as in some broader sense, the computer still functions as intended.

But now, let's suppose this same computer was used to great effect as a doorstop, owing to its sturdy chassis design. On any definition of 'proper function' for this computer, the doorstop usage ought not to qualify. One could try and say it is part of proper functioning via an appeal to entailments: the sturdy chassis entails something not easy to knock over, and a doorstop requires something sturdy. But something nonetheless seems odd about this.

Should we be so willing to ascribe the term technology in this scenario? The 'computer *qua* doorstop' is 1) an artifact. It is 2) intended to have a practical purpose; and it is 3) functional, only functional in a rather different way than that intended by the original manufacturer. If we are comfortable calling this technology, then it seems the term extends to instances where an unwitting manufacturer has been just 'lucky' in meeting the user's requirements?

Our 'computer *qua* doorstop' case shows us that there is something counterintuitive about a definition of technology that allows significant divergence between the intended use, and the domain in which the object is functional. We might want to insist upon a match between the two for a good definition. However, it would be a step too far to simply exclude objects with a mis-matched intention and function as 'not technology', when indeed they are being used successfully for *some* function.

To reconcile this, recall above that artificiality can admit of degree in cases of found and appropriated natural objects like bananas and flint, which, while having natural origins, become used as instruments. We can also apply this same continuum view of artifactual-ness to objects which just so happened to have been artifacts to begin with. Perhaps (but not necessarily) they could begin as 'junk' like the old computer. It was found as an object with the properties of being an artifact, and having an intention and function as a computer. In re-purposing it as a doorstop, I am to some small extent acting as a designer/producer, engaging in some amount of *new intentionality* on the object beyond that which formed it, thereby creating some new technology.

So, in judging whether and to what extent an object is 'technology', we can build a more nuanced story. When the computer is repurposed as a doorstop, it is no longer a technology *as a computer*, but it is as a bundle of physical material that has been appropriated, or in other words, manufactured again *as a doorstop*. This argument could also give an account of the first batches of kendal mint cake and penicillin - they have been repurposed from accidental laboratory/factory spillages, into consumable products with nutritional/health benefits.

So, in summary, a 'context-dependent' account of technology runs like this:

- Technology is an intentional functional artifact, where there is a match between the intention of a creator and the functionality experienced by the user.
- The user and creator can be different or the same person/people.
- Physical material can be 'given purpose' by creators with new intentions at any point in the lifetime of the physical material. This includes 'repurposing', and also giving a first purpose to originally natural physical material.
- The act of 'giving purpose' or repurposing is a form of *artifice* (this is why flint and bananas are in some sense semi-artifactual).
- An object's status as 'technology' is relative to its users' and designers' intentions, and a given mass of physical material can change its status throughout its lifetime.

Using such an account, we can chart the lifetime of some physical object X (say, our computer chassis) as it moves between contexts.

Time	T	T+1	T+2
Description	A computer is created by a company, and used as a computer by User 1.	The computer is old and dumped.	User 2 recovers the computer from the dump to use as a doorstop.
Intention	(Creator 1) Computer	(Creator 1) Computer	(Creator 1) Computer (Creator 2) Doorstop
Function	(User 1) Computer	N/A	Doorstop
Technology?	Yes, as a computer	No	Yes, as a doorstop

In another example, let's take a historical artifact that now appears in a museum. It was originally created as a technology: a vase, say. It subsequently underwent a long tenure as 'junk'. It was subsequently dug up by archeologists, who gave the vase a new function, that is, as a pedagogical tool, an insight into ancient artifice. This wasn't the original designers' intention, but it is for the people who design museums around it.

When we have more complex objects, such as buildings, which themselves are made from many component parts, the assessment of the extent to which it qualifies as a technology may be even more nuanced. Buildings, aircraft, or computer systems may contain parts which are themselves original purpose-built technologies, parts that have been repurposed by secondary and tertiary makers, and parts that lie dormant and unused as junk (perhaps awaiting a new appropriation and use). In addition, it might have parts recycled and re-grown, and parts which are more overtly natural (e.g. the garden, the soil of the house's foundations).

While not possible in practice, if we can settle a method for the aggregation of the status of component parts (e.g. a technology mereology), then, at least in principle, the object as a whole should be able to locate somewhere along the nature/artifact continuum, and locate somewhere on a parameter of the level of matching between the most current maker/designer's intentions and the user's functions. If it locates sufficiently highly on both, we would be inclined to call such a thing 'technology'.

Accepting that the status of something as technology is situation-dependent, we thus should also accept other sorts of movement between categories. Consider our emerging problem of 'space junk' orbiting the earth (NASA, 2021). This junk used to be state-of-the-art technology,

but now, its original functionality and intentionality are moot, and what matters is that it is a big lump of titanium hurtling through space, potentially threatening our fleet of technologies, such as our new and functional satellites and spaceships, which might be made of the same stuff, but we relate to them differently.

Challenge 4: Distinguishing Art as not functional?

Artistic and ornamental objects are both intentional and artifactual. But there is some debate as to whether they can be said to be functional. On one hand, Dipert (1993) gives an account of artworks as artifacts without a definite function. It is their very lack of function that distinguishes them as art from other artifacts. However, I would say that art has many functions. For instance, the inducement of aesthetic appreciation in an audience; the inducement of certain feelings in an audience; the display of artistic virtue or creativity; the exercise of self-expression.

If a function can be conceived for artworks, then on this view, artworks are a subset of technology. If not, they are just intentional, non-functional artifacts. Other conceptual similarities between art and technology are discussed further in the next chapter, which may give us further reason to think they are of a common kind.

Challenge 5: Techno-Gettier Cases

The tripartite definition of knowledge as 'justified true belief' was challenged by a set of counterexamples offered by Edmund Gettier (1963), subsequently dubbed 'Gettier cases'. Gettier cases are instances of 'lucky knowledge', owing to bizarre coincidences, where there is a complete severance of the belief's justification and the conditions that made it true.

Curiously - or perhaps encouragingly for signalling its deservedness of a place in philosophical discourse - my tripartite definition of technology as intentional functional artifact is also subject to Gettier-style cases. Here are some examples:

> *Bob has manufactured a watch. But he forgot to include the internal mechanism that makes the watch hands turn, and forgot to build a compartment for the battery. Bob has built, what we might call a 'watch facade'. We might suppose that it wouldn't be out of place on a scrapheap. Recalling our criteria of technology as intentional functional artifact, Bob's watch most certainly is an artifact, and was intended to be. However, it is not functional for its intended purpose. And so, it is not the sort of thing we intuitively want to call technology, but instead, junk.*

> *But the watch went on sale nevertheless. Rachel purchased the watch to aid her in ensuring she gets up on time for work. As it happens, Rachel only checks her watch twice a day, once at 7am when she gets up, and once at 7pm when she gets home from work. By stroke of luck, the broken watch's hands are stuck on 7 o'clock. As it happens, Rachel's natural body clock is very good, every time that Rachel checks her watch, it displays to her the correct time.*

In this case we have an artifact (a watch), intended to perform a function (to tell the time), and succeeding in performing that function, and so, we have an intentional functional artifact, and hence technology. And yet, under normal circumstances, what has been produced clearly belongs on the scrapheap. It does not seem to be something we ought to value as an instance of technology.

Bob manufactures a doorstop made from an eye-catching, and what he thought to be robust, copper. However, the object is actually too light and too smooth to ordinarily hold a door open. But, Rachel purchases the doorstop for use on her door. Her door is electric, and will open and close automatically. Not content to have the door either fully open or fully closed, she wants the doorstop to ensure the door can be pulled 'to'. In this application, the copper doorstop is successful, not because it can hold back the force of the door, but because the copper material conducts electricity, and short-circuits the electronics powering the door.

In this case, we have a functional artifact - a doorstop. It was intended to be so. And yet, again, it seems to have been successful in its functioning by sheer accident, and is an object that in an ordinary context belongs on the scrapheap.

Gettier cases have prompted myriad responses. One popular approach is to question the independence of 'justification' and 'truth', and search for some condition which 'links' the two. Lehrer and Paxson (1969) offer what they call 'defeasibility conditions' to sit around a belief's justification: As well as JTB, there must also be no further true proposition, that if known, would have defeated a belief's justification. We might try analogous strategies here: we could posit that beyond Intentional Functional Artifact, there must also be no further aspect of the watch's/doorstop's (dis)functionality, that if found incongruous to the user's expectations, would render the watch not technology.

But, Linda Zagzebski's seminal paper (1994) proves that Gettier cases are unavoidable for all JTB+ accounts of knowledge. She outlines a procedure for generating them:

"Start with a case of justified (or warranted) false belief. Make the element of justification (warrant) strong enough for knowledge, but make the belief false [...] due to some element of luck. Now amend the case by adding another element of luck, only this time an element which makes the belief true after all. [...] We now have a case in which the belief is justified (warranted) in a sense strong enough for knowledge, the belief is true, but it is not knowledge. The conclusion is that as long as the concept of knowledge closely connects the justification component and the truth component, but permits some degree of independence between them, justified true belief will never be sufficient for knowledge."

It is analogous in the case of techno-gettier cases. So long as there is some degree of independence between the intentions of a maker/user of an artifact and its true functionality, we can always generate hypothetical cases of 'double luck', whereby an objects functionality and the intentions of its maker/user counteract each other in precisely the right way, such that the artifact is rendered both functional and intended to be so, and yet remains counterintuitive as a successful technological endeavor.

Taking heed of Zagzebski's warning, I do not suppose we can solve Gettier or techno-Gettier problems here. But we will come to see in the next chapter that it is generally useful to observe the operational similarity of the tripartite definitions of knowledge, and my tripartite definition of technology.

Graphical Representation

At this stage there are many concepts floating around, artifacts, technology, nature, function, intention, junk, etc. It is useful to pause to see how they all fit together. This section summarises the above material through a series of conceptual maps.

The core metaphysical claims of this Chapter and Chapter 2 have been:
1. There exists a nature/artifact continuum upon which all physical objects lie.
2. The following conditions make something a technology:
    o Artifact (a physical object that is made by or modified by humans)
    o Functional (serves as a means to some end)
    o Intentional (was intended to serve as a means to some end),

Let us model these two claims on the following graph:

Each of the three venn diagrams are representative slices of three-dimensional prisms running the width of the nature/artifact continuum. One shape shows that objects may be almost entirely natural, or artifactual, or somewhere in between, (semi-artifact). Another shape includes those objects that are functional to humans. A third shape includes those objects that have been intentionally made by humans.
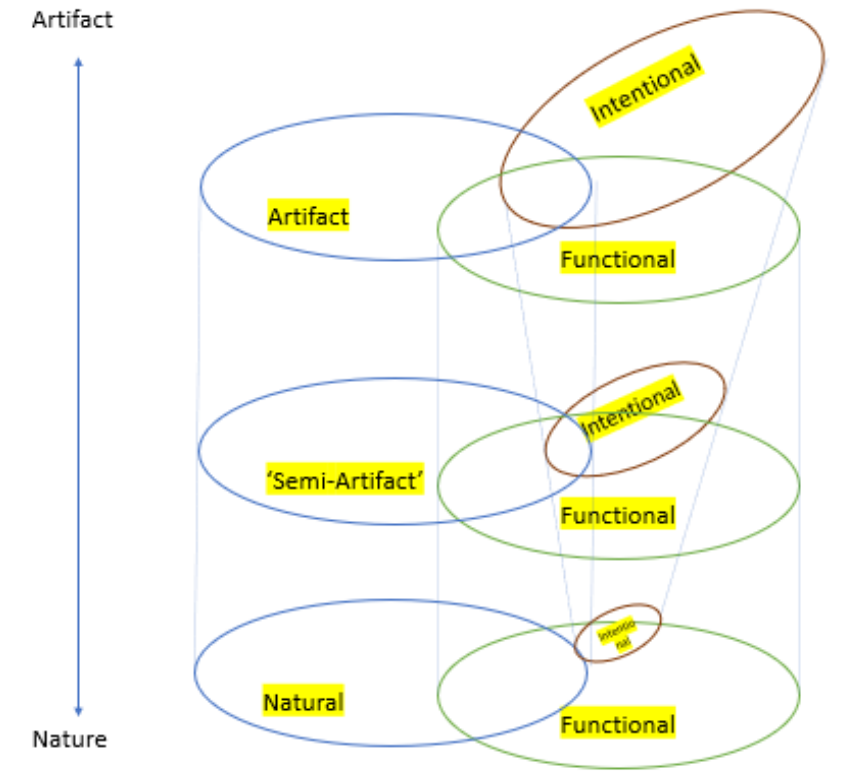
Let us take a closer look at each representative slice: On the artificial end, we can plot the concepts considered in the table and prose above. Technology, by definition, occupies the intersection of artifact, intention and function.
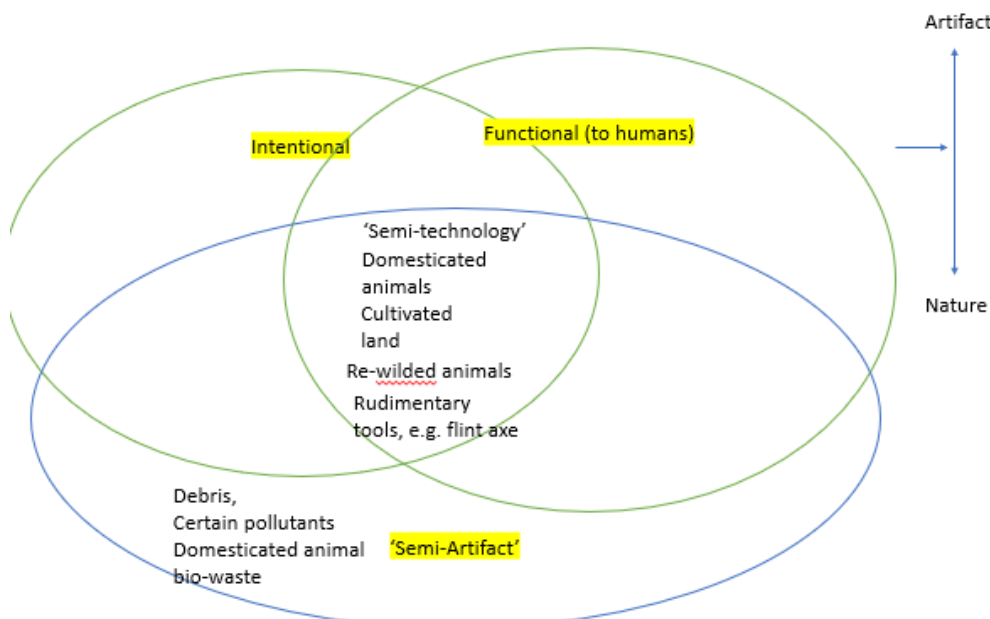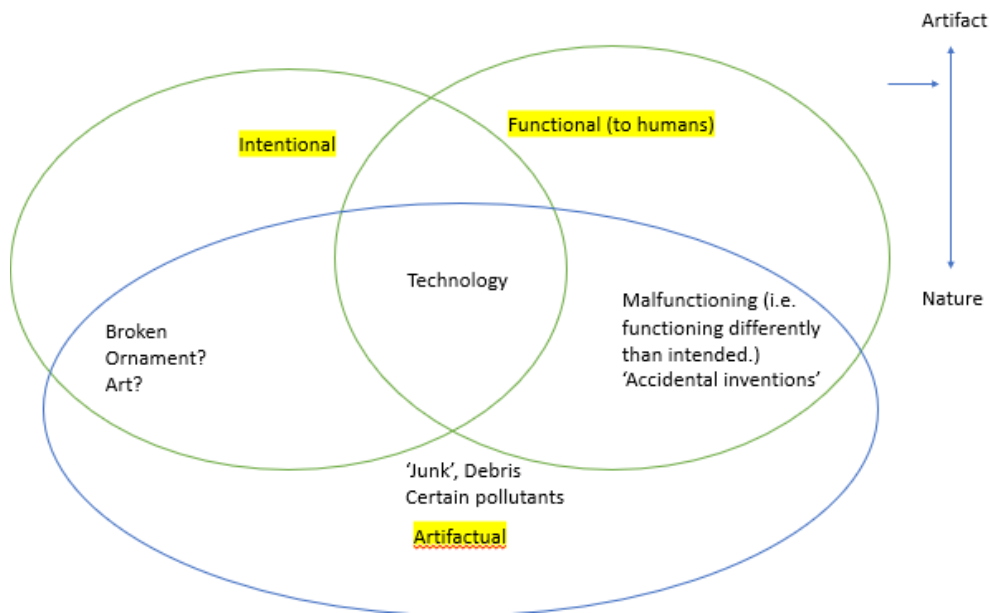
In the middle of the artifact/ nature continuum, we see semi-technologies, which have a significant claim to naturalness, but are interfered with to some extent. We also see debris and pollutants that are unintentional and non-functional semi-artifacts.
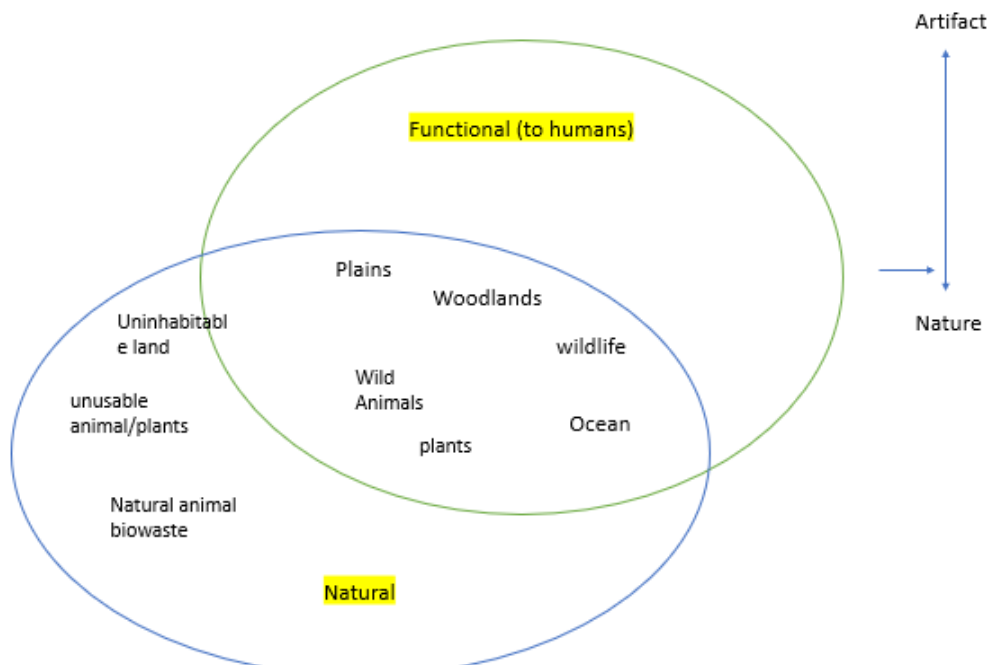
On the natural end, we do have some objects still functional to humans. Arguably the moment they do, they become less natural, but common sense says there needs to be a lot of appropriation done to 'the sea' to make it less a natural entity. Notice here, that there are no, or at least a severely diminished class of, intentional objects. This is because no human artifice has taken place. Intention dwindles in line with artifice.

Now, without further ado, let's look at the claim that technological intrinsic value might exist.

Chapter 4 - Technology's Intrinsic Value

Introduction

I currently work for the UK Government, creating the Advanced Research and Invention Agency (ARIA), a high-risk, blue-skies science and technology agency modelled on the renowned US Advanced Research Projects Agency (ARPA), which gave the world GPS, Apple's SIRI, and was a precursor to the Internet. Here, I have had the privilege of meeting eminent scientists and technologists, for whom innovation is well and truly an end in itself. The former head of a leading publicly funded technology agency once complained to me how her robotics team were so incredibly passionate to the point of obsession about creating a humanoid robot. They had no ability to articulate, and in fact no real concern for, what the positive impact to human lives would be from this technological advance, but perhaps this is just fine.

There is something incredibly awesome about humanity's technological endeavours. I admire that we have built rockets to the moon; broken the sound barrier with Concorde; and created software to beat top human players at chess. I admire that a pile of silicone, metal and plastic can be woven together in such a way that I can see my dad's face rendered on a screen, and talk to him despite a Coronavirus Lockdown-imposed distance. I walk through history museums admiring the huge variety of tools made by ancient peoples to achieve survival, beauty and pleasure. More mundanely, I admire the smoothness with which soft-close cabinets shut, the efficient parsimony of a ring-pull on a Coke can, the resourcefulness of the modern Chicken Nugget as a use for otherwise inedible offal, and the way door handles are designed intuitively so one knows whether they are to be pushed, pulled, twisted or turned.

I am interested in what exactly it is we value in technology and endeavours to create it. What is the source of our non-trivially and sometimes passionately positive attitude towards them? Of course we value technology instrumentally. But I think we fund, advocate for, and admire technologies at least in part because we value technology *intrinsically*.

Little, if any, analytical philosophy has designated technology as a possible bearer of intrinsic value. Philosophy of Technology is a young and disparate field. Despite being a major component of our everyday lives, technology has been relatively ignored by analytical philosophers until the last two decades, perhaps because they see it as too quotidian, too materialistic, or too capitalist to be a worthy subject - unlike high-falutin 'knowledge', 'art', 'nature'.

Technology has been discussed by Continental thinkers, in what is described as the 'humanities philosophy of technology', where the key line of inquiry concerns technology as a social and cultural force (Mitcham, 1994, p.39). Here, in characterising society's woes, the view of technology taken tends to be either that it is intrinsically evil, or that it is a neutral midwife of the evils of mankind. Most famously, in *The Technological Society* (1969), Jacques Ellul argues that society has come to value 'instrumental efficiency' as an end-in-itself, and this is a fatal misstep which has dehumanised and destroyed meaning in our lives. Far from being virtuous, the relentless drive towards efficiency in all areas of life (including manufacture of objects) is a

mentality that makes us fail to observe human freedom, truth, beauty and justice. Ellul is not so much concerned with the disvalue of technological objects per se, but rather humanity's 'instrumentalist attitude' to all things (For similar arguments see also Heidegger (1977); and more recently; articles by Ihde, Whyte, Gunderson and Clark in Kaplan (2017).

Railing against this historical backdrop, and in response to Continental technophobes, I hope to explore a new path in advancing that technology might legitimately be the subject of positive axiological attention.

Types of Value for Technology

Instrumental Value

First I need to be clear that I am not talking here about technology's obvious and massive instrumental value. Technologies exist as means to various ends of ours which are of value.

Technology is a great bringer of economic welfare, it makes our lives more comfortable and pleasurable in numerous ways, and it can be leveraged to increase returns to human labour, to create greater economic value. *Prima facie*, we might think technology's value is straightforwardly reducible to that which is captured in economic value, I.e. what we pay for it plus any consumer or producer surplus. Technology tends to command a high economic valuation, and so is not underappreciated by free market economics relative to, say, Nature and or the Arts. Secondly, unlike nature, technologies are intentional objects, and somewhat unlike art, the intent is often to a great extent explicitly perceived as an intent *to make money*. It might therefore seem odd then to suggest that the public have, as described in Chapter 1, an environmental economics-esque 'willingness to pay' for the mere existence of technology *beyond* what we literally do pay to own and use it.

However, there doesn't seem to be a relevant difference in principle between on the one hand technology, and on the other, things like art and knowledge. We pay for art and knowledge, though we don't take these concepts' value to be just that which we pay. Our motivation for purchasing these things might be well explained by us valuing them intrinsically. If it can be argued in these cases that value somehow transcends economic value, or is not fully reducible to economic value, why can't it for technology too?

Strange as it might at first seem, I actually do have an environmental economics-esque 'willingness to pay' to bring about certain exciting technological endeavours. This is an impulse of the same kind to my willingness to ensure the world contains artistic beauty and natural habitats. I have this willingness to pay even when I will not come to directly own the results, and even when I don't see society as gaining some specific benefit. Following in the footsteps of environmental and aesthetic philosophers, I identify this impulse as the first indicator of technology perhaps having value in some deeper sense than merely instrumental value.

Beyond being an instrument to economic welfare, technology might also be instrumental to other intrinsically valuable goods. Technology such as microscopes helps us learn more, an instrument to epistemic value. But again, this is not what I am talking about. Such instrumental

value is highly contingent and not necessarily the case for all instances of technology. Technologies can also be warmongering, an instrument to mass welfare losses. They also can be an instrument to divert and mislead from the truth, conferring epistemological losses.

"Embodied Value"

Before we embark, I must first clear the decks of some lines of argument in the vicinity that I disagree with. The major discourse linking technology and intrinsic value at present is in applied ethics, where a key question is whether or not technologies can 'embody' moral values.

Many philosophers have attempted to challenge the commonsense 'Value Neutrality Thesis': that technology is value neutral, and values are only present in the producers and users. This view is typified by the phrase popularised by the American National Rifle Association that '*Guns don't kill people, people kill people'* (Van de Poel and Kroes, 2016). A much discussed example posed by Langdon Winner (1980) is an overpass bridge built by Robert Moses which was intentionally designed to be extraordinarily low for racist purposes: the low overpass would not allow buses through, meaning only those who could afford a car could access the beach on the other side. The thought is that *the bridge itself* 'embodies' the value (disvalue) of racism.

De Poel and Kroes (2016) give another example of a speed bump, which, for them, 'embodies' a value of human safety. Katz (2005), similarly cites a Nazi death camp, claiming the *"purposes were evil, as is well known; but more importantly, the evil of the death camps was designed into the technological artifacts themselves"*. For such philosophers, certain technological objects can have value 'baked into them' and so be 'intrinsically' evil or good. For those producing objects with the capacity to expand the harmful capacity of individuals, there is a moral duty incumbent on them to stop, even though they may not be doing the harmful acts themselves.

I do not find this a helpful paradigm. Firstly, I remain committed to the value neutrality thesis. I find the evocative examples in the literature, from speed bumps to death camps, can be equally well explained as holding a very high *instrumental* (dis)value towards the particular intrinsically (dis)valuable end in question. That is to say, rather than being an instance of evil (i.e. an instantiation of an intrinsically disvaluable abstract property), it is equally well explained as an *instrument, or means* to bring about the disvalue. And as such, these examples are conceptual analogues of the microscope discussed above in the way they are instruments to their respective value-laden ends.

De Poel and Kroes use the example of a speed bump as having intrinsic value as it embodies the value of "human safety". But this misunderstands the point of intrinsic value, that the object is valued *for itself*. If human safety happened to be better achieved through other means, let's say, because it turned out that the speed bumps did more damage to car's suspension and increased the likelihood of cars malfunctioning, then the speed bump would not have any embodied value for human safety. This is, in my model, better conceived as a technology's intention, or intended function, and not an 'embodied' intrinsic value.

Second, it seems that while these philosophers speak of certain technologies having 'intrinsic value', they are not suggesting what I am going to advance, which is that we add the concept of 'technology' itself to the list of concepts we might intrinsically value. Rather, their endeavour is about observing more commonly held and well understood intrinsic values such as for 'human life' (in the case of guns), or 'racial equality' (in the case of the bridge) which they see technological objects as somehow possessing or rejecting. What it seems like they are really talking about is the expressive function of artifacts: certain artifacts like bridges and death camps can be means of expressing certain intrinsic values, just as an artwork might express a social critique from a political standpoint. The axiological analysis of these technologies finds nothing special about technology *per se,* it just reduces to the other intrinsic values that happen to be relational properties of certain particular technologies.

Third, even if we grant the possibility of embodied moral value in technology, this seems to me it should be only a peripheral concern for the Philosophy of Technology, in the same way as other philosophical disciplines like aesthetics and epistemology have overlaps with the moral, but it is not their bread-and-butter. While we can find esoteric examples like this racist bridge, or Nazi camps to articulate this view, it seems to have very little to say about most technological objects. I am trying to put my finger on something much more fundamental, something that could feasibly occur at least to some degree in *all* instances of technology, and would cause me to want more of it as a generalised class, all else being equal. That is the value for instances of technology as ends in themselves.

Exporting our Intrinsic Value framework to Technology

In Chapter 2, I developed a broad framework for understanding possible positions for valuing nature intrinsically. I adopted Ben Bradley's distinction between Moorean Intrinsic Value (value for something for its own sake, applying to states of affairs, summable and maximisable) and Kantian inherent worth (value for something for its own sake, applying to persons, about respect rather than maximisation). Within Moorean intrinsic value, we found two sub-types: value for naturalness itself, and value for a range of relational properties of natural objects. We noted that some of these relational properties are value-modifying, but not value-adding in-and-of-themselves. But one relational property, aesthetic merit, is arguably value-adding or value-interacting.

I will be applying roughly the same model here, but I will focus only on the Moorean intrinsic value. Regarding Kantian Intrinsic Worth, we have already seen in Chapter 2 that this can be granted to persons both natural and artificial. I endorse Ronald Sandler's argument, that a synthetic being can be a subject of a life, and so a subject of moral concern just as a natural being can. Biota and machine life may cross the relevant threshold for moral consideration, be it sentience, consciousness, complexity etc. But as noted, claims that such creatures deserve moral consideration are not intrinsic value claims in the Moorean sense.

We noted how Moorean intrinsic value accrues to states of affairs, rather than objects. In the nature case, what is (arguably) intrinsically valuable is a state of affairs in which there are

natural objects. Here, similarly, it is not technological objects themselves that are intrinsically valuable, but the state of affairs in which technological objects exist that is intrinsically valuable. For shorthand I will be occasionally speaking about the value of technological objects and their properties, but more properly, it is about valuing the states of affairs in which instances of technology (or instances of certain relational properties to technology) occur.

Following the order of the last chapter, I start by considering the possibility of intrinsic value of technological states of affairs because of the intrinsic properties of technology. I will then consider value-adding and value-modifying relational properties of technological objects.

In what follows, I consider various lines of argument leading to the conclusion that technological states of affairs are intrinsically valuable. My aim here isn't to pick and choose between them, and they need not be mutually exclusive. It is rather my hope that for each line I can provide enough of a foundation to start a conversation, which so far, doesn't seem to be happening at all.

The *Suis Generis* Intrinsic Value of Technology

It is extremely difficult, or perhaps impossible, to supply a rational argument for why a thing has intrinsic value (Crisp, 2005). The theorists in Chapter 2 who claim intrinsic value for nature presented no such arguments. Instead, it is a matter of appealing to intuitions. Proponents of nature's intrinsic value simply wrote in a pleasing manner about nature, about how wonderful and awe-inspiring it is, and this is intended to induce the right intuitions to support the axiological claim. This is not to say that once an intuition has been induced, there is not then analytical philosophy to be done to try and locate, precisify and understand the intuition. The proceeding section will attempt to first isolate the intuition, then understand it.

My old housemate John was a rocket scientist working on the Mars Rover project. Being exposed to John's work convinced me that spacecraft are incredibly cool. As far as I can tell through introspection, my appreciation of the spacecraft is not shaped by a narrowly conceived instrumental reasoning that it will *serve me*. My appreciation of the spacecraft doesn't stem from an ambition of mine to go to space, nor particularly from what I perceive to be spillover benefits to other industries and the economy. These instrumental benefits might well obtain, but are not responsible for my actual state of mind, which is much more powerful and directly appreciative of the endeavour, in a way I struggle to know how to characterise precisely other than saying: I appreciate it for its own sake.

I want to live in a world where people are endeavouring to build things that allow us to explore the wider universe. I intrinsically appreciate this state of affairs, and I admire John's decision to dedicate his life to helping to realise it. I could say the same about many other technologies and technologists innovating in areas like architecture, artificial intelligence, machine learning, synthetic biology, agriculture, gastronomy.

For me then, there is a lot that is intuitively admirable about technological endeavours. But it is difficult to directly argue for this conclusion. One cannot rationally justify 'all the way down' that any particular concept has intrinsic value *suis generis*. The theorists in Chapter 2 who claim intrinsic value for nature presented no such arguments. Often, proponents of nature's intrinsic value simply wrote in a pleasing manner about nature, and in doing so appealed to the sentiments. And perhaps furthermore *no* sufficient rational justification could be given for any intrinsic value beyond just appealing to intuition (e.g. Crisp, 2005).

Similarly here, it may well be enough to just baldly assert that technology, or technological endeavours, have intrinsic value, perhaps using illustrative case studies like John's spacecraft to induce the right intuitions, and you could simply intuitively agree or disagree, and that is that.

For me, these sorts of examples are sufficient. My intuitions ring out and the most plausible explanation is technology's intrinsic value. However, some may want to explain away these examples as being valuable for one reason or another. Maybe it is a covert form of instrumental value truly at play? A common strategy to try and show the presence of intrinsic value is to try and isolate the very thing that is in question and ask if it is valuable. This is the strategy seen in Richard Sylvan's 'Last Man' thought experiment discussed in chapter 1. In that case, the only thing to consider is the flora and fauna, no human instrumental concerns complicate the picture.

There are examples of technology that could feasibly be seen as 'technology for technology's sake'. That is to say, they exist only as instantiations of technological excellence, with no instrumental value. A literal and figurative 'toy' example is a Rube Goldberg machine, named after the eponymous American cartoonist, which is a chain reaction contraption made to perform a simple task in an overly complicated and indirect way, famously used by Wallace in the stop-motion cartoon Wallace and Gromit. Every year, there is a Rube Goldberg machine competition, where there is a large community of professional builders and junior entrants who revel in the artistry, comedy, and insanity of ever-more convoluted machines.

Watching a Rube Goldberg machine is interesting, fun, marvellous. It might push similar buttons in you as watching an artistic performance. It might be right to call the appreciation *aesthetic*, and we will go on to examine that possibility, but even if it is aesthetic, it is not simply that what I am watching is a sensory pleasure. The appreciation seems to stem from thinking about the craft and engineering behaviours involved, and the fact that it doesn't merely set off a bunch of unconnected mechanical processes, but rather, they all connect together intimately such that one can say about the machine that *it works*.

Consider now a real-world example. Many people appreciate record-breaking technologies. Perennial bestseller "The Guiness Book of World Records" features a page on the world's tallest buildings (GRW, 2016, p.124). It is currently the Burj Khalifa, which, at over 800 metres, is more than five times the height of the Great Pyramids at Giza and twice the height of the Empire State Building. I, along with many other readers, am impressed with the tallest buildings even when their technological functions return me no instrumental value - I might never visit the building but nevertheless be inspired, awestruck, or just merely quite interested in the fact that it has been built. Perhaps one might argue it has instrumental value to Dubai as a 'status symbol' of their industrial prowess. Perhaps it is. But we then in turn may ask why does this confer status? Because there is something there that is appreciable.

It seems to me that technological endeavours are interesting, salient, inspiring, cool, awesome, or hold some other property that indicates the presence of value. Hopefully, I can take for granted that the reader holds some sort of base intuition, or at least see that a sizeable number of people can feel this way.

The purpose of this chapter is now to try and more precisely understand the character of this value. Assuming some value is present, what, precisely, is going on that is valuable? We will examine whether value intuition exists in the definitional components of technology, whether the value intuition reduces to a value for knowledge, and/or whether value accrues to other properties common in technological states of affairs such as creativity and beauty.

But, granting that some sort of base intuition is present, we can use analysis to better specify precisely wherein the intrinsic value lies.

The Technology Meno Problem

In Chapter 3 we defined technology as 'intentional functional artifact'. If some intrinsic value is present here, does it accrue to one or some subset of these three elements, or is technology *fundamentally* intrinsically valuable i.e. it is valuable in such a way that is emergent across the three definitional elements? To answer this, observe again that our tripartite definition of technology as 'intentional functional artifact' is very similar in structure to the classical Platonic definition of knowledge as 'justified true belief':

- The third terms (belief, artifact) both refer to some type of object.
- The first terms (justification, intention) both refer to some process of formation of the object.
- The second terms (true, functional) refers to an attribute held by some instances of the class of the object, namely, instances that are in some sense valuable. We want to have true beliefs, and functional artifacts.

Knowledge may or may not be intrinsically valuable. Some may only recognise knowledge as an instrument, a means to achieving other intrinsically valuable ends. But among those who think knowledge is intrinsically valuable, there is a further question: is it the case that 'true beliefs' are what is valuable? Or is it also that *justified* true belief, i.e. knowledge, is valuable over-and-above true belief? (Nobody thinks it is valuable to simply believing something). Acting upon a given unjustified true belief has the same real world practical effect as a justified true belief. What is the value contribution of the justification? This is referred to as epistemology's 'value problem', and dates back to Plato's Meno (Pritchard et al, 2018).

Unlike in the case of 'true beliefs', it might not be clear to the reader why 'functional artifacts' are even a candidate for intrinsic value at all? Perhaps even more so than 'true beliefs', functional artifacts are inherently instruments. They are means to other ends. How can their mere existence be intrinsically valuable? This is one question to answer, but even if one thinks there might be intrinsic value in the vicinity of technology, there is then another.

In a parallel to the Meno problem, we have here what I'll call the 'Technology Meno problem'. For a given instance, there is no practical difference whether a functional artifact was *intended* to be so by its creator or not. So, if we do value functional artifacts, why should we value technology more than mere functional artifacts? This technology meno problem, like the original meno problem, frames two possible approaches to arguing for technology's *suis generis* intrinsic value.

This is to say, there are two possible Moorean intrinsic value claims that could be made in the vicinity of technology (though note that both are compatible as part of a pluralistic axiological framework):

1) **States of affairs containing functional artifacts are intrinsically valuable**
2) **States of affairs containing *intentional* functional artifacts (i.e. technology) are intrinsically valuable (over-and-above mere functional artifacts)**

Let us explore each of these possibilities in turn.

1) **States of affairs containing functional artifacts are intrinsically valuable:**

As just noted, prima facie, it may seem odd to assert that functionality itself is intrinsically valuable. Functions are instrumental by definition. They are means to ends. Functions are defined with respect to particular ends. The function of scissors is to achieve the end of splitting thin objects (paper, cardboard, plastic). Is it not the case then that all functions are only instrumentally valuable to the ends they serve, and so the value of the artifacts that bear this functionality is only instrumental?

I think the reduction of the value of functional artifacts to only instrumental value may miss something important. My claim here is that the very presence of functionality is itself intrinsically valuable. To see this, we first need to make a detour into the political philosophy of liberty. Many philosophers have argued that liberty is intrinsically valuable. Consider this quote from Isiah Berlin:

> *If, as I believe, the ends of men are many, and not all of them are in principle compatible with each other, then the possibility of conflict—and of tragedy—can never wholly be eliminated from human life, either personal or social. The necessity of choosing between absolute claims is then an inescapable characteristic of the human condition. This gives its value to freedom as Action had conceived of it—as an end in itself, and not as a temporary need, arising out of our confused notions and disordered lives, a predicament which a panacea could one day put right.* Berlin (1958, p. 54).

In a similar vein, John Tomasi's book Free Market Fairness (2012) discusses the idea that economic liberty is intrinsically valuable.

> *"[Consider] the idea that the economic rights of capitalism have intrinsic or fundamental moral value. Traditionally, thinkers in the market-liberal tradition have interpreted this to mean that economic liberties should be treated on a par with the civil and political liberties of citizens. Economic rights, like civil and political ones, are basic rights. Recently, though, some thinkers interpret the intrinsic value of capitalistic rights to mean that economic rights are more basic than other rights. At the limit, civil and political rights are not merely less weighty than property rights: such rights are themselves types of*

property rights. Property rights, on this view, are moral absolutes" (p.xvi, see also p. 29, and p.257 where he explicitly likens this to environmental ethics' intrinsic value for nature).

Amartya Sen progresses this line of thinking across different works using the concept of an 'option set' - a set of options that are feasible for a person to do in some situation, that are jointly exhaustive and mutually exclusive in that one must end up selecting one or other of the options. Sen gives a thought experiment comparing two scenarios, in one, somebody is starving but has no choice in the matter. In the other, the person chooses to starve for religious reasons - but could have chosen otherwise. Both end up in effect with the same life option, but as the latter's option set is wider, their situation is better (p201, 1985) (see also Sen (1988, p270–272). There are internal debates within this line of thinking beyond the scope of this thesis. Sugden uses the option set approach to consider the value of opportunity over time when preferences are unstable, (2007, p. 674), see also Carter (1999, pp. 41–43).

The common thread among these philosophers is this: over and above the *content* of the choices people make (in what to buy and own as property, in how to live, in what valuable ends to pursue), there is intrinsic value in the very fact that they have a choice. The size of one's option set is itself a source of intrinsic value. There are dissenting views. Gustafsson (2020) and Jones and Sugden (1982) argue that liberty is only ever instrumentally valuable to the ends that it permits one to follow. As in much political philosophy, there is a difference of opinion about what ought to be valued here, but beyond a matter of preference and intuition, there doesn't seem to be a decisive objection against the claim of the liberals above that it is the liberty itself which is intrinsically valuable.

Returning now to our subject matter, what should be clear is that functional artifacts expand our liberty (or, as Sen puts it, option-sets) in a unique way. Functional artifacts give us physical freedoms to manipulate and negotiate the world around us: The freedom to fly, the freedom to travel at 100mph, to examine objects in microscopic detail, to arrange large objects, to boil and fry, to explore virtual worlds, to play with simulated characters, to order a takeaway from one's phone, to crowdfund a new business venture, to learn a new skill etc. With only the functions available to us through our bare bodies, our physical option set is limited. But with functional artifacts, our option sets vastly expands.

It may not be so easy to see a meaningful expansion of option sets at the level of an individual instance of an artifact. A set of nail clippers confers only a very small additional increase to an option set. But the expansion of option sets is much clearer when considering aggregated technological states of affairs. Consider two worlds: 1) a hunter-gather style world with only minimal and basic functional artifacts; and 2) The United Kingdom in the present day. It is clear that the latter world has a vastly expanded physical option set, and this comprises many instances of many different functional artifacts.

Sen, articulating his view about which expansions of option sets actually increase value, makes a throwaway analogy to having two cars: he notes that it surely wouldn't increase the value of the situation much or at all if one had two identical cars in their garage, one with a slightly defective gearbox. Yes, it is an additional option, and it might still be a good one, but not one that substantially improves one's opportunities. He goes on to precisify which option sets truly offer additional opportunities (1993, p. 531).

The details of Sen's argument don't matter here. What is telling for us is Sen's use of the analogy of a car. In this particular case, the second car gives no meaningful expansion to his option set. But the argument presupposes that certain states of affairs in the vicinity to the one posed can be evaluated positively, e.g. if the second car genuinely diverged enough from the first to increase the option set, or indeed having a car at all vs. having to walk. Sen is only using this as an analogy to his true desiderata, political and social liberty. But if we reverse the analogy, we can see Sen implicitly appreciated physical liberty here as a coherent source of value.

Beyond Sen, some aspects of traditional political liberal thought do already touch on physical liberty. We are concerned with questions of bodily autonomy, freedom of movement, and the rights of citizens not to be incarcerated. But discussion has historically been limited to one's use (or lack thereof) of their own body, and not particularly of the use and functionality of artifacts.[4] That said, there is now a growing discourse in international development policy around whether access to the internet and digital technology is becoming a 'human right' (Edwards, 2012) (Klang and Murray, 2005). To me, the notion of some certain piece of technology being sectioned off as being a 'right' as opposed to others is slightly arbitrary (though maybe all 'rights-based' theories have this issue), this movement nevertheless shows that many liberals take technological freedom to be a core part of a good life in the modern era.

Of course, recalling Gustafsson (2020) and Jones and Sugden (1982), one might dispute that liberty of *any* kind is intrinsically valuable, saying that any value one attributes to liberty is ultimately instrumental. For instance, saying that the freedom to access the internet isn't inherently good, but just good because it brings about particular good effects such as social connection, commerce, and entertainment. One might even go further, in parallel to Communitarian critiques of liberalism, and say that physical liberty is intrinsically *harmful*, as we ought to be trying to live similar lives with one another, harmonising our physical option set around a set of activities rooted in tradition and cultural capital. But I am happy to be partners in guilt with the other planes of liberty here. I am merely trying to show that physical liberty is on a par with social and economic liberty, in that for at least some, it could validly be taken to be an intrinsic value unto itself.

Assuming social and economic liberty are intrinsically valuable, have we shown an argument for functional artifacts being intrinsically valuable too? Not quite. All we have argued for is that physical liberty is intrinsically valuable. Functional artifacts are just an *instrument* to the intrinsically valuable physical liberty. A means to achieve the end of a wider option set.

Some modicum of physical liberty is realisable without technology. We can achieve things in the physical world using our bare bodies, and enlisting the help of others and their bodies. For instance, I am free to experience what it is like to be 20 feet in the sky by being at the top of a human pyramid.

But notice that beyond the confines of our bare bodies, functional artifacts are effectively *the only* means of expanding our physical liberty. We can achieve physical liberty beyond our bodies to the extent that functional artifacts are present, and only in the ways circumscribed by

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[4] That said, it could be interesting for someone to consider how our use of technology brings to bear on traditional liberal arguments. Consider bodily autonomy arguments around abortion: with the technological possibility of incubating a foetus from near conception, does the argument for bodily autonomy still hold?

the particular artifacts that are present. Nail clippers serve the function of clipping nails. This additional functionality is the way our physical liberty expands. In other words, states of affairs that contain large amounts of physical liberty will very likely contain functional artifacts, and vice-versa.

So in summary, while we have not shown functional artifacts themselves to be intrinsically valuable, we have identified intrinsic value reliably in the vicinity. Functional artifacts are the single source of physical liberty beyond the bare human body, and this liberty, an expanded option set, is intrinsically valuable.

It seems that this approach to valuing technology could account for value in the spaceship case, but definitely does not account for the positive intuition in the case of the useless technology: the Burj Khalifa and the Rube Goldberg machine. These latter cases do not confer any meaningful liberty.

We now turn to consider the second prong of the Technology Meno Problem for an argument for technology's *suis generis* intrinsic value.

2) States of affairs containing *intentional* functional artifacts (i.e. technology) are intrinsically valuable (over and above mere functional artifacts).

By definition, for technology to be valuable over-and-above functional artifacts, there must be something valuable about the intentions involved in creating functional artifacts. To see this, we can take inspiration from how some epistemologists have argued for knowledge being more valuable than mere true belief.

Contemporary virtue epistemology is a broad collection of theories focussed on the normative importance of epistemic or intellectual virtue concepts. Ernest Sosa (1980) was first to introduce into modern philosophy the notion of an intellectual virtue, arguing that it can resolve a longstanding conflict between coherentist and foundationalist epistemology. Since, intellectual virtue concepts have been employed to tackle Gettier problems, the internalism/externalism debate to scepticism, and more. Since Sosa, there has been a split between reliablists, who tend to see intellectual virtues as certain cognitive faculties or powers like memory and introspection; and responsibilists, who see the virtues as character traits involved in knowledge production, such as inquisitiveness, fair-mindedness, intellectual carefulness etc. (Zagzebski, 1998).

For both groups, the exercise of intellectual virtues has a normative value. A key area of enquiry for virtue epistemologists is therefore the Meno Problem. Zagzebski (2003), Greco (2009, 2012), Riggs (1998, 2002, 2009,) and Sosa (2003, 2007) all attempt to solve the Meno problem using the notion of 'credit'. Knowledge is more valuable than true belief because knowledge is a credit-worthy state of an agent. The successful exercising of one's intellectual virtues is an achievement and that achievement is valuable over and above the true belief itself.

Riggs (2009) (quoted in (Turri et. al, 2021):

> *The reason that credit-worthiness views of knowledge can solve the value problem is that they introduce a new vector of value: credit…. If knowing that p always entails that*

one deserves credit for having achieved a true belief, then this introduces something besides true belief that is valuable.

Equivalently to virtue epistemologists, we can respond to the technology meno problem by arguing that the creation of functional artifacts through *intentional* action is credit-worthy. The successful intentional creation of functional artifacts is an achievement, not an epistemic achievement as it does not relate to knowledge production, but rather a distinct type, 'technological achievement', relating to functional artifact production.

Following the analogy through, we can see a set of character traits that dispose someone to create/ improve/promulgate technology as potentially being candidates for virtues. Paralleling the split amongst virtue epistemologists, we can consider 'reliabilist' technological virtues, for instance the exercise of mental faculties involved in wielding and combining propositions and know-how to form technological concepts, or, at a later stage of the production process, the skill of a factory worker in executing the production of a component to an exact specification. Or, as 'responsibilists', we could consider certain character traits in technologists to be virtuous, such as carefulness, exactness, and attention to detail.

There is no reason not to see technological achievements as credit-worthy *on a par* with intellectual achievements. Some of our technological achievements are wondrous. From early hominid's innovations in tool-making, to the printing press, to the internet. But we do not have to refer to these grandiose examples. A great many more technological achievements are less wondrous, but still locally credit-worthy in the life of an average individual. A credit-worthy exercise of one's technological virtue could be as simple as making a dinner, decorating one's room, making art, doing DIY, or knitting a scarf.

In the modern world, I can conveniently and cheaply eat meals prepared by someone else. I can hire tradespeople to affix my new shelving unit. I can simply buy art and scarves of better quality than I can make myself. And yet, a reduction of the value of these activities to just the functional artifacts themselves misses the point. I find it no surprise that it remains a source of personal pride and social respect for people who cook their own food and build their own shelf even when they can conveniently achieve these ends in other ways. It is because the exercising of one's technological virtues is part of a life well lived.

DIY and home-cooking are exceptions to the norm in the modern world. Our modern way of life does not place central importance on technological virtue for all people. Rather, we outsource technological production to a concentrated minority of experts: engineers and manufacturers of various kinds, such as John the rocket scientist. This makes it an area of virtue that is less accessible, and perhaps why it is less the subject of axiological attention. Commonly cited moral and epistemic virtues feature heavily in all of our lives. We are all confronted by regular opportunities to practise honesty, love, friendship, curiosity etc. But it is more possible to lead a life completely lacking in any technological virtue.

On the other hand, we might consider that appreciating virtue in others is a virtue unto itself. I admire John's work. I also admire the great technological achievements of others, past and present. From early hominid's innovations in tool-making, to the printing press, to the internet, to the latest generation smartphone. With all of these examples of highly credit-worthy

technological production, it is very difficult to attribute the achievement to any single individual, and this brings us on to questions of collective achievement.

A key line of criticism of the credit-worthiness approach to virtue epistemology is that many instances of some agent having knowledge don't in fact seem to be credit-worthy at all for the agent in question. If we cannot attribute credit, this mounts a potential challenge to knowledge being valuable. And if, analogously, we cannot attribute credit for technological endeavour, this mounts an equivalent challenge to my argument.

Jennifer Lackey (2007) gives an example where a man called Morris, new to the city of Chicago, asks a passerby for directions. The passerby gives great directions, and on that basis, Morris forms a true belief. Here, while Morris has knowledge, it was the passerby's contribution that was integral to explaining why Morris learned the truth. Morris doesn't deserve credit.

One line of response from Riggs (2009) is to reject that Morris has knowledge in the first place, but it seems to me that trying to rule this out rules out a lot of knowledge derived from testimony that we would want to call knowledge. The consensus seems to be that credit is present somehow, but that it is in some way spread across a collective. One line here attempts to redeem Morris as still individually credit-worthy for his contribution to the successful instance of knowledge dissemination. Greco (2007) argues that he deserves credit for 'having learned the truth'. Morris has no guarantee that the passerby is dependable. Morris exercises various cognitive abilities, based on a complex social intuition, to decide to accept the passerby's testimony. That deserves credit.

Sosa (2007) similarly argues that Morris deserves partial credit for his role in the collective endeavour of knowledge transmission. He uses the analogy of a quarterback in an American Football game who throws a touchdown pass: *"The quarterback's pass derives from his competence, but its great success, its being a touchdown pass manifests more fully the team's competence"*. Similarly, the intellectual achievement of 'knowledge of Morris's whereabouts in Chicago' is not attributable to Morris alone, however, like the runner who catches the winning pass from the quarterback, Morris has 'played his part' in receiving it aptly. But a further line of response, taken up by Greco in later work (2020), is to attribute epistemic virtue not to individual knowers at all, but to broader intellectual communities. Greco develops an account of 'joint agency'. In the case of the achievement of testimonial knowledge, it neither lies with the speaker (passerby) nor the hearer (Morris), but rather, the competent joint agency of both acting together.

Technologies are, perhaps even more so than knowledge, irreducibly social achievements. And like knowledge and sporting teamwork, I think this is part of what makes them particularly valuable. Our technologies instantiate the collaborative efforts of many agents working in harmony. The 2016 film Hidden Figures, inspired by the book of the same name by Margot Lee Shetterly, told the true story of three brilliant female African-American mathematicians who helped to solve problems contributing to the successful launch of the rocket. What we see along the way is just how important teamwork and getting along with each other was in the spaceship's creation. Technologies are a testament to our ability to communicate and overcome the limitations of our lone selves, they are the fruits of complex social endeavours, carried over many generations through teaching and culture, in a way that separates humanity from other species.

Like the 'touchdown pass' and the successful transmission of knowledge through testimony, many technological virtues are exercised socially. And so their credit is not attributable to single individuals. But they do seem credit-worthy nevertheless. The successful sharing of a set of intentions and goals, being in sync, are phenomena that amount to something of value, over-and-above the value of the end product itself.

For more quotidian examples, consider the unique experience of cooking together with a loved one, or the parent and child working together in a garage to build a soapbox racing car. The value in these cases is neither reducible to the output (the meal/car), nor some side benefit, (e.g. the opportunity to merely spend time with one another, or ease boredom). Rather, there is a special significance in the co-production of an artifact. It is a social achievement, a distinct form of human bonding.

So, in summary, the distributed and complex nature of assigning some instances credit is not a challenge but rather a strength of a credit-based account of technological value. It allows us to accommodate intuitions in both the cases where there is individual credit and socially distributed credit.

But Lackey (2007) raises another issue for credit-based accounts. In those instances of knowledge that can straightforwardly be attributed to an individual, for instance, innate knowledge or knowledge gained through perception, these seem so unimpressive as to not intuitively be credit-worthy at all. If so, then an equivalent challenge might be posed to me: small-scale individual technological activities are not credit-worthy.

My first line of response is that I do not see why credit cannot be something that admits of degree. The possessor of knowledge gained through perception deserves some modicum of credit for being aware of their surroundings and interpreting objects correctly - consider how you might play 'Eye Spy' with a toddler and attribute credit to them for their successful participation.

Secondly, I feel that the technological endeavour generally avoids Lackey's objection in the knowledge case, as the vast majority of instances of technological creation are intuitively credit-worthy, with no mental gymnastics required. It just seems obvious to me that making a home-cooked meal and knitting a scarf deserves some credit. They are things I would complement a friend on. They are activities I would consider worthy spends of time. Perhaps the closest equivalent to innate knowledge would be a person's channelling of hunter-gatherer technological instinct, for instance, picking up a boulder or stick for use as a weapon. My intuitions in this case are unclear, but either way, this is not the sort of technological situation that is relevant to our present lives (whereas prima facie uncredit-worthy knowledge is still a feature of our lives).

So, in summary, this credit-based account of technological value seems to be promisingly close to common sense intuitions in grand cases like the production of a spacecraft, and also in more local settings like the production of a home-cooked meal. The credit account captures a certain *appreciability* that societies can have for engineers and their produce, which elevates the value of a functional artifact beyond its value as a mere means. It seems this approach to valuing technology can better account for the Rube Goldberg Machine and Burj Khalifa, as these show a similar sort of virtue.

On a small technical point, note that this argument is not really a claim that technology is intrinsically valuable, but that technology *production* is intrinsically valuable. In what follows, I do

not generally read much into this distinction for four reasons: 1) Because it is convenient to refer to 'intrinsic value of technology' as shorthand; 2) Because the two positions cash out in an identical way: If you value technology, you want more technology to be produced; if you value technology production, you want more technology to be produced. 3) By definition, technology involves an intended production, so valuing technology (assuming the value is emergent across all parts of the definition) includes valuation for the intended production. 4) Under the Bradlian/Moorean framework, we value states of affairs and not objects. States of affairs containing technology production will also contain technology, and in states of affairs containing technology, each instance of technology will have been produced.

To conclude this section, we can see potential lines of argument for technology's intrinsic value, straddling both sides of the technological Meno problem. Technological states of affairs might be intrinsically valuable, but not fundamentally so, but rather only because functional artifacts accrue physical liberty. Or perhaps it is also that the achievement of intentionally creating functional artifacts is virtuous for an individual, a social group, and also something highly appreciable in others even among those not exercising the virtue themselves.

Science and Technology

As the Meno problem shows, it is a much more common and older notion in philosophy that there is intrinsic value in knowledge (or parts thereof). This notion is self-evident in the etymology of 'philosophy'. Building on the ancients, modern epistemologists have argued for intrinsic epistemic values including for knowledge in general (Pritchard et al, 2018); truth (e.g. Christensen, 2013); and for epistemic virtues (e.g. Zagzebski, 2003; Riggs, 2002; Greco, 2003).

One potential source of objection to technology (or technology production) being intrinsically valuable is that the value I attribute to technology is in fact just epistemic value, in particular for the scientific knowledge underpinning technological endeavours. The realm of achievement that is credit-worthy in the previous section is thereby just epistemic achievement and not some distinct realm called technological achievement.

I suspect that in fact the reverse is true. A significant amount of the positive valence towards science (both in philosophy and among the general public) is misattributed, when in fact what is valued also is *technological* endeavour, i.e. engineering. Before we can understand such claims, we first need to get clear on the interplay between the two.

Broadly speaking, I advance that scientific endeavour is concerned with the creation of knowledge propositions, while technological endeavour (I.e. engineering) is, as I've defined it, the creation of intentional functional artifacts. Philosophers have put this distinction in more artful ways. Henryk Skolimowski (1966) and Herbert Simon (1969) both say that "*the scientist is concerned with how things are, but the engineer with how things ought to be*". This seems wrong to me, as we might wonder how engineers get their 'oughts' if not from more normative disciplines e.g. politics, ethics.

Another commonly discussed idea is that technology is 'applied science', though this is contested, as some argue that technological endeavour predates science (Flores, 2019),

although it seems to me that an applied version of something can exist before its corresponding theoretical version with no issue, the issue is only if the application of science requires an agent's self-conscious knowledge that 'they are applying science'.

My preferred treatment of the two activities is to see them as lying on a continuum of different processes. Often one is simultaneously engaged in the generation of scientific and engineering propositions as they are building technological concepts. Whether that be synthetic biologists tweaking cells in a lab to understand cell function, an astrophysicist building computer simulations to mirror features of the universe, or a big pharma chemist developing a molecule for a new drug. A popular representation of the intermediate activities between the pure production of scientific knowledge and the pure production of technological artifacts is the widely used 'technology-readiness level' (TRL) framework developed by NASA (2012), but appropriated for use by the European Union (2014) . This 9-point scale charts the origin of a commercialised and ubiquitous technology, first in pure science, then applied science, then in prototyping, and then in scaling and mass production.

TRL	European Union Definition (2014)
1	Basic principles observed
2	Technology concept formulated
3	Experimental proof of concept
4	Technology validated in lab
5	Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
6	Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
7	System prototype demonstration in operational environment
8	System complete and qualified

9	Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Consider the following statement of intrinsic value for a particular area of science: synthetic biology. This is from Kaebnick (2013), remarking on Ed Regis' book What is Life (2008).

> "[Synthetic biology] *is a morally noble activity, in and of itself. The pursuit of science is the advancement of human mastery, and synthetic biology exemplifies human mastery especially dramatically [...] It is humanism at its most grandiose. The pursuit of science is also the pursuit of understanding, the refinement of human intelligence—a less self-aggrandizing but still grand endeavor. So understood, part of the very point of synthetic biology is philosophy in its original sense—love of knowledge that encompasses both physics and metaphysics. In fact, it's also philosophy in its current sense, which concerns the investigation of human systems of meaning."*

Kaebnick here is articulating an intrinsic valuation of science. While I broadly agree with the sentiment, I disagree on its referent. This is a misattribution of value to science, when it is in fact for the production of technology. The field of synthetic biology's expressed aims are *"to extend or modify the behaviour of organisms and engineer them to perform new tasks"* (Lustig, 2013) (Andrianantoandro et al. 2006). Synthetic biology is, by definition therefore, a technological discipline. Clearly in this case, mastery consists not just in the accumulation of scientific propositions but an application of them to synthesise, i.e. create, new (semi-)artifacts. This is a technological process, and so this observation ought to be recast, at least partially, as an affirmation of the intrinsic value of technology production.

Axiologically, when we hear value sentiments that are *prima facie* about an appreciation for science, it seems to me that we are not merely talking about the endeavour of pure science. Pure science alone does not confer these abilities of human mastery of nature, at most, it only hints at how they might be done in theory. The endeavours that in fact gives us these abilities are those running all the way along the Technology Readiness Level spectrum. And so it seems if these are the sort of sentiments that account for some intrinsic value, then all the steps along the TRL should be considered intrinsically valuable.

Consider these quotes from notable engineers articulating a similar gap between science and technology (Shepherd, 2023):

> *"As engineers, we were going to be in a position to change the world – not just study it."*
> —Henry Petroski, American engineer and author specializing in failure analysis

> *"The scientist discovers a new type of material or energy and the engineer discovers a new use for it."*
> —Gordon Lindsay Glegg, British engineer and author

> *"Science can amuse and fascinate us all, but it is engineering that changes the world."*
> —Isaac Asimov, American writer, professor of biochemistry

"Aeroplanes are not designed by science, but by art in spite of some pretence and humbug to the contrary. I do not mean to suggest that engineering can do without science, on the contrary, it stands on scientific foundations, but there is a big gap between scientific research and the engineering product which has to be bridged by the art of the engineer." — British Engineer to the Royal Aeronautical Society, 1922.

Let us take it as a given for the moment that there is some intrinsic value present in technological pursuits like building spacecraft. Not only might spacecraft have instrumental value, but they are also an awesome achievement of some kind. There is a sense in which locating the intrinsic value only in knowledge propositions here is missing something. Let's return to the Hidden Figures example. Suppose the rocket scientists and brilliant mathematicians decided to keep all the propositions to themselves, and though they had collective knowledge of spaceflight, never actually built the ship. For instance, if the old, white male scientists in Hidden Figures hadn't gotten over their racist and sexist inclinations and hadn't allowed the talented mathematicians to make their contributions. In such a case, the propositions are equally well known among the constituents of NASA. However, this state of affairs seems considerably less intrinsically valuable.

One might counter that the difference is down to the actual building of the spaceship being a surefire demonstration of the knowledge. But this still falls short. Suppose the scientists simulated the spaceflight on sophisticated computer models, such that we could be very sure the propositions were true. Even then, it still seems less good to me than had they actually done it. Put another way, there are infinitely many technologies that could exist if the relevant knowledge-owners happened to get together and produce them, but the fact that these knowledge items exist already now is not a reason to appreciate the state of affairs very much.

A different example might make the point even clearer. Many people appreciate record-breaking technologies. Perennial bestseller "The Guiness Book of World Records" features a page on the world's tallest buildings (GRW, 2016, p.124). It is currently the Burj Khalifa, which, at over 800 metres, is more than five times the height of the Great Pyramids at Giza and twice the height of the Empire State Building. I, along with many other readers, am impressed with the tallest buildings even when their technological functions return me no instrumental value - I might never visit the building but nevertheless be inspired, awestruck, or just merely quite interested in the fact that it has been built.

Consider again the Burj Khlaifa. Many types of knowledge will be involved in the construction of this tall building. But crucially, the propositions that are required to be known to build this tall building are not hugely different to those which contributed to shorter buildings. Moreover, we seem to already know exactly what it would take for us to build *even taller* buildings. And yet, me and other fans of the Guiness World Record books are still impressed by the tallest building as it stands today. In both of these cases, I reserve at least some appreciation for the actual doing of the activity, the application and employment of propositions, not just the propositions themselves. In this way, technology's value doesn't seem reducible to propositions, even though it could account for some significant portion of my positive valence.

Franssen et al (2018) notes how Gilbert Ryle's 'know-how' (1949) might apply to the manufacture of technology, with impossible-to-articulate 'rules of thumb' threatening an account which reduces the knowledge discipline of technology to mere propositions. This is perhaps an important idea missing from the EU's Technology Readiness Level scale. Engineers in the design and manufacture of spaceships and tall buildings will of course use their know-how along with propositional knowledge. Engineers learn much of their craft on the job, and might have skills not articulable in propositional terms. Know-how is indisputably an input into the creation of technology, and it might be epistemically valuable.

But the above examples again serve to show that the existence of some amount of know-how does not sufficiently cover the intuition of technology having value. While I appreciate the know-how of engineers, I appreciate it more that they actually employ this know-how to create remarkable instances of technology like space ships and tall buildings. We need the referent of our valuation to distinguish between states of affairs where the engineers do actually use their know-how successfully in the creation of these great intentional functional artifacts, and when they don't.

There is no denying the intimate relationship between scientific knowledge (propositions and know-how) and technological endeavour (the creation of intentional functional artifacts). It is worth observing, and marvelling, at how incredibly pumped full of knowledge technologies are. At each point of the Technology Readiness Level spectrum there are distinct fields of scientific knowledge involved. Whether that be progress in every field of fundamental science which allows the generation of fundamental scientific concepts, or moving along the TRL, of engineering and production concepts, or knowledge of gaps in the market, or of the best distribution mechanisms to bring objects to a wide audience. Technologies act as uniquely rich domains of knowledge, they are substrates about which new sets of propositions can be generated.

However, to reduce the value of technology to only the value of the knowledge propositions and know-how would be a mistake, as over and above the knowledge itself is the successful application of the knowledge into producing functional artifacts. This process is technological endeavour.

There is a second reason why reducing technology's value to both propositions and know-how is missing something. In the creation of anything new (including technology), there is some element of discretionary judgement not reducible to either knowledge itself, nor the application of knowledge, nor technological endeavour. This other missing element we will later define and discuss as being a component of 'creativity'.

Intrinsic Value for Technology's Relational Properties

Proceeding along a similar path as Chapter 2, we now consider some relational properties of technological objects that might accrue value to states of affairs. As in chapter 2, these properties may be 'value-adding', giving value to states of affairs independently of an object's status as technology, or act as value-modifiers to technological states of affairs only.

Technology's Intrinsic Value as Aesthetic Value

One candidate for explaining my pro-technology intuition is in aesthetic value, which, as noted in Chapter 2, has been argued to confer intrinsic value to natural states of affairs but also, and primarily, artistic objects (e.g. Parker, 1921, Bahm, 1965). Some properties of technologies are overtly subject to aesthetic evaluation. Architecture and interior design, both features of the tall building and the spaceship, are on many accounts artistic mediums. Most products bought on the high-street will be designed with appearance in mind.

But perhaps the aesthetic appeal of technologies go beyond their most superficial design features. Schummer et al (2009) note the inadequacy of current aesthetics discourse in only focussing on art and specifically fine art, this focus gives us a common list of aesthetic virtues which are not exhaustive in covering engineering activities. Schummer argues for the appraisal of technology using some aesthetic virtues already present in art-focussed aesthetic discourse, e.g. beauty, elegance, harmony, simplicity, clarity, familiarity, and resemblance.

Applying this view, I could say the following of a Coca-Cola bottle: Beyond just being aesthetically pleasing because of its bright red label and unique calligraphic logo, the bottle displays more subtle aesthetic virtue in the *resemblance* of its smooth curvature to the liquid inside, or the *simplicity* with which the screw-top mechanism achieves its purpose of being safely resealable, or the *familiarity* accrued from having kept the design the same for many decades.

Agreeing with Schummer, I cannot identify a clear conceptual difference between my admiration for the logo's calligraphy (clearly aesthetic in a traditional sense) and my admiration for the screw-top mechanism (technological). This hints at, or at least doesn't rule out, both judgements being of the same type: aesthetic value. But without a well-formed conception of aesthetics, it's difficult to be sure. Schummer, perhaps too conveniently, defines aesthetic values in the negative as "*any values that are not of epistemic, functional* [i.e. instrumental] *or ethical nature*", and thus makes the aesthetic a catch-all category. Of course then, these engineering virtues, not being epistemic (as shown above) or ethical, or purely functional, do fall into the aesthetic. But defining the aesthetic in the negative gives us no criteria to distinguish between that which is aesthetically valuable and that which just isn't valuable at all. The idea is laughable that the twist-top coca cola bottle is aesthetically valuable *like* art. Is the difference just a matter of degree or a difference in kind?

Beyond this, it is difficult to find aesthetics philosophers specifically and overtly targeting technology *qua* technology as a category for aesthetic appraisal. However, there is a growing movement called 'aesthetics of the every day' that seeks to capture a wider aesthetic experience beyond the artworld. The claim of this group is broadly that aesthetics has been narrow-minded in its focus on art, when in fact, there is no limit to what can be a source of aesthetic experience (Saito, 2021).

In the last 20 years, we have seen works dedicated to aesthetic appeals of particular aspects of daily life such as food (Perullo 2016; van der Meulen and Wiese 2017); bodily aesthetics

(Shusterman 1999, 2013; Bhatt 2013; Irvin 2016); olfactory aesthetics (Drobnick, 2015) and the aesthetics of product design (Forsey 2013, 2014).

Notice that the objects these thinkers pose as constituting 'the everyday world around us' are, for the most part, technologies (the exception being an appreciation of the everyday beauty in the natural environment, which is in fact not often part of many's everyday experience). 'The everyday', sans nature, includes things we don't intuitively think of as at least partial technology, but in fact are, include food, fragrances, landscape gardens, clothing and cosmetics. Saito (2015) implicitly acknowledges the interplay of technology in passing, while remarking on a general problem the field faces in pinning down what constitutes 'the everyday':

> *"what counts as everyday is a complicated matter, and one of the complications is the fact that our lived world is changing rapidly due to technology [...]. We cannot imagine our everyday life today without the use of the internet, social media, Googling, big data, virtual reality, and the like. The future with self-driving vehicles, wearable technology, and AI is already here. Although it is safe to assume that in the foreseeable future we humans will still negotiate our lives surrounded by and interacting with various objects in the way that has always been familiar to us, our everyday life will increasingly include and be affected by technological advancements."*

Indeed, technology does change the world and our experience of it as Saito says, but more to the point, it also *constitutes* our world to a large extent. I advance therefore, that the 'aesthetics of the everyday', can, for the most part, be equivalently labelled the 'aesthetics of technology'.

If still undecided on whether technological aesthetic value is a (perhaps important and underappreciated) type of aesthetic value, it might help to observe the operational similarity between aesthetic and technological appraisal. Below is an illustrative attempt to incorporate technological appraisal into a modern approach to aesthetics.

Technology as a Candidate Class for Aesthetic Appraisal - Worked Example using Zangwill's Hierarchical Proposal

Zangwill (2021) distinguishes between *verdictive* and *substantive* aesthetic judgements. The first category consists in some basic notion of aesthetic merit and demerit: i.e. beauty and ugliness. The second captures a much larger list of concepts such as daintiness, dumpiness, delicacy, elegance.

What is the relationship between substantive and verdictive aesthetic judgements? Zangwill's so-called Hierarchical Proposal is this: The latter substantive aesthetic judgements describe *ways of being beautiful or ugly*. It is part of what it is for a thing to be elegant or delicate that it is beautiful in a particular way. It is part of the meaning of substantive judgements that they imply verdictive aesthetic judgements. The Hierarchical proposal offers us a way to distinguish aesthetic properties from non-aesthetic properties of objects. An artwork might display elegance. Beauty is an essential and necessary part of the meaning of 'elegance', therefore elegance is an aesthetic concept.

By contrast, the same artwork might also have the *representational* property of depicting a flower. Zangwill suggests that this representational property is not aesthetic. It is not part of the meaning of (i.e. necessarily implied by) the fact the artwork represents a flower that it is beautiful. It might nevertheless be beautiful in the way it represents the flower. But one would be able to describe how so using aesthetic concepts: e.g. it is beautiful because the flower is represented *with* parsimony, eye-popping colour, painstaking accuracy etc.. Aesthetic judgements might survey these and other virtues of the painting, but the mere fact it represents a flower is not an aesthetic judgement.

We can now apply this same framework to aesthetic appraisal of technology. For technology to be united with art as similarly aesthetically appreciable, we want to retain the verdictive concepts of beautiful and ugly (or aesthetically merit-worthy and de-merit-worthy) as they are. But we can supply some new technology-related substantive aesthetic concepts, which as with elegance, imply technology is aesthetically merit-worthy or not.

Flicking through a technology reviews website, and then a glossy magazine on housing, I've found many descriptions we might suppose fall into this category: sleek, rustic, futuristic, clean, artisanal, mickey-mouse, cosy, hygge, minimalist, kitsch, gaudy, outlandish, surreal, decadent. Moving from the visual to the kinesthetic, a mobile phone was positively described as 'cool to the touch', a keyboard as 'ergonomic', a soft-close cabinet as mechanically 'smooth'. Moving to the olfactory, a fragrance might smell 'woody' or a room spray 'fresh'. A chicken nugget - which I take to be more than sufficiently artificial for consideration here - is juicy and crispy.

For Zangwill, the flower artwork had non-aesthetic properties, such as representational properties, upon which the aesthetic properties supervene. Likewise, a Technology might have non-aesthetic properties, for instance particular functions, upon which aesthetic properties supervene. Recall that an artwork isn't beautiful because it represents a flower, but because of *the way in which* it represents the flower (e.g. with elegance, accuracy, parsimony). I could similarly say of a footballer, curling a beautiful outside of the boot 40-yard pass to a teammate, that it was not the mere functionality of the pass that was beautiful, but the way in which the pass achieved it. Likewise, the functionality of a given technology isn't aesthetic, but the way in which a technology achieves its function may be. We might aesthetically admire kitchen cabinets, not because their doors open and close, but *the way in which they do* (i.e. with a smooth soft-close mechanism).

Zangwill also notes that for the artwork to be aesthetically appreciable as a picture of a flower, it must be *successful* in its representational properties (i.e. in successfully depicting to an observer a flower). If it did not successfully depict a flower, then no observer could appraise it as depicting it with elegance, accuracy or parsimony etc. While necessary to ascribe these aesthetic concepts, success doesn't entail them. Likewise, when appreciating objects like the kitchen cabinet aesthetically, it is relevant that it 'succeeds' in its function (i.e. that its intention and function match). The positive aesthetic appraisal depends on the cabinet being successful in achieving its function of opening and closing, but this success isn't itself what is beautiful.

One issue here is that my appreciation for technologies doesn't seem to require that I see, hear, smell or touch them. I have only read about the Burj Khalifa or a spacecraft in a news article, and yet, I am still impressed, awestruck, interested etc. We tend to think of aesthetic pleasures as direct sensory experiences: Paintings and football passes are pleasing to the eye, music to the ears, food to the tastebuds.

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This is analogous to the 'problem of non-perceptual art' in aesthetics. Some artistic objects seem to be appreciable 'from afar', or conceptually, irrespective of the medium through which we learn about them. I have not seen Duchamp's The Fountain, or heard John Cage's 4'33". But I can in some sense appreciate what each has done, and we can seriously doubt the appreciation would grow upon seeing the urinal or listening to the silence (Schellekens, 2021).

James Shelley's response to the problem is to pose that there are non-perceptual virtues that are aesthetic (2003). So just as elegance is an aesthetic virtue of a Monet painting, 'Wit' is an aesthetic virtue of the Duchamp Fountain. With the ontology expanded beyond the perceptual for Shelly, it seems we can by the same token add the non-perceptual attributes of a spaceship (i.e. the coolness of space travel that I read about in the newspaper but do not witness), and so adopt technology into the aesthetic realm on a deeper level.

Another problem, specific to Zangwill's theory, is that it might be contended that there is such a thing as a 'beautiful failure'. On Zanghwill's theory, aesthetic merit supervenes on success (successful representation of the flower, successful functioning of the technology). But consider the following three cases:

1. A footballer who attempts an audacious overhead kick, only for the ball to miss the goal narrowly.
2. The 2003 cult classic 'The Room' by Tommy Wiseau.
3. A rocket exploding in space instead of reaching its destination.

Case 1 poses no threat to Zangwill's theory in my view, as what we are attributing aesthetic merit to is the *partial* success. The footballer has executed part of a process well, and can be appraised aesthetically for that part. The beauty in this instance is not contingent on failure. Had she scored, it would have been just as beautiful if not more so.

Case 2 is the opposite. The Room is on all accounts a terrible film, totally failing in its aims. However, the failure itself is a source of comedy, and so another form of aesthetic value. Here, failure is what makes it ironically beautiful. Though we might save Zangwill's theory by saying that while the original filmmakers did not intend comedy, the film has been re-purposed by distributors and fans, and so on this new re-purposing, is successful, or alternativey, we could describe it as unwittingly funny, where 'unwitting' is a substantive aesthetic judgement that might accrue merit in the realm of a comedy.

Case 3 may have elements of 1 and 2. Like 1, we might appreciate the partial success that the rocket managed to get so far before exploding. But like 2, we might also find aesthetic merit in the unintended firework display caused by the rocket's explosion. Unlike 2, it is less arguable that this was intentional.

I will leave this problem standing as an issue for Zangwill to resolve, however, the general point is clear to see, that on Zangwill's account it seems possible to give aesthetic appraisal to technologies for the way in which they carry out their functions. Has this struck upon the raw intuitions of appreciation I have for the spaceship and tall building? I can aesthetically appreciate much about the way in which a spaceship operates. The precision of the targeting; the economy of design to ensure minimum weight; even the elegance with which it flies through the stratosphere or the raw power of the blasting rockets. I can also aesthetically appreciate the tall building. The scale might instil a feeling of the *sublime* or awe. It may have appealing materials and interact well with the light.

Is Technology's Aesthetic Merit Value-Adding, Value-Modifying, or Value-Interacting?
Recall in Chapter 2 we considered whether certain properties of natural objects (aesthetic value, rarity, etc.) were value-adding or value modifying. For all properties of technological objects considered here, we can again think about this.

For some, bearers of (/states of affairs containing) aesthetic value have intrinsic value (e.g. as argued for artistic objects Parker, 1921, Bahm, 1965). And so technologies, as bearers of aesthetic value, have intrinsic value independently of their technological status. Hence on this view, the aesthetic is value-adding: A beautiful thing makes the world better regardless of its technological status.

On the other hand, with natural beauty, we considered that a value interaction might be appropriate, as it is not only that something is beautiful but also made more so 'because nature made it'. We could suppose a similar phenomenon on the technological side: An object might be made more beautiful by the fact it was made by humans. We, mere mortals, have managed to surpass the beauty in nature, and that is a great source of technological achievement.

Thirdly, it might be the case that aesthetic features are value-modifying but not independently valuable.

Technology's Intrinsic Value as Value for Creativity

Another relational property of technological objects is that they are all likely to be, in at least some ways, instances of creativity. Just as states of affairs containing natural objects may be more valuable to the extent that they contribute to biodiversity, here, technological objects may be more valuable to the extent that they also exhibit creativity.

Berys Gaut, a prominent philosopher in the relatively unexplored area of creativity, notes that Zagzebski, Swanton and Kieran have all independently argued for *creativity* being an intrinsic value or virtue (2014).[5] Gaut (2010) defines creativity with a tripartite deconstruction:

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[5] In discussing what it means for creativity to be a virtue, Gaut notes that it entails creativity's intrinsic or final value. It is a standard move to assume virtues (or virtue ethical positions) hinge on questions of intrinsic value (e.g. Zimmerman, 2019).

"Creativity is the capacity[6] to produce <u>original</u> and <u>valuable</u> items, by <u>flair</u>"

Let us consider each of these components in turn:

Flair: Flair describes some features of the intentional actions undertaken by creative agents. Gaut's main idea is that flair involves some degree of judgement in how to apply any rules that are involved in the productive process. Painting-by-numbers is not, for Gaut a creative activity as it merely involves executing a well-defined process, and there is no room for the painter's own aesthetic judgement (Though I'm sure Gaut would agree though that some creativity is involved in the manufacture of the paint-by-numbers template and instructions, meaning the finished product will have been made with some creativity, just not any found in the painting process). This judgement fills a gap where knowledge is not absolute, whereas in the painting by numbers case, the knowledge *is* absolute. We noted above that a value for the propositions and know-how involved in technological production misses this type of gap-filling. Placing value on 'flair' arguably completes that picture.

Originality: Gaut argues that granting creativity requires there to be some originality. It is clear how originality plays into our appreciation of certain technological endeavours. I almost certainly would not value the Burj Khalifa in the same way if it were built as one of many in a pre-existing skyscraper concrete jungle. Going to space is, at least in our lifetimes, an original feat relative to other automated transportation, and my feeling might have been equivalent to seeing the first car in the 1880s.

Valuable: Solving the triviality of originality alone, Gaut (2010) argues that to be an instance of creativity, the objects created must also be *valuable*. This criterion rules out cases of worthless originality (e.g. a bad idea, a nonsense utterance, a piece of originally terrible tat). There is debate as for the type of value an object has to have to be creative, is it intrinsic or instrumental? We will return to this shortly.

Can technology be an instance of creativity?

First, notice that on Gaut's definition, creativity is a description of one's *"capacity to produce items"*. Artifice is not the only type of capacity to produce items, we might produce conceptual items (a scientific theory, a strategy, a musical motif) that do not easily fit the description of

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[6] Gaut, in line with virtue ethicists, defines creativity as a descriptive property of certain individuals and their actions (i.e. "creativity is the capacity to…"). We are interested in ascribing intrinsic value to *objects* of technology. Is there a crucial difference here? Do we value people having creative dispositions? Or do we value there being more objects in the world that have been subject to creative processes? For most intrinsic value theorists, this distinction doesn't matter, and it is a general problem facing the attribution of e.g. aesthetic value to artworks vs. artists, or epistemic value to theories vs. theorists. Chisholm believes all intrinsic value accrues to 'states of affairs' which can capture both the above simultaneously, in this case, we might value the state of affairs whereby more creative people produce more objects exhibiting creativity (Zimmerman, 2019).

physical object and hence artifact *(See chapter 8 for further consideration of non-physical objects as artifacts).* However, artifice is the obvious candidate to fit this description. And so, to a large extent, creativity is a descriptor of artifice.

Gaut's decomposition of creativity as i) original, ii) (taking it henceforth as *instrumentally*) valuable, and iii) created with flair; coheres with my decomposition of technology as intentionally functional artifact. Flair entails a set of descriptions that can be made about the *intentions* involved in an artifact's creation. Meanwhile, originality and instrumental value both are descriptions which relate to the *functionality* of an artifact. Technology can be appraised on all creativity's constituent parts, and so must be able to be appraised as creativity. Spaceships are original in their function, so long as they achieve their function and so possess the requisite instrumental value. The engineers also exhibit flair as well as knowledge in exercising judgement around elements of the design.

The fact that the concept of creativity applies across the tripartite components of technology, and not all to any one part individually, is another argument for why technology's value, if (partially) explained by creativity's value, is emergent and not decomposable to intention, function or artifact individually.

One immediate objection might be that most instances of technology we come across are not original because they have been mass produced. In response, we must see creativity as something that admits of degree and so may be exhibited in some things more than others. But we should also recognise that creativity may be involved in technological states of affairs both in the production of types and tokens of technological objects. My individual instance of a Coca-Cola bottle is not unique, but the object class of all Coca-cola bottles is unique in many ways relative to other object classes, such as other fizzy drinks. The innovative manufacturing processes that allow so many bottles to be made so cheaply are also instances of creativity. The Bradlian/Moorean approach to intrinsic valuation introduced in Chapter 2, valuing states of affairs as opposed to objects, allows for this multi-level evaluation. One state of affairs ripe for evaluation might be that concerned with an individual token of the coca-cola bottle. Another state of affairs might be that the world is such that this type of object exists in abundance. This objection may also be better understood not as concerning originality, but concerning rarity, which we consider later.

Interplay Between Creativity, Technological Virtue and Aesthetic Value.

If artworks, scientific discoveries, evil torture plans, and if accepting my contribution: technology, can all be considered states of affairs bearing 'creativity', where does creativity sit in a conceptual schema of value? Is creativity a fundamental category like the epistemic, the aesthetic, the technological; or is it some second-order concept within these categories? Gaut doesn't expand upon this himself.

We discussed the notion of technological achievement. Colloquially, we might say that when one engages in technological achievements, for instance cooking a meal, attending a pottery class, or knitting a scarf, they are being *creative*.

However, using Gaut's definition we can draw a distinction. Creativity is a *certain way* of producing items (namely, artifacts), it is not the mere production of items. If agent X could be

described as being creative, it is not because they produce a high frequency of items, it is because they produce the items they produce with originality, flair and value. If the cooker of a meal follows a recipe to the letter, and the potter simply follows the close instruction of a teacher, they are engaging in a technological achievement but are not being particularly creative. In this way, creativity is distinct from technological achievement – though the two may often co-occur and a state of affairs might be more valuable for the presence of both.

The idea of flair and originality are also intuitively terms we might associate with aesthetic appraisal. To re-employ Zangwill's hierarchical proposal from above, creativity might function well as a *substantive* aesthetic judgement contributing to an overall aesthetic merit. As discussed, creativity requires that the object hold instrumental value, but this instrumental value doesn't exhaust what is valuable about the object. This mirrors earlier discussion about *success* being necessary but not sufficient for aesthetic merit (the flower case). We can therefore see some play for creativity as an aesthetic judgement.

But perhaps it extends the notion of the aesthetic too far if we are saying things like scientific creativity is just an aesthetic judgement. Instead, Zagzebski's virtue epistemology sees intellectual and epistemic virtues as continuous with ethical virtues (1996). She cites creativity as what might be categorised as an intellectual virtue, but given her overall position, we might interpret her as thinking creativity being a virtue need not be categorised further as either one type or the other - it suffices to say that it just is *a virtue*. That idea could be extended further, where we might suggest that creativity has intrinsic value as a category of its own.

This then entails that artworks, technologies etc. might be intrinsically valuable for both aesthetics and creativity. The neat division of creativity from aesthetics might serve a useful purpose in reducing the impossibly large explananda required for a unifying aesthetic theory. Ultimately, I'm not hugely exercised about where creativity sits in relation to aesthetics, so long as it is plausible that both can be intrinsically valuable properties.

Is Technology's Creative Merit Value-Adding, Value-Modifying, or Value-Interacting?

The question of whether creativity is value-adding is captured well in the aforementioned debate about the type of value a created object has to have to be considered creative: is it intrinsic or instrumental? Novitz (1999), wants to exclude, for instance, murder plots or malevolent torture from a class of creative things because they are evil and so intrinsically disvaluable acts. Meanwhile, Cropley et al. (2008) stipulate creativity only entails an *instrumental* value, and so can admit these acts as "dark creativity". Gaut, sympathising with Novitz's account, wanting to reserve creativity as a term to denote things that are intuitively good, he cites dark creativity as a "*leading problem in the philosophy of creativity*" (2010).

I don't really see what the big deal is. I agree with Cropley et. al account that the value in this context must necessarily be instrumental. If intrinsic, then we face a circularity problem: We are positing for the sake of argument that creativity is intrinsically valuable. If creativity is defined as 'creation towards intrinsically valuable activity', then something is creative because it is valuable, and valuable because it is creative. The circularity is broken by either i) sectioning off particular realms of intrinsic value to which this valuation applies (which seems arbitrary); ii) abandoning creativity as an intrinsic value (which doesn't help our endeavors); or iii) by making

sense of this as instrumental value. I agree with Copley in thinking this third approach is the right one.

Circularity aside, I would bite the bullet on 'dark creativity'. I note that on the Bradlian/Moorean definition, unlike on Korsgaard's, intrinsic value confers positive value to states of affairs *pro tanto*, and need not always and in every case outweigh other forms of value and so make the thing in question unconditionally valuable. Many situations pit different types of intrinsic value against each other. It is possible for many ethically unvirtuous things to display aesthetic virtues (e.g. an offensive joke being humorous) or ethically virtuous things to have epistemic dis-virtues (e.g. a white lie conferring utility). It must be possible to value creativity intrinsically, even when it might serve as an instrument towards intrinsically bad outcomes. For this reason, I would consider creativity independently value-adding. If one disagrees, then they will only see creativity as value-modifying on already valuable things.

Other Relational Properties

In Chapter 2, we identified a list of value-contributing relational properties for Nature (rarity, biodiversity, ecosystem integrity, complexity). It is interesting to observe that, in addition to the relational properties discussed above, there is also a matching intuition on the importance of the same concepts discussed before, but for technological objects.

Rarity: Some people are fascinated by rare and vintage guitars, clothes, jewellery, cars, or art (if we consider art a form of technology). We value ancient vases we find in museums, which are now so rarely preserved. Note that were intentionally created artifacts are concerned, rarity is conceptually overlapping with originality, which we hold above as a component of creativity.

Technological diversity: Similar to my biodiversity thought-experiment of the Two Islands. We might imagine a world of uniform technology. Where everyone has the same stuff. To me, this seems to be an intrinsically duller world to live in.

Technosystem integrity: By analogy to those valuing individual natural objects only in terms of their contribution and relative place in a larger biotic community, we might say the same of technologies. A 'good' technology is one who 'fits in'. We might say a technology like the app Uber has its goodness contingent upon a wider system of technologies, or a lack thereof. It fits in the nooks and crannies where more cumbersome systems of public transport fail to sprawl. It fits with a wider technology ecosystem of GPS, app stores and private transport. It relieves pressure on those systems by shifting demand etc. Herein value may lie.

Complexity: We might appreciate sophisticated technologies. The way in which things come together. This should not be taken in the more superficial sense that we value a complex 'front-end'. Sometimes it takes complexity behind the scenes to create simplicity and intuitive operation from a user. But conversely, we may see the simplicity in the design, implementation, and use of a technology as value adding under certain circumstances as well.

Cultural and sentimental value: We could also add to this list other properties which may obtain in particular instances of technology like sentimental value, historical value, or cultural value, (Kagan, 1998). For instance, the cultural and historical value of an old town hall building that is threatened to be demolished. While I don't doubt this source of intrinsic value, it is not my primary focus, as I am looking to find ways to justify intrinsic value for technology as a general class of objects, whereas it is likely sentimental and historical value probably only applies to a small proportion.

Are these other properties Value-Adding, Value-Modifying, or Value-Interacting?

In parallel to Chapter 2, the properties discussed here seem to be only value-modifying and not individually value-adding.

Conclusion

I have tried to employ a range of strategies for arguing for Technology's positive intrinsic value. We might value states of affairs involving the production of technology *suis generis*, and I give two strategies for doing so, one invoking the notion of physical liberty, and the other invoking the notion of technological virtue.

We might also value particular relational properties technology tends to instantiate, for instance *aesthetic properties* (i.e. the sleekness of a paint job, the ergonomics of the chassis design), and creative properties (i.e. displaying originality and flair in the way in which it achieves its instrumental value). We might also consider other properties such as rarity as value modifiers. The answer need not only lie in one of these categories. Collectively, all of the above give some grounding for my initial intuition that spaceships are awesome. It is common to speak of valuing art for art's sake. I ask the philosophical community: what about craft for craft's sake?

Chapter 5 - The Nature/Technology Value Spectrum

Introduction

While working for the International Marine Team at the Department for Environment, Food and Rural Affairs, I often saw the tension between nature and technological endeavour, with passion on both sides, and this partly inspired my thesis. With many marine environments around the world in disarray due to climate change, ocean acidification, overfishing and industrial agricultural pollution, the environmental policymaker has two competing strategies upon which to allocate resources: to conserve or to regenerate.

Naturally occurring corals are dying rapidly, and efforts are underway to protect them. But we have also seen great strides in recent decades in the ability to grow new corals on artificial substrates. In fact, having initially seen environmentalist campaigns against the placement of wind turbines as they threatened to disrupt sea life, we have recently found the turbines themselves to be a good substrate for corals, which are now growing more rapidly on the turbines than the natural seabed could allow.

However, there is some reluctance to fully embrace the high-tech regenerative strategy and sacrifice the naturalness of an untouched reef. While it is recognised that one can gain great instrumental benefits from artificial coral, there is some subtle but often present view that what we produce ourselves cannot, and should not attempt to out-do Mother Nature. Many still want significant resources diverted to conservation, seen as the more 'worthy' activity. It is sometimes seen that if we do embrace artificial reef construction, it is a last-resort.

For the marine biologists at the cutting edge of this scientific field, this is not the case. It is for them an incredibly exciting thing, that they can harness and cultivate biology so accurately. Looking on in admiration, I feel some alignment with this. I don't want to see what they are doing as a mere Robert Elliot-esque 'forgery' of nature, but instead creating something new with biological building blocks, perhaps something better and more credit-worthy than what lay on the seabed before.

In Chapter 1, I posed a loose jumble of questions about humanity's relationship with the physical world. Questions generally concerning the limits of our dominion over nature through the advancement of technology. These questions, I suggested, are political questions, though our attitudes on these questions are not well explained by our commonly accepted political models. I concluded there is a need to make an addition to these models. In Chapters 2 and 4, I examined ways in which 'nature' and 'technology' might both be thought to be intrinsically valuable.

In this chapter, I move from a discussion of technological and natural values in isolation, to how they interact in the world. If we take the realm of politics as where diverse interests and sets of

values collide, we have now stepped out of axiology, and into political theory. I aim to use the values elucidated in Chapters 2 and 4 to give an explanation of what is primarily at stake in the jumble of questions outlined in Chapter 1.

I will advance the core argument of this thesis in this chapter, which is that a nature/technology value spectrum is a helpful explanatory device for understanding a range of principled attitudes on a range of political topics. Later in the thesis, I will be putting the theory to the test with empirical studies on policymakers and the public.

Political Value Spectrums

Taking a brief aside from nature and technology, I first want to establish what I mean by a political value spectrum, and why they are important conceptual tools in political theory.

Science aims to explain phenomena with models, reducing apparent complexity to a set of fundamental concepts and relations between them, upon which testable predictions can be made (Hepburn, 2021). Political scientists, then, (either implicitly or explicitly) aim to reduce the complexity of political philosophy into descriptive models. Leonard Ferguson and Hans Eysenck in the 1950s and Milton Rokeach in the 1970s, suggest that the fundamental predictors of political attitudes and behaviour (be that of a voting public or of political agents) are a set of core political values, which may or may not be held by some person or group to some degree.

While labelling can vary, many political scientists have commonly coalesced around a reduction of political values into two spectrums, one of economic liberty (or, colloquially, economic left and right) and the other of social liberty (or authoritarian/communitarian and libertarian)(Heywood, 2017)(Bryson and Curtice, 2001). Each of these values have a long history of conceptual refinement in philosophy, for instance, J.S. Mill's liberalism, Karl Marx's socialism, Isiah Berlin's distinctions in liberty, Robert Nozick's libertarianism, and Michael Sandel's communitarianism. Though in empirical chapters I will note some practical problems in trying to reduce the complex political philosophy to these two spectrums, I generally support the endeavour of political scientists and think scientific reduction of political concepts is something to be strived for in principle.

What is it that distinguishes a *political* value like social liberty from a wider set of values that might be the subject of discussion in ethics (life, consciousness, health, pleasure, beauty, truth, knowledge, love, friendship, etc.)? One might start by saying that the former set are values concerned with 'politics'. Leftwich (2015) gives us a working definition of politics as *"[comprising] all the activities of co-operation, negotiation and conflict within and between societies".* So we might say political values are just values pertaining to these activities.

But such a definition does not in fact distinguish those we intuitively call political values (liberty, equality etc.) from the broader set. A society can come to group decisions and exercise power relations, channel resources, and cooperate or negotiate over ethical values too. Ethical values like truth, honesty, beauty, might also be sought at the level of a general societal level through state policies and governance (though non-perfectionist accounts such as John Rawls's, who argues that liberal states should not pursue ethical values, would have it otherwise (Wall, 2021)).

Sleat (2016) has posited that a distinguishing feature of political values is that they are values over which there is a need to come to a consensus. He notes that "*Politics is a response to and necessarily takes place in contexts where a group of people require commonly binding decisions on subjects deemed to be of public concern but over which there is disagreement"*. However, again, this is too generous. All the ethical values thus mentioned can be a source of collective disagreement, and be in competition for our communal effort, resources, and bandwidth.

Should we simply accept that the class of political values is large? I think we shouldn't. I advance that the unique and distinguishing feature of the political values commonly cited by political scientists is that they are related to one another in *antagonistic* pairs. Each political value occupies one end of a zero-sum tradeoff. These antagonistic pairs of values come to define politics precisely because they pit against each other two *prima facie* desirable things, and so create an endless source of tension and argument.

To illustrate, let's take the axis of libertarianism and authoritarianism. If A strongly values personal freedoms from the state (i.e. negative liberty), then what she values is logically incompatible with a prescriptive authoritarian state. An increase in negative liberty comes, by definition, at the expense of state control. Power over individuals is either something the state has, or something that is more widely decentralised to smaller groupings of individuals. Similarly, conferring economic liberty directly opposes the state management of personal wealth to maintain equality: as Nozick famously declares: "liberty upsets patterns" (1974), where equality is the extreme case of a patterned wealth distribution. Either conflicting value, or any compromise between each extreme, could be seen as valuable states of affairs to different people.

Even given infinite political power, cooperation, resources, energy and bandwidth, it would not be possible to pursue both outcomes on these spectrums simultaneously. On the other hand, we could suppose that certain ethical ends like 'culture', 'trust', 'healthcare' and 'security' are in competition for the same budget. But if there were an infinite budget, there would be no issues in pursuing them all *in extremis*. It is not in fact the scarcity of resources/bandwidth/power that creates tension within pairs of political values, but rather, that logical necessity prevents both from being achieved simultaneously. Political values are political values because they have an opponent. And this is why they belong on spectrums, and the others do not.

The fact that the economic liberty and social liberty spectrums are so commonly understood may be a contingent truth about Western politics in the 21st century, but in my view, it is because economics and social policy are fundamental and eternal areas where societies need to come to some form of agreement to cooperate effectively. However, beyond these two classic spectrums, new spectrums could be suggested to reflect that these two fundamental axes might not always capture the defining battle-ground. We might advance that important spectrums to absorb are those of multiculturalism vs. assimilation: i.e. how one society deals with an influx of people from another. Another might be a spectrum relating to how one political society relates to others, for instance, through war (hawkish vs dovish foreign policy) or trade (free trade vs. protectionism).

But there is a practical cost to expanding beyond the simple 2x2 model - the more spectrums we try to accommodate in our day-to-day understanding of politics, the more we might alienate people through over-intellectualizing. We should therefore be careful and parsimonious in positing new spectrums, lest we want to make political analysis strictly the preserve of the ivory tower. But as we endeavour to explain and understand our complex political lives the best we can, there doesn't seem to be a logical limit on the number of spectrums we should settle, so long as in adding new spectrums we are adding significant explanatory power. This explanatory power, in turn, could help a governing body to better understand voter preferences and contribute to political understanding among the population.

To avoid an unjustified expansion of the simple 2x2 model, before considering whether we have a new political spectrum on our hands, I first want to establish some 'blind' judging criteria for a 'candidate spectrum' to meet.

Judging Criteria

> a. ***Pursuing states-of-affairs that appeal to one side of the spectrum must conflict with states-of-affairs appealing to the other side.***

As explained above, the primary feature of a political spectrum is that there must be some genuine trade-off. There must be, at either end, states of affairs desired that are mutually incompatible. There is some sense in which any two goods are in competition for resources, energy and political bandwidth (e.g. parliamentary time). This is not sufficient for a political spectrum. The tradeoff must be zero-sum, that is, where one side's gain is roughly equal to the other's loss.

> b. ***The new spectrum should yield significant additional explanatory power.***

Let us say for the sake of this thesis that there already exists a loose model of political ideologies, lodged in the heads of politicians, civil servants, the media, and to some extent the general public. Let's also suppose that this model is either the two-dimensional economic and social liberty model, or at worst, a unidimensional left-right model.

By posing a new dimension to these existing models, we should be adding significant explanatory power. There should be political questions for which stances are not satisfactorily predicted by a current model, but are by the new dimension. This explanatory power could be theoretical, allowing us to cleave apart different interests and objectives. Or it might be quantitative and empirical: we might test whether statistical analysis reveals the new dimension to explain a significant proportion of the variance in attitudes between people that was not already explained by the other dimensions. We will be doing so later.

> c. ***The possibility of intermediate positions.***
Stating the obvious, for us to represent some political debate as a spectrum rather than, say, a simple binary choice, we must be able to accommodate and differentiate a range of views between the moderates on any given political spectrum. It may be that a population is normally distributed along such a spectrum, with most people occupying relatively moderate positions. But it could be that we see polarisation, i.e. a double-humped distribution.

d. The spectrum should be present over a significant portion of time and places.

Political spectrums should describe a stable and generalisable feature of political discourse, and not something reducible to specific political decisions. Without this condition, all of the above could equally apply to a spectrum of attitudes on non-political matters such as the ethical values discussed above, or, on politically salient but temporally specific matters like Brexit, or 'whether or not to build High Speed Rail 2'. Stances on such issues might be justified with reference to an ideological stance (e.g. a left-winger voting for Brexit as they see the EU as a free market institution). However, when an issue like Brexit or HS2, comes to define politics at a particular time and place, it is usually because it does not neatly fit into standard voting patterns.

Many issues of political salience like Brexit and HS2 have many considerations on all sides of all spectrums - many right-wing brexiteers see the EU in the opposite light. A spectrum of opinion on some particular issue may contain within it a variety of ideological explanations, which can be understood with reference to multiple ideological spectrums.

With these criteria set, I now return to our subject matter, nature and technology. I will first illustrate the trade-off I observe in an intuitive way, before diving into more technical arguments about what exactly is in tension, building a model based on the work of previous chapters.

The Nature/Technology Political Spectrum

Intuitive Illustrations of the Trade-Off

We can see a tension in public choices regarding our land, sea, and sky, and in the development of many new technologies. It is, broadly, a tension in whether the naturalness of some state of affairs should be valued, or whether conversely, technological endeavour involved in supplanting nature should be valued.

Environmental Policy

I have already mentioned my marine team experience, but my government colleagues working on land management policy face similar daily arguments over levels of urbanisation of rural landscapes, in decisions over the building of new towns, cities, factories, quarries, shopping centres and transport links across natural (or at least more natural) habitats like woodlands, plains or mountain ranges. The differences between urban and rural life are manifold, and will bear on many of the items on our hypothetical list of intrinsic values. But one defining feature of urbanity is immersion in technology. Urban environments are where technologies thrive, they are homes to commerce (i.e. the sale of technology), to art (i.e. the exhibition of technology), to infrastructure (i.e. technology).

Conversely, rural life is defined in part by a strong relationship with the natural environment- a cultivated environment, perhaps, but an environment more natural than a city. Accompanying the naturalness of the physical environment is a lifestyle and way of life which is more in harmony with nature. When comparing urban and rural life, we might be able to give some account of the pros and cons of each appealing to measures like 'material well-being', 'comfort', 'quality and quantity of social lives'. However, it would be remiss to ignore the defining difference between the two ways of life, this is a difference in the make-up of the physical environment,

and this difference is explained well by the relative presence of nature and technology. When we decide to pave over a woodland to make a new urban development, we face these questions of value.

Henry David Thoreau, in the seminal book *Walden* (1908), and following in his footsteps more recently, Mark Boyle in The Way Home: Tales from a Life Without Technology (2019), make their rejection of technology explicit when they seek to move their lives off grid and into natural habitat. On his rationale, Boyle writes: *"I wanted to put my finger on the pulse of life again. I wanted to feel the elements in their enormity, to strip away their nonsense and lick the bare bones of existence clean."*. These are intrinsically positive feelings he has about a natural environment that is free from the coddling comforts of technology.

Elsewhere in environmental policy, we can also see the nature/technology tension in debates over climate change mitigation. Historically, naturalness has been a recurrent theme in debates around nuclear energy. Eisenbud (1972) surveyed public opinion about the health hazards of natural and man-made radioactivity. He found in numerous examples that the public are disposed against unnatural radioactivity, for instance, the radioactivity in nuclear facilities, even when radiation levels are lower than in natural instances of radioactivity, for instance, in soils and fossil fuels.

More recently, the 'unnaturalness critique' has been explicit in debates around geoengineering - activities such as routinely pumping a chemical mist into the sky to simulate the climate-cooling effects of a volcanic eruption. Some offer a techno-optimistic vision of geoengineering. Popular ecopragmatist Stewart Brand writes in his Whole Earth Catalog's statement of purpose, *"We are as gods and might as well get good at it."*. Since publishing this in the 1970s, Brand's slogan continues to inspire ecotechnologists to innovate our way out of climate disaster (Cadwalladr, 2013). Meanwhile, other environmentalists have a principled objection to geoengineering proposed solutions, not only because it is practically risky, but also because it contributes 'to a lack of wildness' (Betz, 2012). Recalling chapter 2, we can substitute wildness for naturalness here.

Even when the resistance to geoengineering is not explicitly labelled as principled pro-nature/anti-technology stance, it can be seen implicitly. There is a sense among anti-geoengineering writers that there is something morally deficient about a technological solution to climate change. A commonly cited idea is around 'green moral hazard': If geoengineering solutions seem feasible, this allows a generation to 'evade their moral obligations' to stop climate change by cutting carbon emissions (Pamplany, 2020) - Though the evidence that people do actually behave this way upon learning about geoengineering is mixed (Wagner, 2021). The term 'techno-fix' is used in some cases pejoratively to imply a band-aid to the climate problem and not a 'genuine solution'.

The geoengineering moral hazard argument seems to come in two forms. The first is a more practical objection, running something like this: the promise of geoengineering disincentives carbon cutting behaviour, and this is bad because the technology faces too many practical difficulties (technological, political, social) to be successfully and desirably realised. Therefore, people are absolving their responsibility to cut emissions based on a false promise. If such an effect is occurring, then this is undeniably bad. But the second form, of more interest here, is an in-principle objection: Even assuming geoengineering is to be successful, the moral hazard remains because there is some sense in which it is fundamentally better for humanity to curb their emissions in a more natural way (e.g. clean energy, deconsumption) than to rely on a 'techno-fix'.

The curious thing about this second form is that, ex hypothesi, geoengineering intends to stop climate change. If it succeeds, then why would there remain a moral obligation to cut carbon emissions? As Wagner (2021) points out, we used to have a moral obligation to drive slowly before we invented seatbelts, and we used to have a moral obligation to limit the amount of sex we have with our partners before we invented contraception. What manifests as a principled objection to a techno-fix seems just to be a failure of imagination that in fact a technology can, quite unproblematically and reliably, solve a problem. I think participants invoking the moral hazard argument of the second kind show a presumption in favour of more natural solutions to problems, and conversely, a presumption against techno-fixes. I'm not saying here that the presumption is invalid, just that it exists.

Technology in General

Beyond environmental policy, the same sentiments can also be seen as a timeless feature of decisions around new technological developments. The term 'Luddite', originally referred to a group of 18th century workers who destroyed industrial machinery. But it now exists as a derogatory term for those opposed to technological development. However, we now have a loose movement termed neo-luddism, reclaiming the word, in rejecting technology and embracing simple natural living. This includes Chellis Glendinning, pioneer in the concept of ecopsychology, who is critical of the inherent negative psychological effects of technology in *My name is Chellis & I'm in recovery from Western civilization* (1994). At the more extreme end, such sentiments have been voiced by Unabomber American terrorist Ted Kaczynski, who submitted to the Washington Post a 35,000-word manifesto endorsing:

- *Rejection of all modern technology – "This is logically necessary, because modern technology is a whole in which all parts are interconnected; you can't get rid of the bad parts without also giving up those parts that seem good."*
- *Rejection of civilization itself*
- *Rejection of <u>materialism</u> and its replacement with a conception of life that values moderation and self-sufficiency while deprecating the acquisition of property or of status.*
- *Love and reverence toward nature or even worship of nature. (Washington Post, 1997)*

Though it may be easy to dismiss the extreme conclusions expressed here, the neo-luddites are correct to make explicit that the corollary of rejecting technology is embracing nature. While they are prima facie an anti-technology movement, their message is identical to those we would consider firmly in the camp of 'deep ecology' as described in chapter 2.

In direct contrast to neo-luddites and deep ecologists, we can consider those who clearly see technological progress as a virtue. Admittedly, the sentiment of intrinsic value for technology is rarer than for nature in academia. As said in Chapter 4, this may be because the idea of intrinsically valuing technology is yet to be articulated, whereas for nature the sentiment is commonly voiced. But moreover, as technology's instrumental value is so high, this creates reasons for its promulgation without relying on any intrinsic arguments.

However, we can find expressions of technological virtue when we look at the discourse of engineers and technologists. Consider these quotes from famous engineers (IEEE, 2017).

> *"The engineer has been, and is, a maker of history."*
> — James Kip Finch, American engineer and educator

"Strive for perfection in everything you do. Take the best that exists and make it better. When it does not exist, design it."
—Sir Henry Royce, English engineer and car designer
"We are continually faced by great opportunities brilliantly disguised as insoluble problems."
—Lee Iacocca, American engineer and automobile executive.
"One man's "magic" is another man's engineering. "Supernatural" is a null word." —Robert A. Heinlein

I interpret these as showing an intrinsic appreciation of the pushing of technological boundaries, not in pursuit of some particular end state, but for the act of creation itself.

Biotechnology
The expansion of our capabilities in biotechnology is an area where the nature and technology sentiments particularly come alive, because biological entities are things that, ordinarily and historically, have sat firmly at the natural end of the nature artifact continuum, and their naturalness is being threatened (or positively revolutionised) in sudden leaps and bounds by technological advancements. In chapter 7, we will be taking a deep dive into debates around human enhancement biotechnology, where there has been a high quantity of philosophical discussion around whether the activity's unnaturalness ought to be a reason not to do it. But for now, consider some other applications of biotechnology.

We now are nearing the technological capability to be able to de-extinct species by cloning and artificially growing their DNA. Environmental philosopher Chris Preston gives one of the most explicit illustrations of the trade-off in the discussion of the speculative ethics of de-extinction technology. Preston (2015) writes:

> *"These two differing visions capture just a tiny sliver of what is divisive about de-extinction. One vision contains an uplifting account of human potential and possibility, the other offers a cautionary tale about exceeding boundaries and crossing moral lines in the sand. Each vision has legitimate complaints to make about the other. In one case, the complaint might be, hubris causes humans to erroneously view themselves as virtually omnipotent. In the other, humanity sees itself as shackled by an unnecessary and debilitating image entirely of its own making. The truth is clearly more ambiguous than this bifurcation suggests. We are at the same time both powerful and constrained. We are both part of nature and separate from it. We are both killers and creators."*

Preston goes on to opt for the second vision over the first, arguing that *"If we look only inside of us for guidance on how to interact with the surrounding world we find no foil against which to evaluate our choices, no resistance that might set boundaries or limits, and no honest acknowledgment of an exteriority upon which we might gaze in awe. The focus is too much on us."*, whereas, *"If, alternatively, we look outside and ask questions about the right relationship to what exists independently of us, then, at the very least, we are compelled to score our actions in relation to something separate from us."*

Elsewhere, Preston (2018) (2021) references the work of environmental philosophers in relation to moral questions of de-extinction, noting the work of Holmes Rolston and Keekok Lee - these philosophers argue for the intrinsic value of nature. It is clear from above though, that he also

understands the idea that the first vision (of human mastery) is a valid and competing conception of the good - though he ultimately (partially) rejects the stance in favour of the second vision. Had Preston had the new conceptual apparatus I supply in Chapter 4, to value technology intrinsically, then we might see him illustrate the debate around de-extinction as hinging on relative value for either nature or technology.

There are also interesting and potent questions about whether or not we ought to actively create new artificial life. For some scientists and policymakers in the field that I have spoken to in my work at the Advanced Research and Invention Agency, the creation of artificial life is extremely interesting and exciting, and I think it would fit very comfortably into Chapter 4 as a feat of technological brilliance, deserved of some credit. Others baulk at the very idea, and when we drill down, a common reason offered is a fear arising from the activity's unnaturalness. For instance, a study of activists' views about animal biotechnology revealed that a significant portion of activists were wary of 'going against nature' and were *"uneasy about humans interfering with the natural order"* (Pivetti, 2007).

Also consider ethical debates around the medicalization of pregnancy. Some advocate 'natural' childbirth, free from technological assistance and doctors. Kukla and Wayne (2018) reject the movement, and note how those in this movement often fail to explain why natural birthing is better or more ethical owing to the fact it is more natural. Practical Philosopher Anna Smajdor observes that *"Our societies have a high degree of importance that we place on maternal sacrifice, and a kind of martyrdom that goes with being a mother, [...] It's a badge of honor to show that you're suffering, that you're sacrificing yourself as a mother."* (Preskey, 2019).

Even if one rejects the presumption in favour of natural birthing, they may not extend themselves to endorsing (or being agnostic to) the other extreme, which is the emerging technology of ectogenesis, i.e. an artificial womb outside the body. Smajdor notes that *"When I published my papers on ectogenesis, I had large amounts of hate mail from right across the spectrum—hate mail from the outright [misogynist] types, hate mail from feminists, hate mail from almost everyone [..] It seems that when you challenge or threaten this very, very deep-seated idea about a woman's role, about the beauty and value of natural childbirth and motherhood, you stir up some extremely passionate and aggressive responses in people."* (ibid.). I think the fact that these objections cut across standard political demographics and archetypes is telling.

We can consider many more such cases where a technological intervention is unsettling to some, but not others, despite its practical benefits. Consider rows around GM crops and on the other hand, the organic food movement.

Objection: Agreement(?)

A form of *prima facie* agreement between sides who intrinsically value nature and technology respectively, might be around innovations that involve a parsimonious use of technology to facilitate maximal nature. We could imagine a high-tech society that uses technology to minimise their environmental footprint, living in densely packed well designed cities while leaving large landscapes untouched. Contrast that with a low-tech rural society that burns fossil fuels, harvests too much forest, and so makes a larger, if more rudimentary, physical footprint of humanity on the earth.

It is true that the former society may be doing better than the latter in terms of optimising some quantity of nature and technology. But this is not to say that such a society won't come across

continual dilemmas at the margin of how and when to opt for more of one or the other. A high-tech society might well dress itself in greenery, but to what extent does it cultivate such greenery or let it grow freely? If the high-tech society truly values naturalness of one sort, that of the surrounding physical environment, then why ought it not, by the same token, value naturalness in human bodies and behaviour? And exactly how small ought the society's footprint be? Is a large city of unnaturalness amidst an otherwise wild environment permissible? If only low quantities of urbanity are permissible, then this of course reduces the room within which technologies can be created.

This idea of striking an appropriate balance between competing values implies that this manifests not as a binary choice, but as a continuous optimisation. It seems that matters of technological and natural value are not restrictively applied to pure nature and pure artifact, but are a background consideration in all matters concerning the manipulation of our physical world. This is the first hint that what we have on our hands is a matter of general disposition or attitude. This, taken with the fact that the attitudes involved are about matters of public policy and public investment, points to the best conceptual apparatus to represent this trade-off as being a political spectrum.

A check against criteria for political spectrum:

It should be immediately clear that the nature technology candidate spectrum meets two of our blind criteria. In giving a diverse range of politically salient examples where this spectrum is at work, across land, sea and air, I have satisfied the relevance criterion d. In showing that the debates occur even in instances at the margin between pure nature and pure technology satisfies criterion c, that intermediate positions are possible - I can be concerned by the destruction of some aspect of nature even while embracing some technology.

Criterion B, concerning the predictive power of the spectrum, is an empirical matter and will be the subject of Chapters 9 and 10. This leaves Criterion A, which will be the main point to demonstrate in the rest of this chapter: *in what sense is value for nature and technology in conflict?*

The Nature/Technology Axiological Conflict

Chapters 2 and 4 show a broad range of positions that fit the general description of 'intrinsic value for nature / technology'. As we saw, for instance with the example of whether to cull stray dogs to preserve biodiversity in the form of rare turtle eggs, there are practical tensions between interpretations. How then can the entire analyses of the value of technology and nature in previous chapters be neatly collapsed into a single spectrum? The answer is: it can't. Constructing the spectrum will require differentiated treatment of some of the different types of valuation discussed.

We distinguished between Moorean Intrinsic Value for states of affairs and Kantian Intrinsic Worth for persons. We saw that while the two may co-occur, there is no necessary connection between these sorts of valuation. It is not necessary that those who positively value the object properties of 'naturalness' or 'technological' need to at any point begin to start valuing those objects as subjects. As discussed in Chapter 2, we cannot assume that what is in the best interest of a domesticated animal subject in today's world is necessarily an increase in

'naturalness'. The arguments of Robert Elliot in Faking Nature, about the history of a natural habitat mattering, are a world away from the arguments of Tom Regan and Ronald Sandler, who cares about the moral significance of different forms of life.

Consider that the ontology of politics involves political values but also political *subjects*: i.e. those persons for whom politics *is for,* the beneficiaries of political action, the experiencers of values-based considerations. In a democracy, political subjects will include, but not necessarily be limited to, the voters. In a feudal state, the political subjects will include, but not necessarily be limited to, the ruling class. In both cases, political societies recognise unenfranchised groups whose preferences might be taken into account by the enfranchised. For instance, children; real and/or potential immigrants; prisoners; the mentally impaired.

Views under the Kantian bracket can be construed as matters of political subjecthood. Noting that non-human subjects cannot fend for themselves as political agents, Kantian theorists are seeking to expand the ontology of the unenfranchised-but-morally-relevant person. Those who want to bring animals and/or artificial life under the umbrella of moral consideration want to make decisions on their behalf, in their interest, as we aspire to do for young children and prisoners.

There are interesting debates we cannot explore here over whether these Kantian positions are also a separate form of political value judgement. For animal rights philosophers like Singer and Regan, we saw that expanding the moral circle does not require any more to get going than just that we give moral consideration to beings with some cognitive capacity (sentience, rationality etc.). It is therefore not a matter of justifying a new moral/political value, but rather only a matter of moral consistency to extend existing value considerations to animals. However, there could be a situation where an additional value judgement is necessary. For instance, if the rationality/sentience of animals was accepted as a metaphysical fact, but not *respected,* perhaps because of some tribalistic species in-grouping. We may think such in-grouping is legitimate, and certainly we seem to intuit as much on the technology side when we watch films involving robots fighting humans.

In any case, crucially, one's views about the expansion of moral subjecthood are orthogonal to one's views about the particular content of values they hold and apply to those they consider subjects. Meanwhile, the Moorean intrinsic value for nature and technology, I contend, are straightforwardly matters of political value. They are value considerations that are predominantly made by humans, *for* humans, and are agnostic to questions of expanding political subjecthood. My main focus for the rest of this chapter will be showing just that these Moorean intrinsic values for nature and technology occupy either side of a political value spectrum.

Conflict between Moorean Intrinsic Value for Nature v.s Technology

I summarise the efforts of chapters 2 and 4 as arguing for the following two Moorean intrinsic value claims for nature and technology respectively:

- 1) If X (where X is either nature or technology) is *suis generis* intrinsically valuable then all instances of X confer some positive intrinsic value in virtue of their being X-es. We are concerned here then with the *quantity* of X-es.
- 2) There are also intrinsically value-adding, value-modifying, and value-interacting relational properties of X-es. We can group these relational properties together as describing the *quality* of instances of X.

Now it seems reasonable to suggest that anyone who values X could not only value the quantity of Xes, and not also the quality of Xes. Recall my Chapter 2 appropriation of the Last Man thought-experiment: a world full of only crabs seems much worse than an equivalently populated (or even a *less* populated) biodiverse one. Nor could anyone only value the quality of some X and be agnostic to quantity (given a love of nature, who would prefer a world with only one animal in it (however good an instance it is)?).

Saying that only quantity or only quality matters leads to absurdity, and this can be seen analogously in debates surrounding the different aggregation strategies within Utilitarianism. 'Totalism', the approach which sums total utility, is subject to what Derek Parfit describes as the 'repugnant conclusion': that a massive population subject to lives of drudgery such that lives are only just about worth living is preferable to a small happy population (1984, p.361). But the opposite, averagism, which only cares about the average quality of life and not quantity, is equally bizarre, as it seems that a small group of very happy people - say a small tribe, is better than a whole country or world population of marginally less happy people. Accordingly, it is broadly accepted that some sort of compromise theory is required (Sider, 1991).

Without specifying the precise formula then, it seems reasonable to pose in our case that:

Intrinsic value in the universe with respect to X = F(quantity of Xs, quality of Xs)

Let us define an 'X-lover' as just a shorthand for someone who advocates a high intrinsic value on the universe's instances of X.

There may well be trade-offs for the X-lover between focussing efforts on attaining quality and quantity of Xes, and there might also be trade-offs between the various relational properties within the composite term 'quality' (to use an artistic analogy, it is hard to pursue simultaneously aesthetic concepts of parsimony and complexity). But, given some function, there will always be some hypothetical resource optimisation calculation to reach one (or a set of) optimal solutions, and this is the objective of the X-lover.

The concepts on either side of our spectrum will characterise our two X-lovers: the technology-lover and the nature-lover. The X-lovers each face internal conflicts in pursuit of their respective overarching objectives. But we will now see that most crucially, the two X-lovers' objectives are entirely in conflict with each other, and to be precise, that each of the two terms in each lovers' value function are in conflict with the corresponding term in the others' value function.

In trade-off? Quantity of Xes

As we have seen already both from environmental philosophers like Elliot and Siipi, and from technology philosophers like Mitcham and Preston, it is common and intuitive to conceive all physical matter as located somewhere on a continuum between nature and artifact. Nature is defined as physical material and processes that are not the result of human endeavour/interaction. Artifacts are defined as physical objects that are man-made. My organic lemon is more natural than a genetically modified lemon, which in turn is more natural than a sherbert lemon, but none we might think are as natural as the lemons which grew for hundreds of years undiscovered in ancient Asia.

As many have pointed out, pure nature is a fictional ideal on earth today, because phenomena like climate change and pollution are anthropogenic, and interact with the entire earth's surface in a way as to make it less natural by definition. Pure artifact is also a fictional ideal because all synthetic materials have some natural input (or some input's input, or input's input's input etc). Tracing a lineage of an artifact's corpus backward in time, there will be some grain of naturalness in it.

Recalling the definition work in Chapter 3, defining Technology as intentional functional artifact, and Chapter 2 where we defined nature as the absence of human intervention, there are two avenues by which the act of technology diminishes nature: The more obvious case concerns the use/non-use of our physical world. Creating technology involves artifice by definition. Artifice takes as inputs objects which can generally be described as less artificial than its outputs. So artifice, and therefore technology production, reduces the amount of nature in the world. Given a state-of-affairs with a certain stock of physical material, each instance of technology reduces the naturalness of that state-of-affairs.

The less obvious but equally important case concerns intervention/non-intervention in the *processes* carried out by objects in the physical world. Technology is defined as a particular subset of artifacts that are intended to serve a *function*. By adding a new function to the users disposal, a function which was not already endowed upon users in nature, technology alters, augments, circumvents or replaces natural processes or capabilities. Given a certain stock (or flow) of natural processes; each technological intervention in, augmentation of, or replacement of, this stock of natural process reduces levels of naturalness.

We can see quite straightforwardly then that the quantity *of the two Xes* are in tradeoff. Artifact and nature are logical opposites. Technology is the predominant category of artifacts. *Ceteris paribus*, increasing the quantity of one X reduces the quantity available to be classified as the other. But is this trade-off actually entirely zero-sum (i.e. one side's gain is equal to the other's loss)? The answer is broadly yes, but there are some caveats to consider.

Notice that the nature technology value spectrum does not entirely supervene on the nature artifact metaphysical continuum. There are categories of objects that are artificial, and either not intentional or not functional or both. An increase of unintended pollution in the world is desirable for neither side. Anthropogenic climate change, if taken as an unintended artificial process, is desirable for neither as it looks likely to both destroy nature, and destroy economies: which are needed to stimulate production of new technologies. Non-recyclable waste, i.e. artifacts that no longer serve a function, are desirable for neither. There might be no appreciation from either side for a dead wasteland caused by an anthropogenic but accidental occurrence of acid rain.[7]

There is thus much that can be agreed on between the two sides, to ensure that the maximum possible stock of physical material is dedicated either to nature or technology and not neither. That said, while they can agree to minimise unintentional and non-functional artifacts, the question still remains: how do we allocate any residual physical material between nature and technology? Once again, the answer puts the two sides of the spectrum in zero-sum conflict.

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[7] An extreme nature-lover's view entails that a naturally-occuring wasteland, e.g. caused by a volcanic eruption or asteroid strike, is in this respect *agreeable*. This is a difficult to swallow implication of those holding a highly pro-nature position. That said, some new types of wildlife may thrive as a result of these natural occurrences.

There is a further kink. This account assumes that there are not some further valuable artifacts that fall outside the subset of 'intentional' and 'functional'. On a broad definition, functional objects might include artistic and ornamental objects, but some will want to claim these objects are not technology but nonetheless valuable. This would threaten the one-dimensionality of the nature/technology value spectrum by creating a third valuable class that is competing for some stock of physical material.

My first line of response, as argued in chapter 3, is that I am inclined to suggest art is functional, and so does fall within technology. But if one disagrees, then my second response is that this category is relatively insignificant compared with nature and technology, and for our purposes we can simply re-draw the battle-ground upon which nature and technology are fighting on, to exclude art and cover the politics of *'most* of our physical world'.

Note that this move is par for the course for political spectrums. We might equivalently think of how both sides of the libertarian/authoritarian spectrum might strongly agree peace is good and war is bad. Both the state organisation required to fight a war, and the prize of the war itself (dominion over a set of political subjects), are anathema to the libertarian. But the authoritarian also seeks stability of existing hierarchies and structures which allow authority to be exercised, which are here threatened by the external party. The boundaries of their politics could be properly construed as a politics of state control *in peacetime*. That said, the two sides may also disagree on policies in wartime as well, e.g. whether conscription should be used. So properly speaking, the space of consensus is more limited, but the basic point remains that some minor parts of policymaking decision space can be consensus even between opposing sides of political spectrums.

Similarly in this case, we can limit the relevance of the nature technology spectrum to 'non-artistic physical material'. Both sides can warrant the production of artistic objects as a relatively small side concern. Of course, if artistic object production threatens to be so abundant that it encroaches significantly on nature and technology, and one still maintains that art is non-functional, then this would be better characterised as a trade-off between three valuable types rather than two. But such a possibility seems very remote. Consider that if we did fill the world with paintings, each paintings would either need a wall (technology) to be hung on, or would become part of a wall itself, e.g. a mural, and so would gain a function as a wall with aesthetic properties.

In trade-off? Quality of Xes
  IIs there also a trade-off in quality? I cannot see an argument for the quality of natural and technological objects being in direct metaphysical conflict: there is no extra loss to nature if a car is designed with greater aesthetic merit. There is no extra loss to technology if a rainforest happens to be filled with a higher diversity of species.

However, there may indirectly be a conflict. It is possible that a higher quantity of X is likely to yield better quality instances of X. For instance, society needs a lot of practice in car making before it can produce a Lamborghini. Moreover, some of the value-modifying relational properties discussed are themselves functions of quantity: e.g. (bio)diversity, complexity, community, fit. The creativity involved in the Lamborghini's production is best understood as a creativity relative to other types of car. These would both mean that there is, ceteris paribus, more demand for quantity in order to ensure there is sufficient quality, and so in this sense there is a trade-off for quality *via* quantity. Of course, mass production can also have a negative effect on the average quality of instances, so whether or not this is true is a contingent empirical matter.

But secondly and more importantly, we have suggested that certain relational properties of X are not independently valuable but are either value modifying among already valuable states of affairs, or there is an interaction effect between valuable properties. These quality terms' contribution to goodness will therefore be scaled by the extent to which they are indexed to intrinsically valuable Xes. So because of the fundamental trade-off between *quantity* of the two Xes, even if a naturalist can't deny the aesthetic beauty of a car, this is still less valuable to them than an equivalent amount of beauty found in a natural object, and vice-versa.

And so, in summary, pursuing high amounts (relative to the total physical stock) of high quality instances of nature is fundamentally in conflict with pursuing high amounts (relative to the total physical stock) of high quality instances of technology.

What if it is all aesthetic?

In Chapters 2 and 4, I noted that the realm of 'the aesthetic' is unclear, and, at a push, we could explain all the intuitions towards valuing both technology and nature as an aesthetic appreciation, rather than the fundamental intrinsically valuable concepts being 'nature' or 'technology'.

If the only fundamental value at work here is just aesthetic value, then prima facie, there looks to be a way out of my proposed incompatibility between valuing nature and technology, as one could simply be interested in maximising aesthetic merit irrespective of where it is found, and be agnostic to intrinsic value for either nature or technology while valuing particularly beautiful instances of each very highly.

I have given reasons throughout to suggest that it is not sensible to broaden the concept of the aesthetic so far as to encompass all of the possible values involved in nature and technology. But even if one was to, they still face the same core dilemma but re-cast as a second-order question of value within the aesthetic realm. We could state the claim thus:

There is an inherent trade-off between the way in which nature is aesthetically merit-worthy, and the way technology is aesthetically merit-worthy. If striving for aesthetic merit in general, we might still argue over how it is best achieved, and how to strike the appropriate balance between these two conflicting types of beauty.

Consider the movement of eco-modernist architecture. We might initially want to say this movement displays a complementary value for both nature and technology. But more accurately, the eco-modernist designer is doing very well in *balancing* the competing virtues to be found in nature and technology, but will face constant tradeoffs in striking the appropriate balance of the two. We might be best saying that the ecomodernist architect is thus more a moderate on the spectrum than anything else; with their hearts pulling them at times to control, tame, and cultivate nature and at other times to let it be free and run rampant. This is very easily labeled an aesthetic debate, and so gives an illustration of our point: that absorption into the aesthetic realm does not mean the Nature/Technology trade-off melts away.

The aesthetic natural/technological tradeoff is also obvious in beauty. We groom ourselves and adorn ourselves with artifacts and make technological interventions such as cosmetics, plastic surgery, piercings, tattoos etc. How we scrub up is commonly appraised from a pro nature

perspective ("they are a natural blonde") and a pro technology perspective ("they need a make-over").

A conceptual map of value

Returning to the metaphysical map drawn at the end of Chapter 3, we can now overlay on it where the intrinsic value lies for both technology and nature, and in doing so, we can more clearly illustrate the metaphysical and axiological trade-off described above:
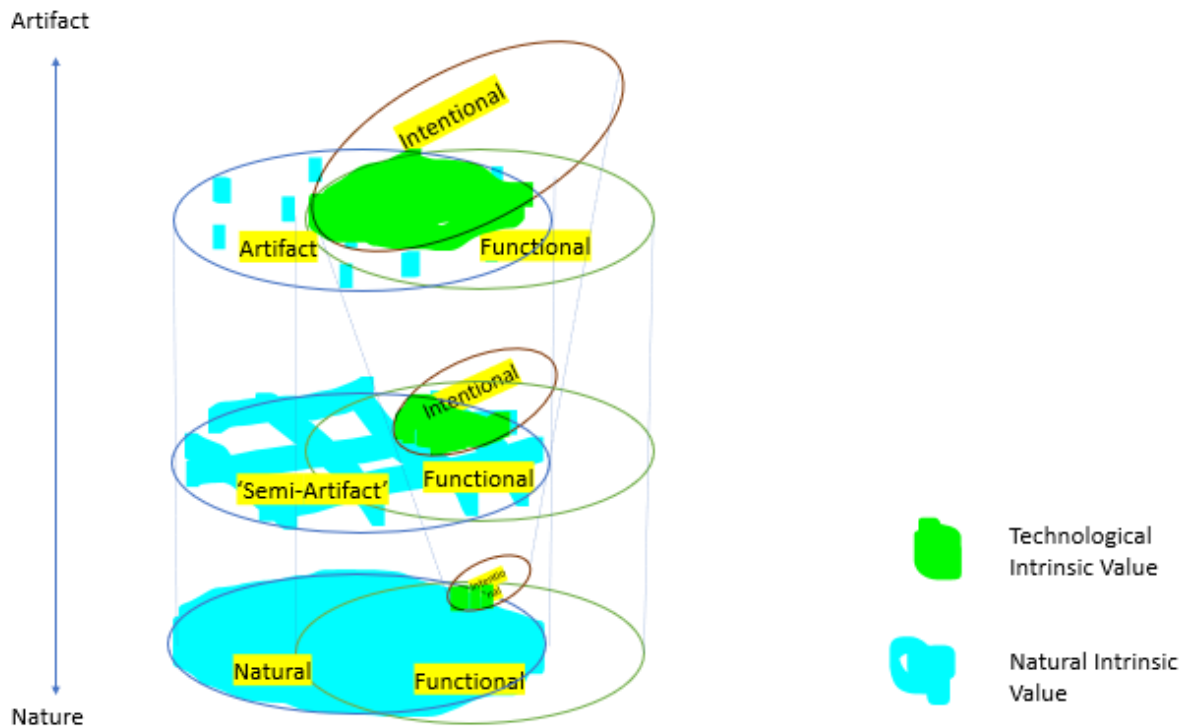
We can see most natural intrinsic value is found at the natural end of the spectrum, though semi-artifacts retain some naturalness and potentially natural value. Meanwhile, Technology (or semi-technology) only occurs at the confluence of the three shapes representing intentionality, functionality and artifactuality. Notably, both types of value can exist in the same object at the same time.

A check against our political spectrum criteria
Through the above analysis, I have met criterion a, as I have shown a genuine conflict between pursuing things at either side of the spectrum. I have also met criterion c, as all objects fall along a nature/artifact continuum rather than falling into binary categories.

But we need a supplementary argument to satisfy criterion b: that the spectrum offers something different to existing spectra, and cannot be collapsed into them.

Argument from uniquely incompatible utopias

There is another way to argue for representing value for nature and technology on a unique spectrum, and this is via an analogy to the other political spectrums. There is a shared characteristic of the left/right and authoritarian/libertarian spectrums with ours which indicates they are of a similar kind: the behaviour of their implied utopias.

Utopia is a subjectively desirable end state such that the values emphasised by a given ideology are maximised. Most ideologies (either implicitly or explicitly) posit a utopia. Conservatism of the Burkean / Oakeshottian variety is the exception to the rule as it is defined in opposition to such idealistic thinking. *"In political activity…men sail a boundless and bottomless sea: there is neither harbour for shelter nor floor for anchorage, neither starting-place nor appointed destination. The enterprise is to keep afloat on an even keel"* (Oakeshott, 1991, p.127)

Two utopias characterised by locating at either end of the same spectrum, such as an anarcho-capitalist utopia (á la Robert Nozick) vs. communist utopia (á la Karl Marx), are incompatible, as one envisages high personal economic liberty, and the other, high shared ownership. But utopias located similarly on one spectrum can differ on orthogonal spectrums. It is possible to have a left wing authoritarian utopia or a left wing libertarian utopia.

Let's now look at firstly whether technologist and naturalist utopias meet these conditions in each being incompatible with each other, and secondly, whether they are compatible with all 4 other utopias occupying left, right, authoritarian and libertarian quadrants. I.e. Are all 8 octants possible utopias?

Technologist and Naturalist Incompatibility

We might look to Arne Naess or Holmes Rolston III for expressions of naturalist utopia, that is, a world in which maximum intrinsic value is placed on nature. Given the high value placed on areas not touched by human artifice, we would expect much of the world to be in wilderness. For those humans who do exist (for it may be the case that the logical extreme natural utopia contains no humans at all), we might expect some minimal technology to keep them alive, but that is all.

Meanwhile, I imagine a rough technological utopia as full of sci-fi-esque flying cars, virtual reality and teleportation. But technological utopias are of course quite hard to imagine *in principle*. Part of technological progress is expanding the art of the possible, many new technologies would have at one point been literally unimaginable. If we knew exactly what to expect, we would have less of a hard time inventing our way there.

The key point though, is whatever the technological utopia looks like, it seems impossible that it would resemble the naturalists'.

Technologist and Naturalist respective compatibility with other utopias

Theorists across the political landscape have demonstrated that both technologist and naturalist utopias are compatible with other utopias occupying the four quadrants of the left/right and libertarian/authoritarian map.

We can imagine a eco-communist utopia that rejects technology (e.g. Pepper, 1994). We can imagine one that pursues it, automates work, and equally distributes its benefits (e.g. Srnicek & Williams, 2015, and Bastani, 2019). We can imagine a right-libertarian utopia that respects nature (e.g. Walshe, 2014), or cyberlibertarians who love technology (e.g. Dahlberg, 2017). We can imagine a totalitarian, economically centrist state imposing a pro/anti nature or pro/anti tech viewpoint on a populus. And we can imagine an anarcho-syndicalist group of cyborgs, or a nature-loving anarchic left hippy commune. To labour the point, if we posited other spectrums, such as a spectrum of multiculturalism vs. assimilation; these also don't appear incompatible either.
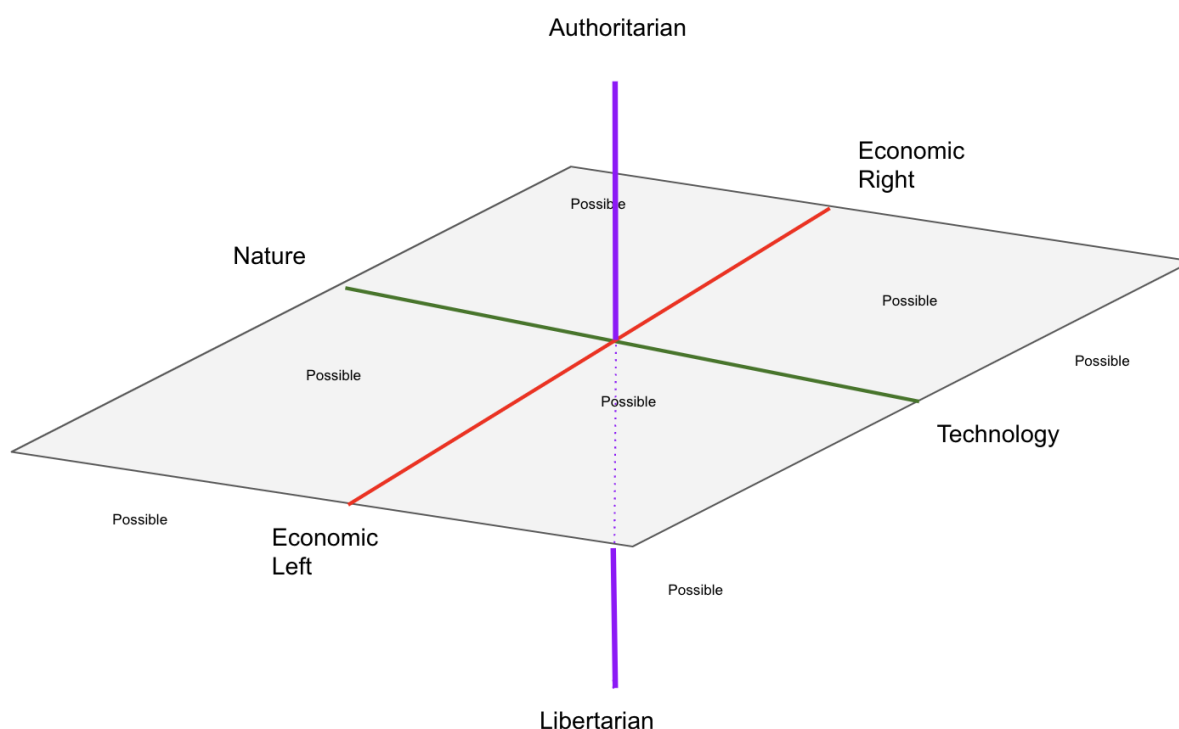
Without appealing to utopias directly, a similar argument can be made around the idea of different planes of liberty. In Chapter 4, I argued that the intrinsic value of technology might be partially explained by a type of liberty: physical liberty. I did so by drawing analogies to economic and social liberty. The standard 2x2 model already shows two types of liberty as being orthogonal. If one were to accept my physical liberty argument, then there is no reason not to see this third liberty as being orthogonal to the first two.[8]

A check against our spectrum criteria

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[8] It is interesting to consider whether all and any political spectrum can be construed as being about a type of liberty, but this is beyond my scope.

In this argument, as well as reinforcing that criterion a (genuine conflict) is met, I have also laid the foundations for satisfying b; by showing the mutual compatibility of nature and technology utopias with others, we see that this new spectrum explains a genuinely different political dimension to economic and social liberalism. Whether or not this theoretical dimension materially explains variance in political attitudes will be an empirical question for Chapters 9 and 10.

Argument from immaterial artifacts, romanticism and the enlightenment

Immaterial Artifacts

There is an open question of what boundaries we place around the types of objects covered by the nature/artifact spectrum? The three philosophers discussed in Chapter 3 define an artifact as a *physical* man-made object. But can artifacts, and hence, technology, include immaterial, abstract and ephemeral and mental objects? And if so, what bearing does this have on the framework's explanatory power?

At the nearer end of this grey area, we probably want something like computer software to be considered as a technology. Software is intentional and functional, and it spans the stages of a technological readiness level development process the same as any tangible object. But a software is not constituted by a single physical instantiation. Software could be construed as an amendment or manipulation of an existing physical object (i.e. a computer drive), rather than a new instance of technology unto itself, but this seems contrary to intuitions that a software can be labelled a piece of technology. We can draw parallels here with the ontology of music, which unlike straightforward objects like paintings, there is no single clear instantiation of what the music physically consists in (Kania, 2017).

In the cases of music and software, we can at least attempt to tie these concepts in with physical instances (even when the relationship is not a one-to-one mapping). But some things are more strictly abstract entities which we do nonetheless occasionally refer to as artifacts. Hilpinen (1995) considers belief systems artifacts, while Envine (2016) argues that human actions, in general, qualify as artifacts (though distinguishes these as artifactual events, not artifactual objects. If language is also considered an artifact, then another route to software qualifying as artifact is that software programmes are linguistic entities, composed in programming languages (Turner 2014, 2018 ch. 5).

On these views, the term artifact potentially covers a significant portion of human mental objects and actions. Moreover, physicalist philosophy of mind would maintain that strictly speaking, both 'mental stuff' - theories, ideas, concepts, knowledge, frameworks etc., and 'physical stuff' - the earth, animal and plant biology, human bodies etc., are in fact composed of the same stuff. So let us entertain for a moment the idea that all of these sorts of objects are similar in kind.

If so, then *ex hypothesi* these objects also must fall on a metaphysical continuum between nature and artifact. Placing mental objects on a nature/artifact continuum is an incredibly difficult thing to do in practice. Each human behaviour is a complex intermingling of natural, evolutionarily derived, drives, and constructed, artificial nurture. There is also an element of recursivity that would need to be unpicked: human nature may to some greater or lesser extent

be composed of those traits that produce nurturing behaviour, for instance, the ability to form mental objects, reason, acquire knowledge, and communicate with language.

Nevertheless, it must be possible in principle that behaviour can be sorted along this continuum. Of course, all mental objects will interact with humans, but it is not necessarily true to say humans 'make or modify' certain mental objects. There are actions and mental objects we intuitively know to be more the product of human creation (scientific theories, ideologies, cultural customs, stories, musical sequences) and those we know are more natural (libido, hunger, fight and flight).

If we assume mental objects and human actions do occupy a nature/artifact continuum, we can then suppose that there will be some tradeoff at the margin between instances of more natural mental objects and actions, and less natural. All else being equal, an increasing amount of mental objects that we deem artificial makes the resultant beings who possess these objects (or the resultant state of affairs containing these beings) less natural. Assuming this metaphysical trade-off still holds, then proceeding along the same lines as the argument above, there is a trade-off in intrinsic value for the natural and technological sides.

The technological end of a value spectrum for mental objects here would imply a principled desire to replace or augment all remnants of a state of nature with the production of efficacious, intentionally manufactured, functional, mental objects: knowledge, scientific theories, music theories, concepts, logic etc..

Meanwhile, the extreme nature end would imply an anti-intellectualism; a principled desire to halt or reverse all intentional mental object production, behaviours and actions which are not considered part of a human state of nature. And on the other hand, an embracing of humanity's natural instincts, desires, emotions, passions.

Perhaps one reason for thinking the likeness does not in fact hold, is that while competition for dominion over physical material is zero-sum, it's not quite so clear that the construction of new *mental* objects comes at a cost. Humans seem to have a very flexible capacity to conceptualise and re-conceptualise.

However, one can be reminded that the ways in which naturalness is diminished is not only through dominion of natural material, but also augmentation and supplanting of natural *processes*. Mental objects change natural mental processes. New theories are often counterintuitive, i.e. they go against what one might have thought in some more natural state. Like ectogenesis versus natural birth, or the 7 year breeding cycle of the cicadas being disturbed by climate change, mental objects do most definitely modify natural mental processes.

Even if the strict identity between mental objects and physical objects falls, the strong analogy between them is clear. This can be best illustrated through comparison of the nature technology spectrum with the historical movements of, respectively, The Enlightenment and Romanticism.

The 18th century Enlightenment, also called 'The Age of Reason', was a period of unprecedented intellectual achievement, including the work of Francis Bacon, Isaac Newton, Leonhard Euler, Rene Decartes, Denis Diderot, John Locke, Adam Smith, David Hume, Thomas Reid, and Immanuel Kant (Porter, 2001). It was the age of the first Encyclopedia, with entries covering human knowledge ranging "from the most abstract theoretical, to the most practical, mechanical and technical" (Bristow, 2017)

It was an age where we also saw great technological achievement, including Benjamin Franklin's bifocal glasses and lightning rod, Gabriel Farenheight's Thermometer, James Watt's Steam engine, the Montgolfier Brothers' first hot air balloon flight, Lesage's telegraph pole, Bushnell's submarine, along with guillotines, bicycles, food preserving jars, carbonated drinks and much more (Bellis, 2019). These intellectual and technological innovations were accompanied by a positive belief in human self-assertiveness, progress and intellectual power. Advancement wasn't merely a descriptive fact, but an ideal, and when progress was made, a matter of great pride (Bristow, 2019).

Jean-Jacques Rousseau provides a bridging point between The Enlightenment and Romanticism. A radical thinker during the enlightenment, he was a key influence on the proceeding Romantic era by criticising scientists and technologists for distancing man from nature (Ayer, 1986). Rousseau's view of man in the state of nature is a positive one to which we should strive to return (Bertram, 2020).

Romanticism is notoriously difficult to define, and spans across different subjects like art, music, literature, philosophy with very little in common (Gorodeisky, 2016) (Lovejoy, 1960). But, in terms of the romantic intellectual outlook, a loose set of principles are given by Cunningham and Jardine (1990, p.4):

> *"the original unity of man and nature in a Golden Age; the subsequent separation of man from nature and the fragmentation of human faculties; the interpretability of the history of the universe in human, spiritual terms; and the possibility of salvation through the contemplation of nature"*

Here, the 'Golden Age' is a reference to the biblical Garden of Eden, a time symbolising man's living in harmony with nature. Romantics cite The Enlightenment's cold-hearted attempt to extort knowledge from nature and its rational, calculating, analytic and judgemental approach, as responsible for humanity's 'fall from grace' (ibid.). Prominent German romantic Friedrich Schelling's *Naturphilosophie* echoes Rousseau in arguing for the necessity of reuniting man's spirit with nature (Heidelberger, 1998).

Romantic scholars held an uneasy relationship with scientific inquiry. Romantics preferred a 'hands-off' approach to understanding nature, preferring observation of facts with careful and limited experimentation. They thought the enlightenment approach to science a problematic attempt to control nature (Bossi and Poggi, 1994, p.xii). Romantic Chemist Sir Humphry Davy said understanding nature required *"an attitude of admiration, love and worship."* (Cunningham and Jardine, 1990).

Meanwhile, in the realm of literature, Bate (1991) and McKusick (2009) have linked Romantic-era poetry to the ecological movement. In the latter's case arguing that the poets like Wordsworth, Blake, Shelley and Coleridge offered a *"conceptual and ideological basis for American environmentalism"*, directly inspiring the likes of Ralph Waldo Emerson, Henry David Thoreau and John Muir.

Mary Shelley, daughter of enlightenment philosopher William Godwin and feminist Mary Wollstonecraft and wife of aforementioned romantic poet Percy Shelly, wrote Frankenstein (1818) at 19 from an upbringing immersed in the culture clash. The character Dr Victor Frankenstein is a derogatory portrayal of The Enlightenment. Victor is vehement in the pursuit of knowledge and power to create life. He is a megalomaniac, wanting to play god by breaking natural boundaries that ought not to be broken: *"Life and death appeared to me ideal bounds,*

which I should first break through, and pour a torrent of light into our dark world. A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me." (Ch 4, 1818). In the present day, where our advances in human enhancement biotechnology make Frankenstein's monster a reality, participants in bioethics debates use the same sentiments without hyperbole (we will see this in chapter 7).

If the tension between The Enlightenment and Romanticism is not part of the same general phenomenon as the physical nature/technology spectrum, the two situations are at the very least strongly analogous to one another.

In addition, while it is useful historical context that Romanticism grew as a reaction to The Enlightenment, there doesn't seem to be anything about these belief systems that is temporally or spatially anchored. As Steven Pinker writes in *Enlightenment Now* (2019), the Enlightenment faith in reason applies equally well to modern times. If we sever these movements from their historical roots, we can see the framework built in this thesis as supplying a robust axiological underpinning to this older tension.

Insights from the Nature/Technology spectrum

Having first intuitively motivated the idea that there is a spectrum of value here, and then having supplied analytical arguments in support of it, I now want to consider some of the benefits and implications of adopting this model. In particular, how doing so brings clarity and insight to some long-standing philosophical challenges. This can stand as further justification that the spectrum yields new explanatory power, thus again satisfying criterion b.

Uniting and Simplifying Disparate Philosophical and Political Debates

Recall David Kaplan's motivational quote from Chapter 1 (2017):

> *"Technology and the environment are like two sides of the same coin: Each is fully understood only in relation to the other. Yet, despite the ample overlap of questions concerning technology and the environment, the two philosophical fields have developed in relative isolation from each other. Even when philosophers in each field address themselves to similar concerns, the research tends to be parallel rather than intersecting, and the literatures remain foreign to one another."*

The Nature/Technology political value spectrum meets Kaplan's call for a unifying theoretical framework. I have used a broad range of examples to illustrate the coverage of the spectrum, including debates traditionally considered under separate rubrics of environmental ethics, bioethics, technological ethics, and aesthetics.

As well as being a unifying framework, the spectrum is also a successful application of Occam's Razor, recognising that a simple common thread underlies debates in *prima facie* disparate fields. Arguing directly along the Nature/technology value spectrum is like submitting a class-action lawsuit to consider all the individual cases in one go. We can reduce esoteric areas of debate into more standardised argumentative moves. I will explore how this reduction works in more detail in Chapter 7 for the question of human biotechnology.

Supplanting 'EcoCentrism v.s. Anthropocentrism'

Environmental ethicists' definitions of anthropocentrism and ecocentrism are contested, but broadly speaking, their opposition hinges on whether or not one embraces the intrinsic value of nature as part of 'the good'. Some theorists would say anthropocentrism is an ethical stance that the only good that matters is the good for humans, ruling out a good for non-human nature. But others we might call 'enlightened anthropocentrists', might contend that while anthropocentrism is a true *metaethical* position, because morality is a human construction, concerned with the good of humans only, it is still nevertheless possible that preserving nature constitutes part of the intrinsic good for humans (this debate is captured in Brennan and Lo, 2021). In this metaethical sense then, anthropocentrism is an empty term, as all it says is that value considerations ought to be the considerations of humans as the valuers, but not that the *content* of the values need be about humans.

To preserve its intended derogatory slant then, we could suppose that Anthropocentrism ought to mean both that the only good that matters is the good for humans, and furthermore, that 'nature' isn't among the intrinsic values that constitute the good for humans. Similarly, Ecocentrism could be construed as either the metaethical stance that there is a good for non-human nature, or that nature constitutes part of the human good.

However it is defined, ethically or metaethically, this distinction is broadly helpful in explaining divergent attitudes in environmental policy, and in particular, in separating intrinsic value considerations from instrumental value considerations. Using this distinction, we can give an account of why the environmental activist campaigns against GM crops, nuclear power, geoengineering etc., even when he accepts the instrumental (e.g. economic) arguments in favour of these activities - he wants to protect *nature*.

However, the explanatory power of the anthropocentrist/ecocentrist distinction is limited. Observe that ecocentrism and anthropocentrism do not constitute either side of a political values spectrum. Anthropocentrism is only defined as an *absence* of a particular intrinsic value. An absence that could imply either ambivalence or hatred of that value. It cannot distinguish between someone who hates nature and loves its opposite; and someone who is just not that bothered. There is no positive intrinsic value on the anthropocentrist side. Anthropocentrism is not conceptually unique. We could similarly take any intrinsic value X and create a concept to mean 'not an X-lover'. Being 'not an x-lover' is not a substantive point of view. By analogy, consider the economic spectrum: If I am not bothered about equality, I could be labelled a 'non-socialist', but this is not a philosophically charitable or useful description. My view isn't defined only in opposition to socialism, but rather in support of something substantive, which, as it happens, directly contradicts socialism.

Unlike the vacant idea of anthropocentrism, my spectrum can more uniquely supply the opposing intrinsic political value to ecocentrism. While the eco-centrist might accuse the environmental economist of ignoring the intrinsic value of nature, and only concentrating on its instrumental value; those who intrinsically value nature do not routinely consider the negative consequences of their position. They view those who don't value nature as cruel, soulless, ruthlessly calculating creatures. But in fact, they may have an equally vibrant soul but of a different sort. It is a soul which admires and perhaps romanticises human creativity and humanities' bettering of nature.

The label of 'anthropocentrist' might still nevertheless be fitting for the technologist, as technology is a distinctly human achievement. However, the term has a derogatory slant, the idea that the human is self-centred and inward looking. The positive spin would be to see humans as constantly trying to sprawl out from their centre, to make their mark wherever they can through expanding technological horizons. My spectrum places a positive intrinsic value on either side of the debate, and so captures the technology side more charitably.

Clarity brought by the delineation of value for nature and personhood.

The term 'Anthropocentrism' is also misleading for a second reason. We have shown that whether one expands the moral circle of concern to animals is a separate matter to whether or not one values naturalness. One might think that expanding moral concern to animals is plausible, but see this as of a piece with expanding moral concern to artificial and semi-artificial life. If Anthropocentric means 'doesn't value nature intrinsically', then it is a misnomer as an anthropocentrist can nevertheless hold non-anthropoids to be morally central.

In distinguishing between concerns that lie on the nature/technology spectrum, and concerns about the personhood of non-human beings, we can explain the tensions within ideological groups that *prima facie* share a common goal. For a fringe movement, indeed for any political movement, it might be practical to make ideological concessions to expand the group's size. But in generations to come, debates around nature and technology will become a greater feature of our politics and so the small distinctions matter more.

There are many debates within environmental ethics which do not make sense if we treat these diverse interests as a coherent group of 'environmentalists'. Environmental groups already exhibit heated internal debates about subjects like culling, and whether we ought to focus efforts more on conservation or artificial regeneration of habitats.

But upon the advent of artificial sentient life, Greenpeace might radically cleave apart when they realise that half their supporters are beholden more to naturalness, while others want to expand the moral circle to all sentient life. Animal rights activists in the mould of David Pearce might find themselves championing the bleeding edge of technological development to tamper with their brains to increase base levels of serotonin and dopamine, or in civilising predatory nature. Others will want to simply leave animals be.

The nature/technology spectrum allows us to get out in front of this incoming phenomenon, allowing us a theoretical map to navigate our way through the confusion.

Re-interpreting The '*Appeal to Nature*' Fallacy?

While indebted to G.E. Moore for originating the concept of intrinsic value so fundamental to this thesis, applying the concept to nature reveals a problem elsewhere in his writings. The 'Appeal to Nature fallacy', first noted by Moore (1942, p.45) (though with aristotelian origins), is an argument proposing that a thing is good (bad) *because* it is natural (unnatural). While it is often employed in informal discourse, the philosophical consensus is that this is a poor argument, because the implicit and unstated premise that *"what is natural is good"* is not true in general.

Baggini (2004) grants that this argument might make sense if used as a rule of thumb in particular domains, if it is indeed true that in the domain, natural is reliably better. Though there are of course many domains where natural isn't better, and the link isn't strong enough to make

the general appeal robust. Baggini uses an example of labels and adverts for food and clothing. Labels often use phrases like "all-natural", in his view, to imply that products hold some other attractive property, for instance, that they are safe. However, so the argument goes, whether or not a product is natural is irrelevant, in itself, in determining safety, and indeed many naturally occurring compounds are poisonous. And hence someone enticed by the products is committing a logical fallacy.

However, contra-Moore and Baggini, if we accept that people and groups locate somewhere on a spectrum involving some amount of intrinsic value for nature or technology, then it seems the naturalness of an object *is* in some sense relevant in its appraisal, even if this fact about the origin of the object has no bearing on other ways in which the thing in question might be instrumentally or intrinsically good.

So when A cries 'fallacy', viewing what they see as B's logical misstep in inferring goodness from naturalness, might it actually be that A is failing to observe an implied premise held by B that "naturalness is intrinsically valuable". Might we actually again just be being derogatory towards someone's values by implying they are an instance of irrationality and not legitimate preference, guilty in the same way as the person shouting 'luddite' or 'anthropocentrist'?

For example, as we will see in later chapters, our growing biomedical capabilities are offering greater opportunities to edit fundamental aspects of our human bodily nature. We find a strand of arguments expressing the sentiment that "this is wrong because it is unnatural". Some have responded to what they might see as an uneducated whine that these people are demonstrating the 'appeal to nature' fallacy - equivocating what is good with what is natural. But to call this a fallacy is just to not observe that the naturalness of the process might be a material consideration in whether to do it.

More formally, if A makes an appeal to nature, the conditions under which A has not committed a fallacy are as follows:

> 1) A intrinsically values naturalness to a high enough degree

> 2) Naturalness a material concern for A in the present context

If the answer to either 1 or 2 is false, then A has committed a fallacy. If both are true, then A has not committed a fallacy. It is possible that the accuser, B, does not agree with 1 and 2, if so, this is a values-based disagreement, but still not a fallacy.

My challenge to Moore's 'appeal to nature fallacy' could have equally been raised by an eco-centrist, and we do not necessarily need to rely on the presence of the full political value spectrum for the point to be made. However, once one does recognise the political value spectrum, and its wide coverage across many policy issues, it becomes easier to see that a sentimental attachment to nature can be an expression of a general ideological outlook and not a localised logical mistake.

Being an expression of ideology, it is *as valid* as someone being a socialist or a conservative. They are partners in guilt. In a politically liberal society that tolerates freedom of political beliefs, even if one does not agree with the value sentiment, the recognition that values are involved may help foster greater understanding and a different approach to fostering agreement or compromise. The policymaker in the biomedical case cannot simply and conveniently dismiss

their citizens' "wrong because it is unnatural" assertion as being irrational while maintaining a commitment to political representation.

Guarding Against Slippery Slope Fallacies
Conceiving this as an ideological spectrum also guards against a 'slippery slope fallacy' that I find to be common in nature/technology debates, particularly among laypeople, as will be explored in Chapter 10. The argument line runs as follows: some activity Y (say, medical drugs to save human lives) is justified, and Y involves unnaturalness. Therefore, X (say, pumping our food with antibiotics) is also justified. The justification of some artificial intervention leads to justifying all artificial interventions, on pain of inconsistency.

Viewing this as a spectrum of value allows someone to consistently maintain that Y is justified and X is not. X may concern higher quantities of intrinsic value than Y, or be lower in instrumental value such that the overall calculation is such that it should not be done on balance. One can note that while they accept Y, it is not without some appreciation of arguments to the contrary, and while they reject X, it is not whole-heartedly so. Just like on any other political spectrum, a principled centrism is possible.

Challenging the Strategy of 'Cynical Anthropocentrism'

James Lovelock, in *The Revenge of Gaia* (2006) poses a position of 'cynical anthropocentrism'. In parallel to Bernard Williams' indirect utilitarianism and Henry Sidgwick's esoteric morality (Brennan and Lo, 2021), the thought is this: While on serious reflection there might be no intrinsic value in nature, we have a higher-level anthropocentric reason to be non-anthropocentric in our day-to-day thinking. The instrumental value of nature is so high, that we ought to pretend it is valuable for its own sake as a means of ensuring we pay it due regard. This might seem to some at first like an attractive position as it allows us to maintain intuitions and behavior about nature's value without the philosophical baggage of 'truly valuing it for its own sake'.

Recognising now that there is not just anthropocentrism and ecocentrism, but in fact, a Nature/Technology *spectrum* of value, we can see that adopting such a strategy comes at a cost. The fabrication of a 'myth' regarding nature's intrinsic value, if successful, will entail that those 'indoctrinated' will be less open to another source of value in the world, that found in technology.

The strategy might even be self-defeating, as if the 'cynical anthropocentrist' does not truly believe in a value for nature in the first place, she may truly be inclined towards high value for technology. So in forging the myth, she acts against her own interests. This might still be rational on balance if there are very high instrumental benefits gained from this hypocrisy in service of other dearly held values like that for human welfare. But without proper consideration of technological value, it is hard to say.

An alternative to Inglehart's Post-Materialism Spectrum

My spectrum is not the first posed that seeks to capture environmental policy considerations. It is worth seeing how the incumbent interacts with my spectrum.

Political Scientist Ronald Inglehart has found empirical evidence for a spectrum he calls materialism vs. post-materialism. In his book The Silent Revolution (1977), he finds that the affluence of post-war generations in the west has led them to place greater emphasis on non-material goals such as autonomy, gender equality, freedom of speech, and, most importantly for our sake, environmentalism.

Prima facie, based on the words involved, we might consider whether the nature technology spectrum could collapse into the materialism vs. post-materialism spectrum, where 'intrinsic value for technology' maps to materialism and 'intrinsic value for nature' to post-materialism. However, this does not work. Inglehart's materialism does not mean 'concerned with physical material' *per se*. It is not to be confused with the 'materialism' of a vapid rich socialite. It is rather about fulfilling basic human needs like hunger and physical security. Notably, he considers 'aesthetic satisfaction' a sub-category of *post-materialist* value even though we know such satisfaction will often be given by material objects e.g. art. Meanwhile, my intrinsic value for technology is to be sharply distinguished from an instrumental value for technology. Whereas Inglehart's materialism sees its materials as instruments to satisfy other ends such as security and hunger.

The better way to reconcile the two spectrums is to see Inglehart's as a sort of 'meta-political spectrum', attempting to describe a movement from hard matters of human survival found in poorer countries and times, to a more abstract value-laden politics in richer countries and times, who possess the luxuries of leisure time, education, and democracy to engage in a more philosophical political discourse. Within societies Inglehart would characterise as highly post-materialist, such as the UK, there are ideological disagreements. These are internal to post-materialism. My nature/technology spectrum is, then, one such internal disagreement post-materialist disagreement.

So when Inglehart finds evidence that post-materialist societies are more likely to take up the cause of environmentalism (which we can suppose might overlap with my 'intrinsic value for nature' parameter), I would imagine that the same post-materialists would also be more likely to take up the rival cause of 'intrinsic value for technology'. As Inglehart is operating at this higher level of abstraction, I don't see a strong need to engage with his work much more here.

Conclusion

I have aimed to argue in this chapter that a significant amount of variance in attitudes regarding humanity's interactions with the physical world can be explained by a single political spectrum: The "Nature/Technology spectrum". This is a spectrum representing the relative value one places on different possible states that non-human physical material may exist in. Location on one extreme represents a high intrinsic value for Nature/Naturalness and a set of associated properties that tend to occur in abundance in natural objects. Location on the other extreme represents a high intrinsic value for Technology, and a set of associated properties that tend to occur in abundance in technological objects. Locating in the middle exhibits a muted appreciation and disapproval of both.

We outlined at the outset five criteria for some conceptual representation to qualify as a political spectrum and one which should be added to our common understanding of politics. The arguments in this chapter have shown there is a spectrum that ticks all the criteria.

This spectrum, I argue, is a useful and meaningful addition to our common political understanding. It clarifies debates and makes us re-think claims around the 'Appeal to Nature Fallacy', and it presents a more charitable version of the debate than the dichotomy of 'ecocentrism vs. anthropocentrism'. In the next two chapters, I will examine to what extent this theoretical framework is applicable to the specific case of human enhancement technologies.

Chapter 6 - Applying the Nature/Artifact Continuum to Humans

Introduction

In the next chapter, we will be looking to apply the framework set out in earlier chapters to look at ethical debates around the proper limits on artificial human enhancement. But before we do, we must pause to notice that this case of human enhancement is in some sense special: here, for the first time in this thesis, we are turning the lens of nature/technology axiology onto ourselves. It is not immediately obvious whether and to what extent humans are natural objects, and so what is conceptually occurring when we tweak and manipulate human bodies with technology. We will see here that the definitions of nature and artifact, hinging as they do on the role of humans, struggle with issues of self-reference.

To apply these frameworks to human enhancement, we must address two problems: first, humans must occupy a location on the nature/artifact continuum where there is 'room on either side' to be made more or less natural through our intentional artifice. But there are challenges to consider that maybe humans are either completely natural, artificial, or sit somewhere outside the nature/artifact continuum altogether. Second, as we consider the implications of human enhancement may cross a species boundary, we must consider how the definitions of nature and artifact deal with a non-human artificer.

Problem 1: The Natural/Artificial Status of Humans

The conceptual engineering of Chapter 3 gave us a rough schema of physical objects, across a nature/ artifact continuum and in or out of overlapping sets of functionality and intentionality.

For simplicity, I have so far limited discussion of those parts of the physical world occupied by humans, within which I include things that come out of humans (bodily excretions, reproductive

cells, other humans). But now let us ask, where do humans (their constituent parts, their offspring, their excretions) situate on the nature/artifact continuum?

Recall from Chapters 2 and 3 a trio of working definitions:

- Nature refers to physical objects or processes not made or modified by humans.
- Artifact refers to physical objects or processes made or modified by humans (of which the most important sub-set is intentional functional artifacts, i.e. technology).

Recall that many theorists accept the nature/artifact continuum, and moreover an overwhelming majority, as far as I can see, accept that even if there is no continuum, the concepts of 'natural' and 'artifact' are binary opposites (e.g. Katz). Both descriptions hinge on the presence or absence of human beings in an object's history. Humans are thus the one and only 'conveyor belt' through which physical material comes in natural and comes out artificial. Which of these opposing definitions better applies to humans themselves?

Humans = Natural?
We might be initially inclined to say humans are purely natural. Humans have evolved through *natural selection* - a process that predates humans and is itself certainly a natural one. If any artifice has crept in, where along the evolutionary lineage has it done so? This seems to demand a high burden of proof to demonstrate the juncture at which humans became unnatural, which is a difficult line in the sand to draw. We could for instance consider the evolution of some property gained by human ancestors, e.g. 'metacognition', as being where unnaturalness started. But even this looks like a gradually acquired faculty. For this reason, the idea that the human retains the property of naturalness is initially attractive.

However, evolution also involves many occurrences of one set of humans making or modifying another, and thus successive generations of humans are arguably artifacts of those before them. We therefore have a potential contradiction on our hands:

P1) Humans are natural objects.
P2) Humans produce other humans.
P3) Humans producing other humans is a form of artifice.
P2+P3 = C1) Humans are artifacts.
P4) Artifacts are not natural objects (by definition).
P1+C1+P4 = C2) 'Humans are artifacts and natural objects' and 'artifacts are not natural objects' (Contradiction).

Assuming we want to maintain P1 *ex hypothesi*, and P2 is obviously true, we must abandon P3. This requires a manoeuvre, which looks slightly ad-hoc, that human reproduction does *not* count as 'making' in the relevant sense for the output to be considered an artifact. But we are left wanting for good delineations of the scope of 'making' in a way which rules it out.

Even if we successfully reject P3 as reproduction, there are still various other ways in which humans do modify and, both literally and figuratively, 'make' each other. Most obviously, we make and modify each others' thoughts through social interaction. Social interaction produces and shapes the mental states and identity of humans, for instance - as Simone De-Beauvoir said: "One is not born, but *made* a woman" (1989). As we have defined artifice in terms of physical properties, this may or may not include such mental phenomena. But even in a non-physicalist philosophy of mind, the process of nurture (that is, intra-human activity) has a

profound physical effect on brain development. Education and social interaction directly affects brain development, and also leads to, for instance, the availability of nutrition which will affect growth and stature, as well as other human artifacts which extend life. Humans also modify each others' physical bodies through physical violence, applying social pressure to lose weight, or through giving each other haircuts, piercings, tattoos, amputations and cosmetic surgery.

Again, an appeal that these sorts of interactions with humans are not sufficient for artifice seems ad-hoc, this time more fatally, as very similar sorts of behaviours performed on non-human subjects most definitely *are* artifice, for instance, feeding, shearing, rearing or slaughtering a non-human animal (e.g. livestock), or cutting and committing violence on a crop of vegetables to manufacture a sweet potato pie. It seems with the range of interactions humans have with one another, we can't avoid being tarred with the artificial brush. Or at least to preserve humans, we would need a thorough account of the differences between these interactions from those of the preceding paragraph, which is not forthcoming.

Humans = Artificial?
Humans cannot be purely artificial either though. While humans might modify one-another around the edges, humans have undeniably evolved from a pre-human world, and retain many aspects of their biology from that period. Though it is heavily disputed what falls into this category, there are still some aspects of humanity we think it right to attribute to human *nature*.

But notice that it is a general feature of things in the real world we want to call 'artifacts' that they will have remnants of nature in their corpus. A pure artifact is an impossibility as anything we call an artifact in the real world must have at some point had natural inputs, the extreme-artifact end of the nature/artifact spectrum is a myth, and things we call artifacts day-to-day are just things with 'a high degree of human involvement', though still might have remnants of natural inputs.

One response could be to recognise that naming something an artifact requires perhaps not a particularly high bar on the nature/artifact continuum, and so perhaps humans are artificial enough to cross this boundary.

However, it seems that we have other reasons to doubt that humans are artificial quite to the extent that we should loosely call them 'artifacts'. We need to have some room left on the nature/artifact continuum to distinguish between humans in their naked form and quite obviously more artificial enhanced humans and post-humans. Surely cyborgs and cloud-uploaded brains are genuinely more artificial than the humble, unmanipulated human kind? Shouldn't the term artificial be reserved for those more intentional innovations?

Humans = Neither Natural or Artificial?
Perhaps we ought to give up on the whole enterprise of trying to locate humans on the nature/artifact continuum. Even if we generally accept nature and artifacts in other applications, we could attempt to argue that our categories 'natural' and 'artificial' only apply to physical objects and processes *other than* those of humans themselves. In other words, what if we suppose that 'natural' and 'artificial' are just not terms that we can use literally to describe humans, in the same way as it would be inapplicable to describe a golf swing as 'unctuous' or a cardboard box as 'kind'?

In what way is this not an ad-hoc maneuver? Can we pose some non-arbitrary reason to distinguish humans? I can think of one such group of reasons and that is to make an object/subject distinction. What if we say that the term human refers not to a physical object but

to a *subject*. So, if you will excuse a reversal in terminology, while humans can be *subjects of the predicates* 'nature' and 'artifact', they cannot be objects of them. While human bodies quite obviously do occupy physical space, and interact with the physical world, we might identify 'humans' not with this physical bodily mass, but with some non-physical essence: their subjecthood, or personhood, or certain mental properties such as their sentience or intentionality. So while we might colloquially say "humans are natural/artificial", we are really only making descriptions of physical bodies of humans, or parts thereof and not of humans themselves.

This is a difficult argument. It relies on subjecthood being defined in non-physical terms, requiring either something reminiscent of a dated Cartesian mind/body dualism, or a Kantian view of personhood as defined by the presence of rationality. Even if we were to accept one or other of these, we still face the fundamental issue that this non-physical mind/rational person is interacting with the world in ways crucial to the evaluative task of environmental and technological ethics. We have simply passed the buck, generating a further problem of how to categorise the physical mass which is not human but belongs to humans. And it is this mass, not the ethereal 'subject', which may indeed be the important desiderata on both sides of the nature/technology values spectrum. It is humans who have plastic surgery and mind altering drugs, not just their bodies, and even if it is just their bodies, we care about the natural status of those too!

Another general challenge for any account of artifact and nature that exclude humans from their ontology is this: It would become difficult to make sense of terms we use to describe phenomena related to humans, for instance the concept of 'human nature', and types of activities we would intuitively want to describe as artifice taking place on human subjects such as 'artificial insemination', or 'artificial limbs' replacement surgery (this is prima facie a part of a human which is artificial, but if we cannot apply the term to human beings, we cannot say it is so). We could try and suggest that these usages are not literal, but some sort of analogy to a process we would call artifice if applied in a non-human setting. But if it talks like a duck and walks like a duck….

To recap, we have struggled to place humans at either end of the nature/artifact continuum or off it all together. This leaves us with only one option, which I advance is the right option, and that is to suggest that humans are located somewhere in the middle of the nature/artifact continuum:

Humans = Semi-Natural (and Semi-Artificial)
Let us say that humans are semi-natural and semi-artifactual. There are elements of our physical makeup and process that we undergo that are natural, and have remained unchanged since the days of our pre-artifactual ancestors. But we are also to some extent artificial, and proceed to literally make and modify each others' physical instantiations through our conscious activity. We don't necessarily need humans as a species to occupy a single fixed point on the spectrum. Successive generations of humans, and different instances within the species at a particular time, might have greater or lesser proportions of naturalness and artificiality.

This view avoids the problems of the extreme positions. By rejecting P1, that humans are *purely* natural objects, the view avoids the contradiction of human reproduction as artifice. It also accepts that some human-on-human behaviour is artifice, while accepting that some naturalness is preserved in humans, and remains unchanged. The position also retains the intuitive usage of terminology like 'human nature' and 'artificial insemination', and coheres with how we have treated other objects in previous chapters. Just as a household pet dog is less natural than its wild canine ancestor, but more natural than Boston Dynamics' robot dog 'Spot'.

The same is true for humans, we are more natural than cyborgs, but with generations upon generations of tampering with each other, we are less natural than early hominids.

Locating particular humans in an exact spot on the continuum is a fuzzy and fraught affair, even more so than it is for any other physical object. But note that to engage in debate about the natural value of humans, we do not need to rule that humans occupy a definitive point between nature and artifact. All we need to say about humans is that they are somewhere in the middle, and choices we make will pull them up or down, and in so doing, increase/decrease relative proportions of natural and technological value.

So this means, we can apply the frameworks of previous chapters, and look at both intrinsic value in preserving natural elements of humans and also pursue technological virtues.

Problem 2: Non-Human Artifice

Let us consider again our definitions:
- Nature refers to physical objects or processes not made or modified <u>by humans.</u>
- Artifact refers to physical objects or processes made or modified <u>by humans</u>.

Note first of all, that these concepts are defined with respect to humans. Note why either this, or something close to this, must be the case to preserve these terms' intuitive meaning: If artifact simply referred to physical objects that are 'made or modified' (...by anything/anyone), then the term seems to capture an beaver's dam, a coral's reef, but also maybe even a moon's tide, an earthquake's canyon. Do I want my definition of artifact to include something made by a bee? Something so intrinsic to the life of a bee and something occurring through a natural evolutionary process? Shouldn't the beehive be a natural entity like the bee itself? Everything on the earth is in some sense made or modified by *something*. If that makes it an artifact, then nothing is natural, and the definitional pair becomes meaningless.

However, the suggestion that there might be artificial space beyond run-of-the-evolutionary-mill humans throws up an issue for these definitions, and hence, our entire framework. Our concepts are currently defined relative to humans, but it is possible that our artifice will challenge the species boundary. There is no philosophical consensus over how to delineate boundaries between species. Evolution necessitates that there cannot be straightforward, eternal, natural kinds in biology. (Odenbaugh and Griffiths, 2020). But whatever definition is chosen, it could be the case that sufficient genetic tampering means we create beings we want to delineate as a separate category to humans.

But perhaps this difference in biology does not mean we want to lose the prospect that these new species are still to be treated like humans in an evaluative sense. As discussed in Chapters 2 and 3, our definitions of nature and artifact are inevitably value-laden and governed by their usefulness. I advance that there isn't, so to speak, a 'natural kind' which reserves the subjects of 'nature' and 'artifact' to only humans. Who we include as capable of artifice depends on how we want to construct nature/artifact definitions that are useful to practice our particular ethics and politics, in this case, environmental and technological ethics and politics.

Imagine a world in which we have two distinct humanoid species, one human, one post-human. The two species live together in harmony, as friends, co-workers, and even perhaps lovers (some accounts of species would allow for two to mate and procreate, others would not. On these latter accounts, procreation would make post-humans not a separate species (Ereshefsky,

2022)). Let's suppose that these post-humans have faculties similar to humans which would lead us to presume they have agency, personhood, and moral responsibility. Presuming these properties exist in another being of course requires a small leap of faith, but no more so than to overcome David Chalmers' Zombie Problem of proving consciousness exists in other humans (1996)).

What does our framework say about these post-humans? As *objects*, the answer is straightforward: the post-humans are objects that are more artificial than humans are. But as subjects in our predicates 'natural' and 'artificial', the framework as it stands has nothing to say. Artifice is the preserve of humans, nature, the absence of humans, technology, a form of artifice concerning the intentions of, and functionality to, humans.

This means that if a post-human were to slash and burn a forest and build a shopping centre, this would not be an artificial act. If they designed a technical object to fit a purpose beneficial to them, but not humans, (for instance, inventing a new battery pack for cyborgs to charge themselves), this would not count as technology. Even among post-humans, there will be marginal debate over what amount of 'naturally evolved humanness' is preserved, though as it stands this could not be incorporated into the framework built in this thesis.

To linguists and philosophers so far in our history, defining nature and artifact with humans as the sole referent has not posed a problem. But as post-humans and also sentient artificial life become more of a possibility, we must see it is better to broaden the class of referents. But how exactly should we broaden it?

Potential solutions to the non-human artifice problem:

1) **Artifice is Human-Derived production**

One potential solution would be to define artifacts in terms of 'either human activity or *human-derived* activity', where post-humans (and also, for instance, non-biological artificial intelligence) are considered human-derived, and so any 'making' that these entities engage in will counts as artifice. This would rule in the post-human's shopping centre as an artifact, as it would the AI-generated AI. So far, so good.

The derivation relation seems very slippery. Consider that humans are in some sense derived from apes, but are not apes. Consider that if an AI generates another AI, and this process continues *ad infinitum*, then in what sense is the most recent AI-generated AI *derived from* humans? Is it the same sense in which humans are derived from apes?

A broad definition of 'derived' might be that X derives from Y if Y is causally involved in the history of X's production. So a son is derived from a father, a wooden chair derived from a carpenter, an AI is derived from a human. But it also seems wrong to say each X only corresponds to one Y. A son is derived from a father and a grandfather. A wooden chair is derived from a carpenter and an oak tree; an AI is derived from another AI, and a human. We can see that derivations are infinite, complex, interweaving and multi-generational causal chains.

To rule in a second-generation AI, an artifact could then be said to be not something that directly comes from a human, but just something that has had a human involved in the history of its production.

But the criterion of 'having a human in X's derivation chain' will rule in many activities we do not consider artifice. Consider the following case: Let's suppose that a group of humans do some re-wilding of natural species to a woodland habitat. One species they reintroduce to the woodland are colonies of bees. Suppose that the bees thrive in the new woodland, and breed, and successive generations of bees live happily on the woodland.

Now consider a different case, whereby a synthetic biology lab artificially replicates the anatomy of a bee and produces an artificial colony of bees, who then go on to live happily on a woodland as above.

Both the re-wilding and the synthetic biology activity are ways in which this colony of bees could be said to be 'human-derived'. However, it seems to me that the original problem still stands: when these bees produce honeycomb, this is not a process we intuitively want to call 'artifice'. The honeycomb is a natural product resulting from a natural process. It is not an artifact.

To rule out honeycomb, and to side-step the difficulties inherent to the 'derivation' relation, alternatives are worth exploring.

2) Artifice is complex production

A second approach starts by observing a parallel with the endeavors of ethicists such as Peter Singer, Tom Regan and Ronald Sandler discussed in Chapter 2, who seek to broaden the class of subjects for moral concern to include, respectively, animals and artificial life. In both cases their strategy is to find properties which give humans moral status (sentience, agency, preferences, etc.) and argue these properties also occur in non-human life.

We might analogously ask: What properties of humans are relevant in determining that *their* interventions should be the determinant of nature vs. artifact? And what other species (post-human or indeed animal) can bear these same properties?

Like Singer and Sandler do for morally relevant properties, we might identify artificial properties in non-humans. We might conclude that there is *no* evaluatively relevant property separating human creations from the bee's hive and the beaver's dam, and we should therefore see artifice as something all living things are capable of. Perhaps we redefine it as simply 'the manipulation of physical environments by living things'.

So, on first approximation, this is biting the bullet on the obscure counterintuitive implication raised above: my definition of artifact does include something made by a bee, something so intrinsic to the life of a bee and something occurring through a natural evolutionary process.

But notice that this strange situation is analogously strange to Singer's position on first approximation: the idea that all animals are ethically equal. Surely my life is surely more morally worthwhile than that of a slug or an amoeba. The strangeness in both cases owes to treating the evaluative classes (subject of moral concern, subject of artifact) as binary, rather than parameters.

Singer saves his claims from absurdity by suggesting that animals do possess properties such as sentience or consciousness, but they do so in most cases to a lesser extent than humans. An invertebrate might feel something we might call pain, but its pain is not like a human's pain. Humans are distinguished in having higher order or metacognition (Allen and Trestman, 2020). We can then say that animals do possess morally relevant properties, but the differing degree

justifies their differing treatment. Given the orders of magnitude difference in sentience, intelligence, pain etc., focussing moral discourse on only a small subset of biota, e.g. humans, primates, dolphins, octopodes and other charismatic megafauna, is, for a utilitarian, mathematically justified in that it will generally maximise utility to focus efforts on those biggest utility recipients.

For our problem, we can solve the absurd implications analogously, and say: All beings have *a degree* of ability to manipulate and shape the physical environment around them. But some do in far more complex and profound ways. In particular, humans are the beings who manipulate the environment most profoundly. While other animals do manipulate the physical environment around them, it is in limited and predictable ways. And so, while humans are not the only artificers, it is worth focusing the discourse of environmental ethics on them and not on the artifice of others.

From here, it is easy to acknowledge that post-humans might also join humans in manipulating the physical environment in complex ways, as they will presumably retain, and even improve upon the relevant faculties that make human artifice so potent, so transformative and so dangerous.

Returning to our definitions, we can substitute in our findings, that there can be non-human artificers, and that the threshold for artifactuality involves some cut-off for the complexity of a beings' making process:

- *Artifact refers to physical objects or processes that have undergone a [sufficiently complex] process of being made or modified [by a human, or another living thing].*

- *Nature refers to physical objects or processes that have not undergone a [sufficiently complex] process of being made or modified [by a human, or other living thing].*

This new definitional pair works effectively to rule in the complex 'making' of humans and sophisticated post-humans, while ruling out the beaver and the bee. It would also include, for instance, an alien producing a flying saucer, which I think it ought to. For these reasons, it is my preferred approach.

3) Artifice is intentional production

Notice here that I am avoiding the temptation to draw a more direct parallel between the case of defining artifice's subjects and morality's subjects: Recall in Chapter 3 we outlined the 'thin' and 'thick' definitions of artifact. The former to mean just 'human-made' and the latter to mean 'intentionally human-made'. While we have been using the thin definition, had we been using the thick definition, then an appeal to intentionality might be a good strategy for sorting between artificers and non-artificers. Those who participate in artifice are only those who can have intentions. This looks prima facie like an elegant way to rule in the human and post-human, and rule out the bee and beaver.

Whether or not animals can be said to have intentions is tricky though, as in approach 2, this is a matter of how we understand animal cognition (Allen and Trestman, 2020). Following the complexity approach, intentionality could be parameterized and so used to warrant differing treatment of more and less 'intentionally acting' beings. A pair of definitions could thus be:

- *Artifact refers to a physical object or process that has undergone a process of being made or modified [intentionally, for a purpose].*
- *Nature refers to a physical object or process that has not undergone a process of being made or modified [intentionally, for a purpose].*

The reason I reject this tempting approach is the same reason I continue to maintain that the thin definition of artifact is better for our nature/artifact continuum: it allows the continuum to capture all possible physical material. Waste, junk, pollution, debris, and other such types of objects that really struggle to be called 'intentional artifacts' would become an irritating off-spectrum class of physical objects. Irritating because the physical spectrum underpins our axiological claims, and those claims want to refer to environmental harms like pollution, debris, waste and junk. We could make some attempt to argue that waste and junk are intentional, but nevertheless it is still logically possible that a physical object could be made unintentionally.

We are thus better off isolating humans and near-humans from the rest of the animal kingdom by using the parameter of complexity of the making/modification process, and so accept option 2.

Conclusion

We now have shown that it makes sense to apply the framework of previous chapters to humans. Humans occupy physical space in the world, and this physical presence sits on the nature/artifact continuum like everything else. We can see that it sits at neither extreme of this continuum, leaving room for the species to be pulled to either side, perhaps even to the extent that it becomes an entirely new species. We have also considered how the framework is robust to an era of artificial intelligence.

Now that we have incorporated humans and post-humans into the nature/artifact continuum, we can in the next chapter consider normative questions about which direction we ought to push in.

Chapter 7 - Human Enhancement

Introduction

In this chapter, I aim to show how the Nature Technology intrinsic value spectrum framework can be employed to shed light on debates concerning the unnaturalness of human enhancement technologies. My claim is simply that the debate over human enhancement's unnaturalness is just one instance of the wider values trade-off we have outlined in previous chapters, concerning the way humans interact with not just other humans, but *all* physical material. Viewing the debate as operating at this more general level quashes bioethicists' burning demand to draw a 'line in Darwin's sand'.

Our ability to manipulate the fundamental components of the human body is rapidly changing with the advancement of the loose collection of disciplines termed 'synthetic biology'. Though

there is no generally accepted definition, I take synthetic biology to be *"combining the knowledge and methods of biology, engineering and related disciplines in the design of chemically synthesized DNA to create organisms with novel or enhanced characteristics and traits"* (Gutmann, 2011). In this chapter, the focus is less on the part of the discipline creating entirely novel organisms and more on alterations to existing ones, namely, human beings.

Bioethicists commonly distinguish two potential rationales for altering humans. A relatively non-controversial use is therapeutic, where the objective is to bring a person deficient in some characteristic up to 'normal functioning' (if such a thing can be defined). More controversial is the idea that we might actively innovate to enhance humans beyond normal functioning (Hoffman, 2017). Paradigmatic examples of non-therapeutic human enhancement include: biosynthetic growth hormone for increased stature; athletic doping to increase endurance and strength; and psychopharmaceutical interventions for improving memory, mood and cognitive capacity; and a range of profound genetic and neurological interventions to increase lifespan, bring new sensory-motor abilities, and alter our personalities to encourage more empathy and generosity (Juengst and Moseley, 2019).

These technologies are controversial with respect to many axes of value. For instance, there is a burgeoning public and philosophical debate around the perceived unfairness of athletic doping (Tolleneer et al, 2013) and similar implications on use of artificial enhancements in society at large (Buchanan et al, 2000). There are also lots of ethical concerns around the proper use and explorations of these technologies and the risks and harms they pose (Whitehouse et. al, 1997). These worries have grown in interest including gaining discussion beyond the annals of academic philosophy, with the President's Council on Bioethics report: Beyond therapy (2003).

My focus in this chapter is on one particular debate upon which there has been an abundance of literature. This is the debate focussed around the claim that because human genetic engineering is unnatural, it therefore is intrinsically wrong.

The Current Debate

I will examine in turn what I, following others (e.g. (Juengst and Moseley, 2019) (Hoffman, 2017)), recognise as three camps in the debate: There are those who believe that all human-centred genetic engineering is intrinsically wrong because it is unnatural; There are those who support human genetic engineering as either intrinsically right, or not intrinsically wrong (and therefore ought to be encouraged if the instrumental benefits are shown to be high). There are those in-between, searching for a way to delineate some limits at particular technological junctures or with regard to particular human traits.

The Naturalness-Based Attack on Human Enhancement

Many strongly feel that human nature is something that ought to be protected from the technological impulse. A leading voice on the side against human enhancement technology, and Chair of the President's Committee on Bioethics, is Leon Kass. Kass has argued in multiple places that our human bodily constraints, especially the fact of human finitude, must be maintained for human flourishing (Kass 1998, 2002, 2003). On the subject of human cloning technologies, which can be construed as an enhancement or alteration to human's natural reproductive systems, Kass writes:

Cloning personifies our desire fully to control the future, while being subject to no controls ourselves. Enchanted and enslaved by the glamour of technology, we have lost our awe and wonder before the deep mysteries of nature and of life. We cheerfully take our own beginnings in our hands and, like the last man, we blink. (1998, p.683)

In justifying his anti-human-enhancement position, Kass appeals to 'the wisdom of repugnance', arguing that peoples' feeling of disgust towards cloning and other human biotechnologies ought to be treated as an expression of a deep and inarticulable wisdom that it is morally wrong. Summing up, he warns "*Shallow are the souls that have forgotten how to shudder" (ibid.).*

Michael Sandel (2004) takes umbrage with our yielding to the human drive to mastery, arguing that this may destroy our appreciation of the gifted character of human powers and achievements. He says "*To acknowledge the giftedness of life is to recognize that our talents and powers are not wholly our own doing, despite the effort we expend to develop and to exercise them*". Elsewhere, Sandel (2002) characterizes a desire for enhancement as hubris, advancing that one ought to foster an attitude of contentment with nature and chance.

George Annas, advancing the need for a new U.N treaty to ban species-altering research, argues inheritable genetic alterations and cloning can be seen as crimes against humanity, in altering the essence of humanity itself (Annas et al, 2002). Similarly, Francis Fukuyama believes in some universal human essence he labels 'Factor X'. He is concerned that human enhancement may violate Factor X, challenging biological human nature as the appropriate basis of shared human rights and dignity, and so eroding our sense of common humanity (Fukuyama 2002).

Fukuyama also argues that embracing biotechnology may lead to a reductionism in the meaning and value of human life:

The answer lies in the constant pressure that exists to reduce the ends of biomedicine to utilitarian ones – that is, the attempt to reduce a complex diversity of natural ends and purposes to just a few simple categories like pain and pleasure, or autonomy. There is in particular a constant predisposition to allow the relief of pain and suffering to automatically trump all other human purposes and objectives. For this will be the constant trade-off that biotechnology will pose: we can cure this disease, or prolong this person's life, or make this child more tractable, at the expense of some ineffable human quality like genius, or ambition, or sheer diversity (Fukuyama, 2002, 172).

Even if we decide to permit enhancements, it is not at all clear what trait ought to be enhanced. Those who state what these are, are in effect asserting that certain genotypes and not others are "jewels in the genome" (Sikela 2006), in a way that is uncomfortably close to the behaviour of Eugenicists. Juengst and Moseley (2019) say *"The natural human gene pool has no top, bottom, edges or direction: it cannot be "used up", "diverted", "purified" or "polluted". The reservoir of human mutual respect, good will and tolerance for difference, however, seems perennially in danger of running dry.".*

Those using technology to manipulate natural beings, and in particular, human beings, are often accused of "playing god". All today's major religions, and many indigenous peoples view nature as something to which we should have reverence, humility, gratitude, and awe. John Stuart Mill argued that concerns about unnaturalness are, for many, derived from concerns about offense to God (Streiffer, 2019):

The consciousness that whatever man does to improve his condition is in so much a censure and a thwarting of the spontaneous order of Nature, has in all ages caused new and unprecedented attempts at improvement to be generally at first under a shade of religious suspicion; as being in any case uncomplimentary, and very probably offensive to the powerful beings (or, when polytheism gave place to monotheism, to the all-powerful Being) supposed to govern the various phenomena of the universe, and of whose will the course of nature was conceived to be the expression. (Mill 1958 [1847], 14).

But many have observed that the emotive force behind the metaphor of "playing god" does not depend on a theistic worldview (Lustig, 2013) (McKenny 2009). Coady (2009) argues that the phrase is used figuratively to warn against hubris in the power and knowledge of human beings. In my view, even on a religious account, we may argue that the moral stance's appearance in religious doctrine may be evidence that it is a moral insight which, while codified in religion, precedes it.

Most theorists discussed are cognisant of the immediate and obvious challenge facing any idea that the human genome ought to be preserved: that as a matter of evolutionary fact, humans, like all other species, will continue to evolve in perpetuity. Nobody suggests we should suppress this natural evolutionary path. So what we could construe as an internal debate within such views is defining precisely counts as the wrong form of genetic intervention (Juengst, 1998).

In summary then, while these arguments take on different forms, the views can be broadly characterised as holding the following claims to be true:
- There is some intrinsic value in human nature, where human nature is defined as an authentically evolved human biology, which, though gradually evolving, retains some core essence of humanness.
- Synthetic biotechnologies threaten human nature. As a matter of biological categorisation, they risk tweaking the species to the point where differences are material with respect to its value.
- And therefore, we ought not to develop and use such technologies.

The Naturalness-Based Defence of Human Enhancement

Proponents of human enhancement, in particular those comprising the transhumanism movement, commonly reject the intrinsic significance given to human nature. They see the above arguments as an unsubstantiated, bald assertion that human enhancement is 'wrong because it is unnatural'. But, as Strieffer (2019) suggests, "*This fails to provide any reasons whatsoever to those who do not already share [the view that unnaturalness equals wrongness]*". Those who do not share the view "*are in no way epistemically irresponsible in simply rejecting the argument out of hand.*".

Mandel (2013) notes that, contrary to Kass, the public are not universally repulsed by human-centred biotechnologies like cloning. Preston's (2013) response to Kass's wisdom of repugnance argument is that we just have to "*get over it!*". John Harris (2009), in arguing we are morally obliged to innovate on human biotechnology, contests the preoccupation with nature, noting *"Famines, floods, droughts, storms are all natural and all disastrous"*. Contending that awe and mystery is necessarily wherein v*alue lies, Caplan (2010) notes that "the value of life is not imperiled or cheapened by coming to understand how it works".*

McConnell (2010) takes aim at arguments given by Fukuyama and Annas, pointing out that much of these authors' negative valence to post-humanity is left unexplained. He challenges us to consider whether 'losing one's humanity', as Fukuyama puts it, is actually such a terrible outcome, particularly when set against the potential health and wellbeing benefits of human genetic engineering technologies. He contends that the risk of reductionism of ends Fukuyama sees is but another instrumental risk and not an intrinsic objection. He also challenges Annas to specify exactly why the creation of a new species of post-humans is in and of itself a bad thing.

Glover's *Choosing Children* (2006) defends a similar sentiment in the use of biotechnologies in the specific case of producing 'designer babies'. He argues *"If a good argument showed that some terrible characteristic—which by genetic means, we could change—was essential to being human, it might be better to transcend the limits of humanity rather than stay as we are. The idea of what is essential is a murky one, but, even if it were not, its importance is unclear. What is worth preserving is what is valuable, and the connection between the two is not obvious (Glover, 2006, 84).* Bostrom's (2003) answer to this murkiness is to claim that in fact there are no static features of humanity at all. Our moral kinship and forms of social organization have changed radically over time, and it is difficult in his view to identify anything we might want to call an *essentially* human vulnerability.

For some, the playing god metaphor ought to be abandoned, not saved from its archaic religious origins. Kaebnick (2013) documents Drew Endy, a leading figure in the field of synthetic biology, saying *"the questions of playing God or not are so superficial and embarrassingly simple that they're not going to be useful"*. Ed Regis (2008), a science writer and philosopher says *"The problems started with the perennial and trite layman's taunt, the claim that creating life was 'playing God'"*.

Groll and Lott (2015) would likely categorise the above theorists into what they call the 'inert view', which sees human nature as neither normatively good or bad. There are many more proponents of human enhancement who, either implicitly or explicitly adopt the inert view, and argue passionately for acceleration of these technologies on instrumental grounds. For instance, in order to equip humans to adapt lifestyles (Liao et al, 2012), or moral motivations (Persson and Savulescu, 2012) to better deal with global coordination problems like climate change or terrorism. Kamm (2009) illustrates this point with the examples of our arrogance-surely bad for us, and an inhuman altruism which may be good for us.

Those who embrace the inert thesis will assume that the only way in which human enhancement can be justified is instrumentally. It is generally harder to find positive expressions of intrinsic value for the activity of human enhancement, and this likely reflects the general lack of articulation of this idea as noted in Chapter 4. That said, some theorists writing more widely about the ethics of synthetic biology have touched on this, and their arguments can apply here.

Bedau and Larson (2013) argue that many of the ways nature has been argued to be intrinsically valuable (namely relational properties such as beauty, harmony, complexity, rareness, autonomy) can still apply to synthetic life. We might then on their behalf extend this argument to cover *human* life. However, the authors don't take heed of my discussion in earlier chapters, where we question whether these relational properties only gain their valence if indexed to some non-relational intrinsically valuable intrinsic property such as naturalness. Recall, a disease is not valuable because it is rare or complex. A stronger footing would be if theorists recognise intrinsic value intrinsic to the activity of human enhancement.

We noted in Chapter 4 that the idea of intrinsic value for technology is relatively unheard of, so it doesn't surprise me we don't find much of this in the specific technological field of human enhancement either. We saw already in Chapter 4 how Kaebnick gives something close to this, though misattributes the value to science and not technology. Recall:

> "[Synthetic Biology] *is a morally noble activity, in and of itself. The pursuit of science is the advancement of human mastery, and synthetic biology exemplifies human mastery especially dramatically [...] It is humanism at its most grandiose. The pursuit of science is also the pursuit of understanding, the refinement of human intelligence—a less self-aggrandizing but still grand endeavor. So understood, part of the very point of synthetic biology is philosophy in its original sense—love of knowledge that encompasses both physics and metaphysics. In fact, it's also philosophy in its current sense, which concerns the investigation of human systems of meaning."*

Meanwhile, Schummer (2009) evaluates the instrumental case in favour of pursuing synthetic biology (including, we might suggest, on humans) is weak. He contends that *"the leading motivation is to prove the 'creative power of man,' a symbolic act in the imagined rivalry with a metaphysical agency"*. Whether or not we agree with Schummer's derogatory tone, we can see he is saying that the appeal of these sorts of technologies is unclear without reference to some positive intrinsic value proposition (though, in his view, a misguided one).

But beyond the strict confines of analytical philosophy, we can see the intrinsic value sentiment echoed strongly amongst the Transhumanist movement. Anthropologist Abou Farman's On Not Dying (2020) documents those groups seeking immortality. Their faith in technology, he argues, is quasi-religious. It is not merely that living longer provides some instrumental benefit, it is that conquering death is, for this group, a triumph of man's ingenuity over nature. Newton Lee, author of The Transhumanism Handbook (2019), sloganizes that *"all living things are recycled"*, and argues with a positive valence that the fusion of man and machine is inevitable *"given the human nature to discover, create, and change the world that we live in.".*

One notable proponent of the Transhumanist movement is billionaire co-founder of Paypal, Peter Thiel. Mary Harrington, a recent profiler of Thiel, writes:

> *"Thiel seems unfazed by the idea that technology may infringe on what's "natural". How do we prevent runaway tech changes dragging us into some monstrously inhuman dystopia? Can we retain our humanity, I ask Thiel, in the context of just how transformative technology can be?'*

> *"The word 'nature' does not occur once in the Old Testament," he tells me, while "the concept of 'nature' as something that's eternal and unchanging" isn't a Christian one either. "It seems to me that the Christian concepts are more things like grace or original sin." From this perspective, Thiel argues, the problem with transhumanism isn't that it seeks to remake humanity, but that it isn't ambitious enough in this regard: "the Christian critique of transhumanism should be that it's not radical enough, because it's only seeking to transform our bodies and not our souls." It appears, in other words, that while Thiel is unflinchingly realistic about what's immediately achievable, he doesn't see any given or self-evident limits to what we could set our sights on."* (Harrington, 2022)

Lines in Darwin's Sand

At this stage in the dialectic, some commentators search for some reasoned way to distinguish between those sorts of tampering with human nature that are acceptable and those that aren't. For instance, Andrew Lustig (2013) writes:

> *Given such differences, and in light of the complexity of concepts of nature and the natural, it would be both desirable and useful to articulate some general concept of what it means to be human that could guide or constrain ethical choices in biotechnology. However, it is far less clear, from the vantage of either philosophy or religious studies, that we are warranted in appealing to "nature" in a way that provides clear ethical guidelines for current and proposed interventions, alterations, or additions to it.*

Beyond the strict confines of the human enhancement debate, there is again a roster of theorists who do more broadly consider the naturalness of synthetic biology, not just with regard to humans, though their thinking is applicable to humans.

Christopher Preston (2008) attempts to distinguish between the more traditional practices of molecular biology, which involve tweaking and modifying existing organisms with new genes, and the more advanced areas of synthetic biology which involve creating an entirely new organism. The latter, and only the latter in Preston's view, crosses the line. The former, he argues, cannot be objected to as it is how Darwinian evolution works. The latter, meanwhile, is entirely new. Tweaking of the human genome then, would on this account be an acceptable form of biotechnology.

However, Bedau and Larson (2013) challenge this distinction twice-over, firstly as a series of tweaks can result in quite profound changes. There is, we could say, a Sorites-Paradox-esque continuum between the two types of endeavour. Secondly, even if there is some category distinction between novel synthetic organisms and genetic modification, it's not clear why the violation of category boundary is morally relevant.

It seems then that, while the extremes of total endorsement of nature and total permissiveness to technology are often seen as undesirable amongst bioethicists, no definitive line in the sand has been successfully drawn. Paul Thompson (2003), as recently endorsed in (Streiffer 2019), lays the problem out thus: *"no one has succeeded in articulating a principled way of stating why the unnaturalness associated with the manipulation of [human] DNA is unethical, while ordinary plant and animal breeding, computers and modern transport are not"*.

Reduction to the Nature Technology Value Spectrum

I do not aim to wade in on this debate, but rather to offer a metacommentary. My core claim is that the debate over human enhancement's unnaturalness is simply one instance of the wider values trade-off we have outlined in previous chapters, concerning the way humans interact with not just other humans, but *all* physical material.

Those who object to human enhancement we can wed with those discussed in Chapter 2 who generally intrinsically value nature. The positions documented above are extremely similar to how environmental ethicists write on the subject of preserving other natural entities. Recall Robert Elliot's example of the restored natural habitat being akin to art forgery. He values the

history, authenticity, awe and majesty of nature as being untouched by humans. It is these same features invoked here to justify preservation of human nature. For instance, take Michael Sandel's calling enhancement desires 'hubristic' (2002), he is directly opposed to the idea advanced in Chapter 4, that technological mastery of nature is a virtue. Rather than trying to strive for technological progress in relation to our bodies, he wants us to our authentic, natural bodies.

The notion of 'Playing god' is invoked not just in discussion of human genetic tampering, but more widely, for instance in debates around ways in which technologies interfere with the natural reproductive process, including sex changes (Walker, 2017), abortion (Kelley, 1993), IVF treatments and embryo research and contraception (Deech, 2006) (Coleman, 1995). But also, with regard to humanity's subduing of natural habitats. For instance, Hartman (2017) analyses how the same metaphor has been invoked to argue that climate geo-engineering oversteps the proper scope of human agency. We've also already seen, with the examples given in Kaebnick (2013), that the same metaphor has been used with regard to other types of synthetic biology beyond human life. And indeed Kaebnick (ibid.) and Bedau and Larson (2013) are explicit about the history of their ideas in the general environmental ethics literature, citing the likes of Aldo Leopold, Holmes Rolston III, and Keekok Lee.

Meanwhile, we can wed the transhumanists and other pro-enhancement theorists with the intrinsic value of technology positions discussed in Chapter 4. This debate mirrors the wider discourse as it stands in often ignoring the potential for intrinsic value from technological endeavors. But with a charitable interpretation of Kaebernick's analysis, we can see the positive 'intrinsic value for technology' view is represented. Instead, the defensive case focuses more on undermining appeals to the intrinsic value of nature. Again, such undermining arguments are reminiscent of Chapter 5's discussion of the naturalistic 'fallacy'.

What Groll and Lott (2015) call the 'inert view' of human nature plays a functionally equivalent role in this debate to what in Chapter 4 we referred to as 'the technological neutrality thesis'. While the inert view is saying nature has no intrinsic normativity, the technology neutrality thesis says technology has no intrinsic normativity. In both cases what is in question is whether technological endeavours (in this case specifically human-centered technological endeavors) are in and of themselves value-neutral, and thus only made right or wrong because of their effects.

Another approach to showing that this is in fact one instance of the general debate is to see that all the positions documented in previous chapters can be straightforwardly applied to the subject matter of human beings, even if that was not the authors' intention. What was required to apply these views was for human beings to have a metaphysical status of semi-artifact, which we provided strong argument for in Chapter 6. Just because those general arguments weren't intended to apply in this specific case, we have no reason to think that they are any less potent.

Is my reduction of the human enhancement naturalness debate to the nature/technology value spectrum a fair one? Let us consider some potential objections. Firstly, it is logically possible that one might take one stance concerning human nature, and another concerning nature of other sorts (animal, plant, habitat, process). While it would seem curiously arbitrary to intrinsically value all of nature except human nature, we could more plausibly conceive of the reverse. One plausibly non-arbitrary reason for prioritising human nature and not nature in general might be that ethics is about what is good *for* humans, and so it is specifically an

account of human nature that matters in order to provide a basis for a coherent ethics, but not necessarily nature in general.

However, it is not easy to de-couple human nature from nature in general. Human nature is what it is because humans have evolved to adapt to particular external environments. All our physical and mental features would have been otherwise if the environment were otherwise. Even if it was only a conception of human nature required to buttress one's ethics, it seems that this human nature would not necessarily continue to entail the good for humans when there is a substantial shift in the context to which that human nature was fitting to. Anti-enhancement theorists seek us to retain awe, wonder, and acceptance for both the gifts and limitations of humanity. But what we consider gifts and limitations of human bodies are context-dependent. The Philosophy of Disability obviates this point in showing what we refer to as normal functioning, and what we consider limitations, is necessarily environment-dependent (e.g. Wasserman et al, 2016). Given human nature must be conceived within a broader context, those intrinsically valuing human nature cannot help but also support, as a means to its creation, the wider states of affairs within which human nature resides: nature in general.

Even if we could successfully de-couple human nature value considerations from nature in general, we still face the metaphysical fact that the former is a subset of the latter, and so human enhancement debates face the same general dialectic covered in Chapter 5.

A second challenge which, *prima facie,* threatens to break the dichotomy of (human) nature vs. (human-enhancing) technology is the line of argument in Newton Lee's Transhumanism Handbook (ibid.) : human nature is intrinsically valuable, and the technological disposition is once such a feature of human nature, and so we ought to honour that feature of ourselves and explore the innovations of improving our bodies and minds.

Even if we accept there is some evolutionary impulse to innovate, this is a problematic argument. Firstly because it seems that any human trait can be similarly claimed to be naturally evolved, including contradictory traits like impulse to preserve, or to hold reverence for nature. We cannot use evidence of *some* measure of the technological disposition in *some* people to say that it is the predominant natural trait. We can't take 'valuing human nature' just to demand 'fully embracing a particular human impulse', as human impulses are contradictory. Justifying why we ought to listen to the innovative impulse and not the preservation impulse requires an independent argument.

Furthermore, the appeal to the naturalness of human innovation is also potentially self-defeating. If there is a human impulse to innovate, and this innovation can be applied to humans themselves, and this impulse ought to be respected to achieve betterment in the species, then it appears we could, in the eyes of some, better our species by removing or curbing our impulse to innovate in the first place. Again, we need to find independent reasons to justify which impulses to curb and which to honour.

Not Interesting?

Granting the framework of previous chapters and its linkage to the above, we should see that the debate over human enhancement's unnaturalness is not particularly interesting. Why exactly is it not interesting to consider a single instance of a wider debate? I don't doubt that in many respects it is interesting to follow through the implications of the general stance to different areas. It is also true that focussing on the specific instance can helpfully illustrate and reveal

general concerns, and indeed that is why our focussing down here is a worthwhile endeavor as part of the overall project. But what I mean is that the specific instance does not generate any of its own considerations or particular dimensions over-and-above the general debate.

Let's consider an analogy from elsewhere. There is a rich and complex debate around the merits and demerits of redistributive justice. We can have such debates without considering in great detail the specific mechanisms of redistribution, for instance, whether we use income tax, capital gains tax, corporation tax. When debating some particular tax, it is likely that part of the core rationale for it links to a general stance on redistributive justice. The general stance is more or less sufficient. We don't have a 'philosophy of income tax', and if we did, it would not be particularly interesting beyond the general debate on redistributive justice. Similarly here, we don't need a specific branch of bioethics dealing with how our general spectrum pertains to human synthetic biology; we just need the Nature/technology spectrum.

Viewing this issue at a political level of explanation, helps to meet the challenge of drawing lines in the sand. We shouldn't ever expect an answer to Thompson's problem. This challenge won't be solved by proposing precise technology-specific statements like *"Recombinant DNA techniques are wrong when they edit a particular individual's traits beyond the population's range of naturally occurring variation."* On the political conception, drawing such delineations would be analogous to a left-winger believing there is some single rate at which the income tax suddenly switches from unfair to fair. The left-winger doesn't face such absurdities because the tax debate is carried out at a more general dispositional level.

Applying a political lens allows us to employ political models to explain the matter at hand with more efficacy. Our representational model of choice for political values has been political values spectrums. Using a spectrum alleviates the pressure to draw lines in the sand, allowing us to take intermediate positions without fear of slippery-slope argument, and without needing to find some holy grail method of delineating good tampering from bad.

Bioethics, being an ethics, seems to demand clear delineations of right and wrong in the case of human enhancement. But once we see the human enhancement naturalness debate in the terms of the Technology/Nature political value spectrum, we should see that the endeavour to argue for some correct cut-off point for a particular technological intervention is hopeless.

Conclusion

In this chapter I have explored the heated debate around the naturalness of human-centred synthetic biology. We have seen those on the pro-nature side wanting to protect something special about natural humanity. We have seen those on the pro-technology side wanting to 'play god' in pushing the species boundary, and we have seen those struggling in the middle to draw a coherent line in the sand.

By re-casting this debate in terms of my more general nature/technology value spectrum, I have offered what is perhaps an unsatisfying account. I have not been unequivocal in whether or not particular technologies are right or wrong, and that seems to be what many want to know. Unfortunately, those asking this question are making a category mistake. As with other political dispositions, we should not expect them to create binary rights and wrongs out of particular policies, rather, they influence at a more general level.

However, in the next chapter, I will be taking a stance on this more general values spectrum, and in doing so, the read-across to this specific case should be clear.

Chapter 8 - The Enlightened Technophile

So far, this project has been a descriptive ethics and political philosophy: I have been setting out a framework to describe how values to nature and technology relate to each other, and to other political values. My motivation for this stands alone - conceptual clarity is intrinsically valuable, and as a civil servant, better understanding the moral landscape pertaining to my policy area is helpful for giving good advice to ministers. But a further instrumental benefit of conceptual clarity is that it gives me the vocabulary to argue for my own normative ethic: my stance on the nature technology spectrum. I confine all my normative assertions to this chapter, and its contents can be disputed independently without affecting chapters thus far, or the empirical chapters 9 and 10.

Firstly, on reflection, I do not particularly intuit the intrinsic value of naturalness as an abstract property of objects. There is little discussion in the literature of things that are natural, but clearly disvaluable to human beings, such as naturally occurring diseases and natural disasters. While obviously instrumentally bad, it is not clear to me that the naturalness of these phenomena is value-adding (or mitigating in any way).

Moreover, it has struck me that while environmental ethicists have discussed whether natural intrinsic value exists in wildlife and habitats, there has been no discussion of the almost infinitely vast quantity of natural physical material found on other planets. It seems odd to me the claim that the existence of distant sterile planets is intrinsically valuable in a moorean sense, i.e. that their existence 'makes the world a better place' (or perhaps, more charitably, we could reformulate the moorean condition here as 'makes the universe a better place', nevertheless, *does it?*). One could respond by saying value considerations are relative to earth. But this seems arbitrary - it is conceivable we will colonise other planets soon.

Again, in the context of the natural faculties of human beings, I do not intuit value. If a skill or attribute is cultivated through nurture, or technological assistance, this seems to me just as valid as a random natural endowment. Of course there are considerations along other axes of value such as fairness and competition when considering, for instance, sporting achievement. But in isolation, I see no distinguishing feature of natural faculties such that they ought to be put on a pedestal.

I do see that expanding moral concern to animals is plausible. But I see this as of a piece with expanding moral concern to artificial and semi-artificial life, i.e. this is a distinct matter from the question of the value of naturalness. The welfare of life, and the strong sentiments that go with it, cannot be co-opted for the deep ecologists cause. The arguments of techno-positive animal welfarist David Pearce exemplify this point. My suspicion is that the intuitive force of deep ecology should be attributed mainly to a moral, aesthetic, and/or intellectual interest in biota, i.e. living things. But this need not be particular reverence for *nature*.

So far, my view places me on the 'anthropocentric' side of the classic environmental ethics dichotomy. This pigeonholing is first confused by the fact just noted, that I am sympathetic to non-human welfare. But moreover, as I argue in chapter 5, 'anthropocentric' isn't sufficiently descriptive of the positive features of my position. It's not just that I am ambivalent about the intrinsic value for nature, I actively reject it. I highly intrinsically value its very opposite.

As outlined in chapter 4, I find technology production a rich source of value for its aesthetic and creative properties. I see the activities of skilled engineers as virtuous in a way we would commonly speak of artists (and artists also fall under the technological rubric, broadly defined). Most of all, I see technology as a profound social achievement. Knowledge propositions are free-floating amongst us, but technologies instantiate our ability to communicate and amalgamate this knowledge with one another, and fill in the gaps in our knowledge with creativity. I feel this is a fruitful area of axiology thus far ignored, even when it dramatically shapes our lives far more than something like fine art.

I am cautiously in favour of experimentation to learn more about the prospect of human enhancement. Why should we be satisfied with bodies and minds optimised for the life of a hunter gatherer? Why should we not strive for better? As Nick Bostrom argues, we need an inhuman empathy to solve the various collective action problems threatening humanity (climate change, nuclear holocaust, war). This is a technological solution to a problem, a profound instance of technology's instrumental value. But moreover, a greater capacity for empathy is a bigger heart, allowing one to feel more. I think this is one example of an improvement to our human capacities that increases our 'physical option set'. Following liberals like Amartya Sen, this expansion to our option set is intrinsically valuable, whatever one chooses to use their expanded capacities for.

I feel that all of this amounts to technology satisfying the Bradlean/Moorean condition: The production of technology is something that in and of itself makes the world, lives, and states of affairs better, and so ought to be maximised all else being equal.

These anti nature and pro technology sentiments have been curiously absent from academic literature until now. I think this is because our value for technology is seen as either too quotidian, too materialistic or perhaps too capitalist to be a worthy subject amongst philosophers. Outside the self-selecting pool of environmental ethicists, who contribute most writing on the axiology of the physical world, my hunch is that some degree of technophilia and nature-ambivalent sentiments are held by a significant proportion of the public and policymakers. This will be put to the test in subsequent empirical chapters.

Immaterial Artifacts

There is an open question of what boundaries we place around the types of objects covered by the nature/artifact spectrum? The three philosophers discussed in Chapter 3 define an artifact as a *physical* man-made object. But can artifacts, and hence, technology, include immaterial, abstract and ephemeral and mental objects? And if so, what bearing does this have on the framework's explanatory power?

At the nearer end of this grey area, we probably want something like computer software to be considered as a technology. Software is intentional and functional, and it spans the stages of a technological readiness level development process the same as any tangible object. But a software is not constituted by a single physical instantiation. Software could be construed as an amendment or manipulation of an existing physical object (i.e. a computer drive), rather than a

new instance of technology unto itself, but this seems contrary to intuitions that a software can be labelled a piece of technology. We can draw parallels here with the ontology of music, which unlike straightforward objects like paintings, there is no single clear instantiation of what the music physically consists in (Kania, 2017).

In the cases of music and software, we can at least attempt to tie these concepts in with physical instances (even when the relationship is not a one-to-one mapping). But some things are more strictly abstract entities which we do nonetheless occasionally refer to as artifacts. Hilpinen (1995) considers belief systems artifacts, while Envine (2016) argues that human actions, in general, qualify as artifacts (though distinguishes these as artifactual events, not artifactual objects. If language is also considered an artifact, then another route to software qualifying as artifact is that software programmes are linguistic entities, composed in programming languages (Turner 2014, 2018 ch. 5).

On these views, the term artifact potentially covers a significant portion of human mental objects and actions. Moreover, physicalist philosophy of mind would maintain that strictly speaking, both 'mental stuff' - theories, ideas, concepts, knowledge, frameworks etc., and 'physical stuff' - the earth, animal and plant biology, human bodies etc., are in fact composed of the same stuff. So let us entertain for a moment the idea that all of these sorts of objects are similar in kind.

If so, then *ex hypothesi* these objects also must fall on a metaphysical continuum between nature and artifact. Placing mental objects on a nature/artifact continuum is an incredibly difficult thing to do in practice. Each human behaviour is a complex intermingling of natural, evolutionarily derived, drives, and constructed, artificial nurture. There is also an element of recursivity that would need to be unpicked: human nature may to some greater or lesser extent be composed of those traits that produce nurturing behaviour, for instance, the ability to form mental objects, reason, acquire knowledge, and communicate with language.

Nevertheless, it must be possible in principle that behaviour can be sorted along this continuum (- recall Chapter 6: where else could these human activities be if not on the spectrum?). Of course, all mental objects will interact with humans, but it is not necessarily true to say humans 'make or modify' certain mental objects. There are actions and mental objects we intuitively know to be more the product of human creation (scientific theories, ideologies, cultural customs, stories, musical sequences) and those we know are more natural (libido, hunger, fight and flight).

If we assume mental objects and human actions do occupy a nature/artifact continuum, we can then suppose that there will be some tradeoff at the margin between instances of more natural mental objects and actions, and less natural. All else being equal, an increasing amount of mental objects that we deem artificial makes the resultant beings who possess these objects (or the resultant state of affairs containing these beings) less natural. Assuming this metaphysical trade-off still holds, then proceeding along the same lines as the thesis in Chapter 5, there is a trade-off in intrinsic value for the natural and technological sides.

The technological end of a value spectrum for mental objects here would imply a principled desire to replace or augment all remnants of a state of nature with the production of efficacious, intentionally manufactured, functional, mental objects: knowledge, scientific theories, music theories, concepts, logic etc..

Meanwhile, the extreme nature end would imply an anti-intellectualism; a principled desire to halt or reverse all intentional mental object production, behaviours and actions which are not

considered part of a human state of nature. And on the other hand, an embracing of humanity's natural instincts, desires, emotions, passions.

If this similarity holds, then it makes environmental ethics self-undermining! Environmental ethicists' mental constructions are acts of harm against more natural forms of thought. Perhaps some limited mental construction is justified to outline the basic position. But when environmental ethicists dedicate their whole life to the unnatural process of theory construction, there must come a point where they can be charged with not practicing what they preach.

Perhaps one reason for thinking the likeness does not in fact hold, is that while competition for dominion over physical material is zero-sum (recall chapter 5), it's not quite so clear that the construction of new *mental* objects comes at a cost. Humans seem to have a very flexible capacity to conceptualise and re-conceptualise.

However, one can be reminded that the ways in which naturalness is diminished is not only through dominion of natural material, but also augmentation and supplanting of natural *processes*. Mental objects change natural mental processes. New theories are often counterintuitive, i.e. they go against what one might have thought in some more natural state. Like ectogenesis versus natural birth, or the 7 year breeding cycle of the cicadas being disturbed by climate change, mental objects do most definitely modify natural mental processes.

Maybe you are convinced that this undermines environmental ethics, but perhaps you will swing the other way and see this as a *reductio ad absurdum* against the claim that mental objects are identical to artifacts. Let's assume the latter, i.e. that there is some relevant difference. Even if the identity between mental objects and physical objects falls, the strong analogy between them still stands. This can be best illustrated through comparison of the nature technology spectrum with the historical movements of, respectively, The Enlightenment and Romanticism.

The Enlightened Technophile

The 18th century Enlightenment, also called 'The Age of Reason', was a period of unprecedented intellectual achievement, including the work of Francis Bacon, Isaac Newton, Leonhard Euler, Rene Decartes, Denis Diderot, John Locke, Adam Smith, David Hume, Thomas Reid, and Immanuel Kant (Porter, 2001). It was the age of the first Encyclopedia, with entries covering human knowledge ranging "from the most abstract theoretical, to the most practical, mechanical and technical" (Bristow, 2017)

It was an age where we also saw great technological achievement, including Benjamin Franklin's bifocal glasses and lightning rod, Gabriel Farenheight's Thermometer, James Watt's Steam engine, the Montgolfier Brothers' first hot air balloon flight, Lesage's telegraph pole, Bushnell's submarine, along with guillotines, bicycles, food preserving jars, carbonated drinks and much more (Bellis, 2019). These intellectual and technological innovations were accompanied by a positive belief in human self-assertiveness, progress and intellectual power. Advancement wasn't merely a descriptive fact, but an ideal, and when progress was made, a matter of great pride (Bristow, 2019).

Jean-Jacques Rousseau provides a bridging point between The Enlightenment and Romanticism. A radical thinker during the enlightenment, he was a key influence on the proceeding Romantic era by criticising scientists and technologists for distancing man from nature (Ayer, 1986). Rousseau's view of man in the state of nature is a positive one to which we should strive to return (Bertram, 2020).

Romanticism is notoriously difficult to define, and spans across different subjects like art, music, literature, philosophy with very little in common (Gorodeisky, 2016) (Lovejoy, 1960). But, in terms of the romantic intellectual outlook, a loose set of principles are given by Cunningham and Jardine (1990, p.4):

> "the original unity of man and nature in a Golden Age; the subsequent separation of man from nature and the fragmentation of human faculties; the interpretability of the history of the universe in human, spiritual terms; and the possibility of salvation through the contemplation of nature"

Here, the 'Golden Age' is a reference to the biblical Garden of Eden, a time symbolising man's living in harmony with nature. Romantics cite The Enlightenment's cold-hearted attempt to extort knowledge from nature and its rational, calculating, analytic and judgemental approach, as responsible for humanity's 'fall from grace' (ibid.). Prominent German romantic Friedrich Schelling's *Naturphilosophie* echoes Rousseau in arguing for the necessity of reuniting man's spirit with nature (Heidelberger, 1998).

Earlier, I argued with tongue in cheek that today's environmental ethicists might see their own conceptual manufacturing as an affront to nature, but romantic scholars genuinely did have an uneasy relationship with scientific inquiry. Romantics preferred a 'hands-off' approach to understanding nature, preferring observation of facts with careful and limited experimentation. They thought the enlightenment approach to science a problematic attempt to control nature (Bossi and Poggi, 1994, p.xii). Romantic Chemist Sir Humphry Davy said understanding nature required *"an attitude of admiration, love and worship."* (Cunningham and Jardine, 1990).

Meanwhile, in the realm of literature, Bate (1991) and McKusick (2009) have linked Romantic-era poetry to the ecological movement. In the latter's case arguing that the poets like Wordsworth, Blake, Shelley and Coleridge offered a *"conceptual and ideological basis for American environmentalism"*, directly inspiring the likes of Ralph Waldo Emerson, Henry David Thoreau and John Muir.

Mary Shelley, daughter of enlightenment philosopher William Godwin and feminist Mary Wollstonecraft and wife of aforementioned romantic poet Percy Shelly, wrote Frankenstein (1818) at 19 from an upbringing immersed in the culture clash. The character Dr Victor Frankenstein is a derogatory portrayal of The Enlightenment. Victor is vehement in the pursuit of knowledge and power to create life. He is a megalomaniac, wanting to play god by breaking natural boundaries that ought not to be broken: *"Life and death appeared to me ideal bounds, which I should first break through, and pour a torrent of light into our dark world. A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me." (Ch 4, 1818).* In the present day, where our advances in human enhancement biotechnology make Frankenstein's monster a reality, participants in bioethics debates use the same sentiments without hyperbole.

If the tension between The Enlightenment and Romanticism is not part of the same general phenomenon as the physical nature/technology spectrum, the two situations are at the very least strongly analogous to one another. Even without diving into a metaphysics of mind, there doesn't seem to be a relevant difference between the two types of stuff, and the affinities between romantics and nature; and enlightenments with technology is plain to see.

In addition, while it is useful historical context that Romanticism grew as a reaction to The Enlightenment, there doesn't seem to be anything about these belief systems that is temporally or spatially anchored. As Steven Pinker writes in *Enlightenment Now* (2019), the Enlightenment faith in reason applies equally well to modern times. If we sever these movements from their historical roots, we can see the framework built in this thesis as supplying a robust axiological underpinning to this older tension.

Having observed this strong analogy, my normative argument for technophilia is a simple companion-in-arms claim: As analytic philosophers and political scientists, we ought to be proponents of The Enlightenment. It is a founding assumption of our disciplines that we should construct theories, accumulate propositions, and in general, create mental artifacts to improve our understanding of reality and our efficacy in the world. If, as products of the enlightenment, we endorse the creation of mental artifacts at the expense of mental nature, we should also endorse the creation of physical artifacts at the expense of physical nature.

Chapter 9 - Surveying Value for Nature and Technology

Introduction

In this chapter, I look for the empirical evidence around my proposed nature/technology political value spectrum, reviewing the existing landscape of empirical data, and after pointing out design deficiencies in the current best-in-class scales, I devise my own scale and use factor analysis to test it against libertarian/authoritarian and left/right political scales from the British Social Attitudes study.

But first, what is the relationship between this empirical endeavour and the theoretical endeavours of chapters 1-8? Empirical study is a way of capturing the public's pre-theoretical intuitions. There is much written on the role of intuitions in philosophy. For a normative theory to be acceptable, it is likely that it must cohere with at least some of our intuitions. Yet, we also want our theories often to guide us to truth, and peoples' intuitions conflict (Pust, 2019). For many, testing a theory against intuitions is a valuable datapoint to add to the credibility of a theory, even if it is not wholly conclusive.

But even if one assumes a theory to be true on the basis of theoretical argument alone, then empirical study has a second function. It helps decide whether I can claim that my theory is *descriptive* of what people's attitudes actually are today. Or, alternatively, whether I should be using it in an *epistemically prescriptive* way, suggesting that people ought to conceive of and structure their ideas this way to clarify and avoid contradictions in their own political thinking, whether or not it is descriptive. And/or in a *morally prescriptive* way, where not only am I advancing that the political landscape ought to be conceived as a spectrum of value, but also that the right place to be on that spectrum is towards the pro-technological end.

Political attitudes surveys are a common technique in political science. With a sufficiently well designed question-set, an attitudes survey can be a robust way to make inferences about

people's political values, amongst those who may not have self-diagnosed or are not aware of the terminology of political ideology. I will be following the methods of Rokeach (1973), Kerlinger (1972), Eysenck (1975), Middendorp (1978), and many others since (see (Todosijevic, 2013) for literature review), who have all used values survey techniques in combination with the statistical technique of factor analysis, to derive scales to capture values of political and psychological kinds. Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables - called factors (Bandalos, 2017).

Literature Review

Political Values Surveys

Curtice and Bryson's review of political value scales finds the two dominant scales that have historically been thought to capture political life are first, a scale of economic liberty or left- vs. right-wing; and second, one of social liberty, variously labelled authoritarianism or communitarianism vs. libertarianism or radicalism (2001). They note several attempts to form a left-right scale including in the European Values Survey, Eurobarometer, ISSP, British Social Attitudes and British election studies. Best performing amongst them was the British Social Attitudes 5-item scale, obtaining a Cronbach's alpha score of 0.82 in 1999, indicating high reliability. Meanwhile, they document attempts to devise a libertarian / authoritarian scale including from Adorno, Middendorp, and the British Election Study, though again, the British Social Attitudes study achieved the highest alpha of 0.7 in 1999.

But despite these successes, Curtice and Bryson (ibid.) also document a history of many low reliability studies. There is a general debate over whether this low reliability is a feature of the electorate's inconsistency, or a failure in survey design, or both (e.g. Evans et al, 1996). To this latter criticism, I will return, but on the former, in my view, a big part of the issue is that the field faces a methodological difficulty in designing question-sets which are both accessible to the public; and which tease out deeply held political values (or what I would call *intrinsic* values) rather than merely practical and contingent positions. Simple statements of natural language are inherently ambiguous, so political value surveyists are, and ought to, be engaged in an art of aiming at the realm of the principled as much as possible without sacrificing accessibility. Another general issue is that statements can sometimes inadvertently bear on two or more values at the same time.

Both issues could affect a survey item used on the Libertarian/Authoritarian scale. Take this item from the British Election Study (Evans and Heath, 1995):

> *People should be allowed to organise public meetings to protest against the government*

The surveyist's intent is to draw out an intrinsic political value for freedom from the state. An affirmative response is interpreted as a 'libertarian' answer. But, we could imagine an authoritarian respondent answering the question in the affirmative because they see the instrumental benefits of protest. They might be grateful for a platform to voice their authoritarian views against a liberal government. This gets even more complicated in cases like the US Capitol attack on Jan 6th 2021, where people whose political views are reasonable characterisable as authoritarian/communitarian are taking forceful protest action against a state

they consider corrupt. The possibility of rogue interpretations on items such as this may explain why the scale had a low reliability (Cronbach's alpha 0.5 (Evans and Heath, 1995)). Indeed, this item was subsequently dropped from the scale in its usage for the British Social Attitudes study.

It is worth noting that some political scientists have characterised a voting public using 'identity-based' accounts, rather than 'values-based accounts'. These would rely more on inferring political positions based on demographic data about class, ethnicity, profession, membership of certain community groups (Paris, 2017). Achen and Bartels (2017, p.267) argue that group attachments are more influential on voting patterns than policy preferences or ideological principles. "B*eing a Catholic, a white southerner, or a woman—may have dramatic effects on party identification or on the choice of a candidate in an election. When political events make a particular identity salient or threatened, powerful psychological forces can be evoked, with effects that go well beyond the impact of the issues involved".* On the other hand, Bai (2022) finds that ideology (which he describes as a matter of values) is more important than party affiliation (a matter of identity) in all but the final stages of a presidential race.

The choice of model depends on its intended use and interpretation. It may be true that identity-based accounts better describe voting intentions, and so have practical utility to a political strategist. But here, we are directly interested in people's values, and ultimately, in the real ethical questions of 'how we ought to treat nature?', and to what extent the answers posed by philosophers to this question are palatable. While 'values' have a more robust theoretical underpinning tracing a path from philosophy through to political science, Weiner and Tatum (2021) note how theoretical accounts of identity remain severely underdetermined.

In our case, trying to infer value sentiments *via* an identity construct introduces conceptual muddiness. We could suppose there are identities in the vicinity of my subject - the 'environmentalist', the 'eco-warrior', the 'anthropocentrist'. But part of my argument in this thesis is to highlight stark divides within environmental thought, making such loose identities less tenable. To be an 'environmentalist' may involve radical bioengineering à la David Pearce, or complete deindustrialisation à la Arne Naess, or it may involve no positive sentiments towards the environment at all but rather a value for human welfare threatened by climate change. A model constructed around environmentalist identities could be predictively accurate, but it would not deepen understanding of people's thinking about the internal conflicts within environmentalism, and the differing solutions to climate change and biodiversity loss that these entail.

Nature and Technology Values Surveys

As noted throughout this thesis, academia seldom focusses on technology as a source of intrinsic or political value. It is unsurprising then that we cannot find much evidence on this point. We also noted that it is even more seldom the case that theoretical inquiry unites the areas of philosophy of technology and environmental ethics, so again, it is no surprise we find little empirical evidence. This in itself is a problem for my endeavour. The separation of enquiries give no sight of possible correlations in attitudes between each domain of value in a single survey respondent, which is what would be required to demonstrate evidence of the theoretical scale I pose.

The only places we can find data on attitudes to both nature and technology is in the handful of large political attitudes surveys, namely the World Values Survey, European Values Study, European Social Survey, and Eurobarometer's main surveys. Unfortunately, these surveys strive for breadth over depth, and the few questions they contain on our subject matter do not provide

the clarity we need. For instance, the fourth wave of the World Values Survey (Inglehart et al, 2014) features the following questions on nature:

> *"Now let's consider environmental problems in the world as a whole. Please, tell me how serious you consider each of the following to be for the world as a whole?*
> *[...] Global warming or the greenhouse Effect [….]"*

And these items on technology:
> *"Science and technology are making our lives healthier, easier, and more comfortable."*
> *"Because of science and technology, there will be more opportunities for the next generation."*
> *"All things considered, would you say that the world is better off, or worse off, because of science and technology?*

Setting aside the ambiguity caused by the lumping together of science and technology (see chapter 4), we can see that in all cases, the World Values Survey questions are only vaguely hitting upon values. Political values are the realm of the principled over the practical, the intrinsically valuable over the instrumentally valuable, distinguishing ends from means. These statements do not do this. To think global warming is serious; and technology comfort-inducing, opportunity-providing, and welfare-improving, only requires that I see how important nature and technology are as means to these various ends. But they do not necessitate a view on whether or not nature and technology are valuable as ends in themselves.

Nature Values Surveys

Curtice and Bryson (2001) identify 'environmentalism' as a third factor underpinning politics, orthogonal to left/right and libertarian/authoritarian scales. They document questions posed by the International Social Survey Programme, Global Environmental Survey, New Environmental Paradigm (NEP) index, and from their own prior work. However, they admit that both the precedents and their own suggestions for a questionset do not have a strong theoretical (i.e. axiological) justification: *"We are not aware of a well-developed scale of environmentalist values. Although it is not uncommon [...] to develop scales of environmental 'concern' or 'behaviour', it is open to question how far these tap a distinctive set of 'values'."* A more recent review of environmental values scales by Bernstein and Szuster (2019) suggests the situation has not improved, noting that current metrics *"conflate a situated, incomplete set of environmental attitudes with pro-environmental worldviews generally"*.

Bernstein and Szuster focus their critique in particular on the New Environmental Paradigm index. But they do not include discussion of another prominent framework residing in the realm of social psychology, which, having risen to some level of both prominence and statistical validity, I feel warrants some critical attention. The 2-MEV was created by, and buttressed with frequent usage from, Franz Bogner and Michael Wiseman (1996a; 1996b; 1997; 1998; 1999; 2002b; 2004; 2006), and by Kibbe, Bogner and Kaiser (2014) and Johnson and Manoli (2008). 2-MEV posits there are two orthogonal dimensions of environmental value (Wiseman and Bogner, 2003, p. 5):

- Preservation - *"a biocentric dimension that reflects conservation and protection of the environment"*.
- Utilisation - *"an anthropocentric dimension that reflects the utilization of natural resources"*.

Not political scientists by trade, Bogner and Wiseman do not conceive 2-MEV's environmental values explicitly as *political* values, but rather values in a more general or psychological sense. One of Bogner and Wiseman's main motives is to improve environmental education. Many of these studies appear in educational studies journals and involve youth participants. Bogner and Wiseman's catalogue of papers also shows an interest in finding correlations between environmental value and psychological characteristics such as associations with risk aversion (2000), and personality (2003).

There is one instance of testing the measure's correlation with a quasi-political (and quasi-psychological) parameter of conservatism, using the Wilson-Patterson Conservatism scale, devised in 1968 (Wiseman and Bogner, 2012). They find a correlation between Utilisation and authoritarianism, which, on this scale, is a sub-component of conservatism. Authoritarianism as rendered on this scale though is not as it appears elsewhere. Items are rooted in a very particular set of US attitudes of the 1950s, featuring issues such as the "Superiority of the White Race" and "Imperialism".

It would be interesting to test 2-MEV in a UK context with more prominent and recent political values scales capturing social and economic liberty, to see what correlations emerge. Perhaps that is a study worth doing. However, there are numerous other theoretical issues with 2-MEV which mean I will not be undertaking such a study.

Though I dispute many of the scale items for reasons I will return to later, the 2-MEV's Preservation scale broadly captures sentiments and behaviours which indicate what I have come to call in Chapter 2 an 'intrinsic value for nature'. The following scale items used in (2006) illustrate the point:

- *It is interesting to know what kinds of creatures live in ponds or rivers.*
- *It upsets me to see the countryside taken over by building sites.*

Meanwhile, the Utilisation scale broadly captures people's attitudes to the use of nature as a means to other ends, such as material wellbeing.
- *Worrying about the environment often holds up development projects*
- *Dirty smoke from chimneys makes me angry*
- *Only plants and animals of economical importance need to be protected.*

These constructs of Preservation and Utilisation are suggested (and evidenced) to be orthogonal. Multiple papers embrace this finding:

> *The factors' orthogonality permits a respondent to vary his position on one dimension independently of that on the other. Hence the model implies no conflict between assigning high importance both to the protection of the environment and to the need to make use of natural resources—a configuration that demonstrably occurs in reality (Bogner and Wiseman, 2002)*

> *It is essential to the 2-MEV that it does not imply a conflict between assigning importance to preserving the environment whilst recognizing the need to make use of natural resources (Bogner and Wiseman, 2018).*

Given the discussion of previous chapters, it strikes me as quite strange that these concepts are not negatively correlated, that Bogner and Wiseman do not see there being a trade-off between protecting and using the environment. Bogner and Wiseman make passing reference in a literature review to the philosophical origins of the eco-centric stance in Dewey, Muir, Leopold, and Carson (2018)). But it is a crucial battle-cry of these thinkers that nature ought not to be seen in exploitative terms. The extent to which we see nature as anything other than to be exploited ought to be the extent to which we want to preserve it. Let's take, for instance, a quote from Rachel Carson's Lost Woods writings on nature:

> "*For many years public-spirited citizens throughout the country have been working for the conservation of the natural resources, realizing their vital importance to the Nation. Apparently their hard-won progress is to be wiped out, as a politically minded Administration returns us to the dark ages of unrestrained exploitation and destruction.*" *(Carson, 1998)*

Quite bizarrely, I can, on this scale, be a strong advocate of exploitation and of conservation. I can be a strong anthropocentrist and a strong biocentrist. This vastly reduces the scale's explanatory power: If, as a civil servant, I was tasked with estimating the public acceptability of building a new urban development project, I could evidence two contradictory conclusions on the basis of a 2-MEV study. I could observe that respondents are "*upset to see the countryside taken over by building sites",* and conclude it is unacceptable. But I could also see the same respondents agree that *"worrying about the environment holds up development projects"*, and conclude that I should continue without delay. Likewise in deciding whether to invest public money into a nature conservation project, I might be buoyed by the finding that people are "*interested to know what kinds of creatures live in ponds or rivers"*, but puzzled that the same respondents say "*Only plants and animals of economical importance need to be protected".*

Let us consider some possible explanations for what has gone awry here.

No Forced Choices

Suppose a town asked participants Q1: *Would you like more milk chocolate in the shops?* And Q2: *Would you like more breakfast cereals in the shops? Prima facie* these choices seem uncorrelated, and consistency demands nothing of one choice in relation to the other.

Now suppose there is a severe milk shortage in the town and residents are aware. There are only a few goods containing milk left on the shelves. It now becomes more evident to the participant that in answering 'yes' to Q1, they are implying they would like more of the rationed milk stock to be spent on producing chocolate at the expense of milk that they can buy to use on their cereal for breakfast. We would expect answers to no longer be uncorrelated, but negatively correlated.

Now suppose again that the residents are not fully aware of the milk shortage, but democratic policymakers nevertheless need to gauge public preferences about the use/non-use of milk. The issue here is that people may well just opt for more of both items, which is unhelpful. The policymaker needs to force the survey respondent to make a choice, for instance, Q3: *would you prefer milk chocolate to breakfast cereal?*

Like the hypothetical town's milk supply, the real world stock of nature is in short supply, presenting a problem for the policymaker. While someone may profess to like both using and

preserving nature very much, the two goals are in conflict. But not everybody intuits this. Indeed, it appears that Bogner and Wisemann do not intuit this, as they not only endorse the orthogonality of use and preservation, but even go as far as to imply that the 2-MEV scales are parameters of environmental educational outcomes - i.e a successfully educated individual *ought to* score highly on both preservation and utilisation scales (e.g. 2006, 2018). Bogner and Wisemann do not include scale items explicitly forcing a trade-off, and so, there is no need for participants to ever express mutually consistent preferences.

The public's failure to grasp the consequences of environmental utilisation is not surprising. It could be similar in structure to another phenomenon in the separate but related matter of solving climate change. Michael Hoexter is credited with formalising the notion of 'Soft Climate Denial', where *"one acknowledges in some parts of one's life that climate change is real, disastrous and happening now but in most other parts of one's life, one ignores that anthropogenic global warming is, in fact, a real existential emergency and catastrophic"* (Hoexter, 2016). Some key thought patterns cited by Hoexter (2016b) contributing to soft climate denial include:

- *Compartmentalization:* everyday events lack an obvious connection to global warming, so it becomes an abstract item of knowledge not linked to practical action.
- *Climate Providentialism*: post-industrial societies are disconnected from nature, view it as an exogenous and eternally provider, regardless of drastic changes.
- *Millenarianism:* people become preoccupied with an eventual, large-scale transformation of society, not day-to-day concrete action.

Arguably, these same three thought patterns give rise to the positions expressed in these surveys, that it is possible to both preserve and intrinsically value nature, and do the opposite. One might *compartmentalize* a love of the wild, and not see that it is, on a daily basis, threatened by those engaged in artifice. One might do so because the transition from one to the other takes place *out of view*. One might also have idealistic nature-loving tendencies and yet maintain, in another more practical, *day-to-day* frame of mind, that in fact they are grateful for the material comforts of modernity.

Mismatch of Items and Theoretical Construct?

Another part of the explanation for the mismatch between theoretical incompatibility and statistical orthogonality could be that one or other of the theoretical constructs does not actually describe the correlation captured in the scale items:

Let us first examine a list of Utilisation scale items from Bogner (2018) (items remain relatively unchanged since conception in the 1990s):

1. *We must build more roads so people can travel to the countryside.*
2. *Nature is always able to restore itself.*
3. *Our planet has unlimited resources.*
4. *We do not need to set aside areas to protect endangered species.*
5. *People worry too much about pollution.*
6. *The quiet nature outdoors makes me anxious.*
7. *We need to clear forests in order to grow crops.*

What could this theoretical construct be, if not as the authors argue, some notion of 'Utilisation'? One possible interpretation consistent with orthogonality is that items indicate a level of awareness or education about the processes involved in environmental economics. Questions 2, 3 and 7, seem to elicit respondents' knowledge of facts that indicate their understanding of environmental issues, such as that we sometimes do need to clear forests to grow crops. This awareness can feasibly be orthogonal to any evaluative stance on those facts, which would be covered in the Preservation scale. Another possible interpretation, particularly items 2,3,4 and 5, is that this scale measures one's optimism/pessimism about the planet's ability to cope with humanity's demands on it. Again, this scale would be orthogonal with the Preservation scale, as loving nature does not bear either way on the empirical matter of whether nature survives.

However, I think these items do seem to be best explained in the author's intended way: all items do seem united by an intention to exploit nature for some purpose or other. Now let us examine the Preservation scale.

Returning to the theme of instrumental vs. intrinsic value, the 2-MEV Preservation scale is flawed in a similar vein to the WVS in focussing on nature's instrumental value in many of its questions. The following items again from Bogner (2018) do all give some reason to preserve nature, but none necessarily entail ecocentrism:

- *I save water by taking a shower instead of a bath (in order to spare water).*
- *I always switch the light off when I don't need it.*

While indicative of someone being environmentally conscious, these behaviours also are consistent with simple economic prudence.

- *I enjoy trips to the countryside*

There are many reasons why I might enjoy the countryside beyond having Preservation value, for instance, because I can burn a log fire.

- *Dirty industrial smoke from chimneys makes me angry.*

Again, this could be because of the direct harms caused to humans caused by localized pollutants, rather than because of some intrinsic value for nature.

It is worth noting 2-MEV's predecessors also suffer similarly in mixing the instrumental and the intrinsic:

- *It is just too difficult for someone like me to do much about the environment (Bryson and Curtice, 1998)*
- *Whether you save energy or not does not really make a difference in the protection of the environment* (plus 10 similar questions on other activities) *(Global Environmental Survey, documented in Bryson and Curtice, (2002)*
- *How willing would you be to pay much higher prices in order to protect the environment? (Bryson and Curtice, 1998)*
- *I do what is right for the environment, even when it costs more money or takes more time (Bryson and Curtice, 1998)*

Secondly, some of the 2-MEV Preservation survey items survey the existence of factual beliefs which are logically independent of any evaluative stance:

- *Humankind will die out if we don't live in tune with nature.*
- *Society will continue to solve even the biggest environmental problems.*

Perhaps it might be argued that these empirical beliefs are commonly held by those who have an intrinsic value for Preservation, but then we would want further evidence linking factual beliefs to ideology, rather than presume a relationship between them.

Again this mixing of positive and evaluative statements is a recurrent problem in other values surveys:

- *Nature would be at peace and in harmony if only human beings would leave it alone. (NEP index, (Albrecht et al, 1982))*
- *We believe too often in science, and not enough in feelings and faith (NEP index)*
- *Economic growth always harms the environment (NEP index)*
- *Almost everything we do in modern life harms the environment* (Curtice and Bryson, 2001)
- *Many of the claims about environmental threats are exaggerated* (Curtice and Bryson, 2001)

These factual claims might all be true, but that is irrelevant to the respondents appraisal of the environment itself.

Thirdly, two scale items used in 2-MEV capture some notion of animal welfare:

- *Human beings are not more important than other creatures.*
- *Pets are part of the family*

Likewise, the NEP index:

- *Animals should have the same moral rights that human beings do*

We saw in previous chapters that value for animals as moral subjects is conceptually distinct from intrinsic value for nature. The fact that we find empirical correlations between the two, as I argued in Chapter 2, is an unfortunate and historically contingent confusion, and one that will not stand the test of time in an age of synthetic life. Animal rights enthusiasts have some common ground with environmentalists, but the gap is widening.

These issues with the items on the Preservation scale come together to make me think what is being measured here is not precisely ecocentrism, but rather, a cluster of attitudes and beliefs which happen to be held by those who would broadly associate themselves with an environmentalist movement. Recalling the discussion above of identity-based accounts v.s. Values-based accounts, perhaps this scale is in fact measuring some loose 'environmentalist identity', not environmental values as it purports to.

One-Sidedness
Putting aside the issues of suspect constructs and orthogonality, my final issue with 2-MEV, NEP, Bryson and Curtice's and other environmental values scales is a re-emphasis of the one I began this section with: all scales so far have been one-sided. They assume some purely positive construct (or in 2-MEV's case, two constructs), to describe the extent to which someone values the environment. The interpretation of a low score on these scales is not clear. It could be either complete ambivalence, or complete disagreement.

What I have argued is special about political values spectrums is that they occur when there are genuinely incompatible 'goods' that are located *at either end*. These cause disagreements upon which there can be passionate responses on both sides, rather than one side being ambivalent. There is a fundamental trade-off between economic liberty and economic equality; and between libertarianism and authoritarianism.

It could be argued that in some survey items, value for nature has been traded off against something incompatible: economic welfare. For instance, "*How willing would you be to pay*

much higher prices in order to protect the environment?" (Bryson and Curtice, 1998). But we should see that economic welfare is not the direct opposite of 'value for nature' in the way economic liberty is the opposite of economic equality.

Economic welfare could be set against *any* intrinsic value. We could ask people whether they would be willing to pay much higher prices in the name of equality, or liberty, or community, or art, or honour, or honesty, or anything else. The parameter of economic welfare essentially describes our society's resources, and we face many options in how we employ those resources to various 'ends'. Economic welfare might be an end in itself, but it is also a very important, perhaps the most important, *means* to many other ends, and so it is valuable. But nature is just one such other end.

In this way, we could question whether 'Utilisation of nature' is actually a distinct political value at all? Or whether the value in question is just a value for a more general form of economic 'utility', which could have, in another unrelated survey design, been contrasted with any other desiderata.

I have advanced throughout this thesis that instead, the *intrinsic* value opposing nature, and so creating a political ideological spectrum, is an intrinsic value for technological endeavour, for taming the wild, for mastering nature's mysteries, for the unparalleled creativity and productivity of mankind. Pitting these values against each other is the study I will now try to design.

Method

I surveyed 1,000 participants using online survey company Pollfish. The sample was 58% male, with ages ranging 16-58, and mean 40. This was a convenience sample, but this is acceptable as I am not interested in making any demographic based comparisons. I opted to append my new scale items to well-evidenced scales for Libertarian/Authoritarianism and Economic Left/Right, as used in the British Social Attitudes (BSA) survey. My participants were all UK-based to align with the BSA. The response pattern followed a 7-point likert scale to align with the BSA. Resource constraints limited me to a total of 19 items.

Factor analysis is used to describe variability among observed and correlated variables, in terms of a smaller set of unobserved variables, called factors (Bandalos, 2017). When using factor analysis for a political values scale, the observed variables are the survey items, while the factor aims to be the underlying theoretical political value construct. Factor analysis first reduces the survey items to some number of factors, it then attributes each survey item a 'factor loading', which explains the extent to which an item is related with a given factor. A low factor loading means the item in question is orthogonal, meaning statistically independent and uncorrelated to the factor.

Factor analyses were conducted using IBM SPSS Statistics 26. I used a varimax rotation, a statistical technique used within factor analysis where one assumes there to be no correlation between factors (Abdi, 2003), though I also checked this assumption by running a confirmatory direct oblimin, which relaxes this assumption, and found no substantial differences using this method of rotation. The sample size for this method should be >250, which is met.

My 8 original scale items fall into three classes: three are aiming to elicit a response indicating the intrinsic value of nature, three are about the intrinsic value of technology, and two are 'continuum questions', forcing participants to trade off nature and technology by asking about the value of both at the same time. Providing this mixture allows us to both identify a correlation amongst prima facie unconnected items on nature and technology, and also create some scenarios forcing participants onto the spectrum to see if they do so in a consistent way.

My hypothesis is that the factor analysis will generate three factors: one for each of the two existing political scales (social liberty, economic liberty), and one new factor explaining both the nature and technology items, which I am claiming theoretically reside on a single scale of political value. Nature item responses should be negatively correlated with technology item responses. If my nature and technology items do not load onto a single factor, but instead on, say, two independently varying (i.e. orthogonal) factors, I will have failed to find evidence that people see nature and technology as in conflict.

Prior to fielding the study, I tested a larger battery of question wordings with 5 cognitive interviews to mitigate against misinterpretation of items. When I asked participants directly whether they value nature and technology 'as ends in themselves', they tended not to understand what was meant, so more creative approaches were required. To prevent an instrumental value interpretation, items needed to have phrases that cleave apart the desiderata from material and practical concerns, for instance, asking if nature is worth sacrificing material wealth, or requiring that the benefits to humans are not the focus. Meanwhile two items invoke the idea of love: which, I felt, worked as a proxy for intrinsic value in being a directed unconditional attitude of strong appreciation towards the thing in question.

I also tested these items alongside an additional question asking participants to rate their own technological proficiency, to check that the participant pool isn't unduly skewed in undertaking an online survey.

Results

Across the 8 nature and technology survey items, the average variance in answers was 2.27, while it was 2.51 for economic items and 2.80 for social items.

The factor analysis reduced the 19 items to four factors with an Eigenvalue above 1 - the cut-off for new factors according to the Kaiser's criterion (Bandalos, 2017). BSA scale items for economic liberty loaded reliably onto a single factor with eigenvalues of 4.461 and Cronbach's Alpha 0.755. Similarly, the BSA social liberty items loaded with an eigenvalue of 2.232 and Alpha 0.730. The Kaiser-Meyer-Olkin Measure of Sampling adequacy of 0.86 suggests adequate sampling for use of factor analysis (Shrestha, 2021).

The three nature items and two continuum items loaded strongly onto a third factor with Eigenvalue 1.354, Alpha 0.718. The three technology items loaded onto a separate fourth factor Eigenvalue 1.200, but with a lower Alpha of 0.508.

	Component			
	1	2	3	4

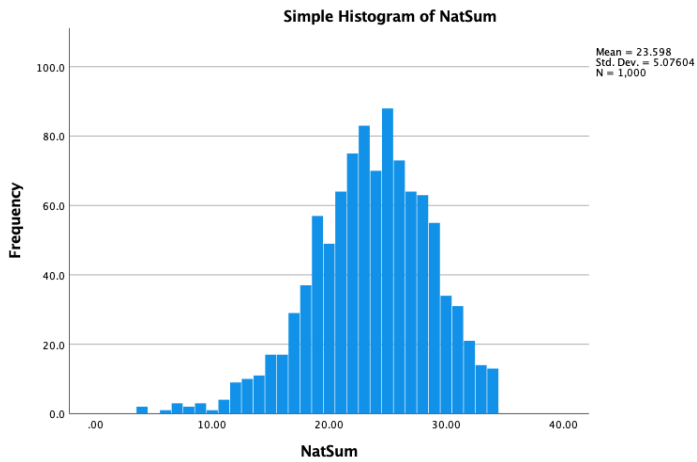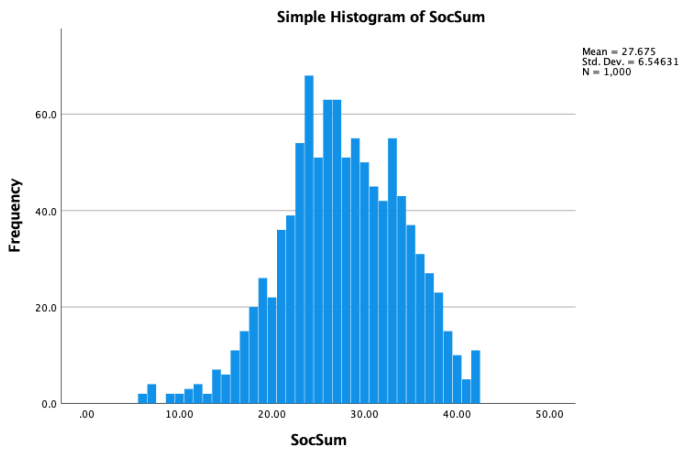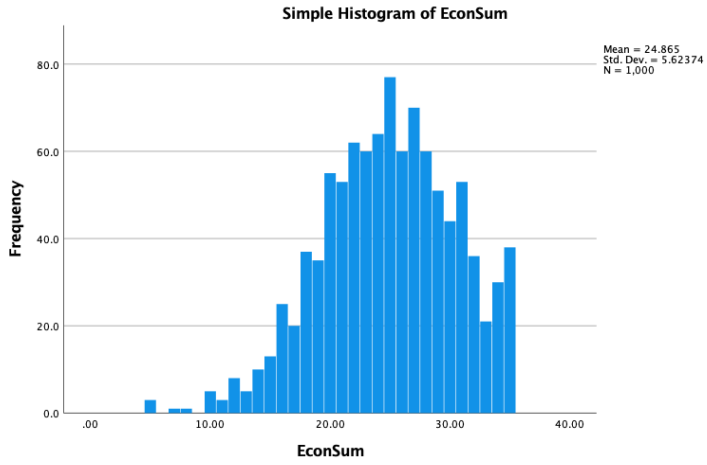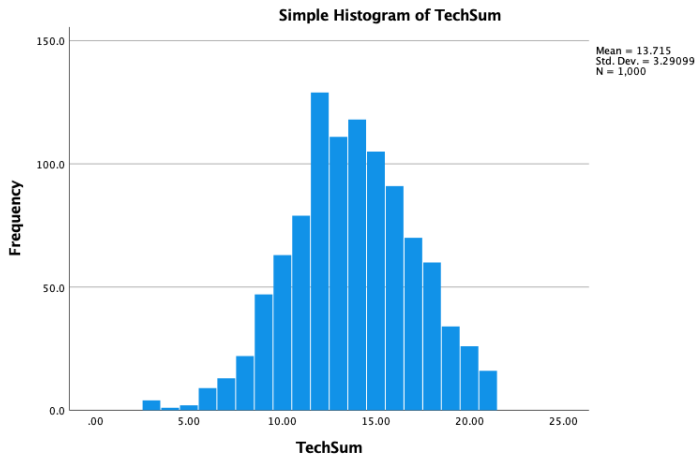| Statement				
Ordinary working people do not get their fair share of the nation's wealth.	**0.722**	0.048	0.256	-0.007
Big business benefits owners at the expense of workers.	**0.674**	-0.009	0.214	0.142
There is one law for the rich and one for the poor.	**0.673**	0.153	0.111	-0.06
Management will always try to get the better of employees if it gets the chance.	**0.624**	0.146	0.135	0.236
Government should redistribute income from the better off to those who are less well off.	**0.619**	-0.027	0.234	0.162
Young people today don't have enough respect for traditional British values.	0.097	**0.706**	0.146	-0.008
People who break the law should be given stiffer sentences.	0.177	**0.704**	0.087	0.071
Schools should teach children to obey authority	0.046	**0.683**	0.138	0.179
For some crimes, the death penalty is the most appropriate sentence.	0.217	**0.645**	-0.093	-0.067
The law should always be obeyed even if a particular law is wrong.	-0.194	**0.541**	0.097	0.356
Censorship of films and magazines is necessary to uphold moral standards.	-0.125	**0.52**	0.205	0.21
I would describe myself as a nature-lover.	0.132	0.166	**0.752**	-0.002
It is important that people are in touch with the natural environment	0.274	0.112	**0.656**	-0.019
Humans should sacrifice material comforts to live more in tune with nature.	0.035	0.107	**0.643**	0.169
Assuming the benefits to humans are equal, taxpayers' money would be better spent on wildlife conservation than on funding new feats of technology.	0.258	0.047	**0.597**	0.05
There is a 1,000-year-old tree in a nearby woodland. A company threatens to tear it down to make way for an important railway line. Building around the tree would come at large cost to the taxpayer. Despite the cost, I would support a campaign to protect the tree.	0.28	0.057	**0.562**	-0.03
I think we should develop technology to enhance human bodies and minds.	0.036	0.101	0.043	**0.692**
Humanity is better off living in the modern industrial world than it has been ever before in its 10,000 year history.	0.117	0.076	0.024	**0.689**
I would describe myself as a technology-lover.	0.162	0.115	0.047	**0.592**

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 7 iterations.				

Scree Plot
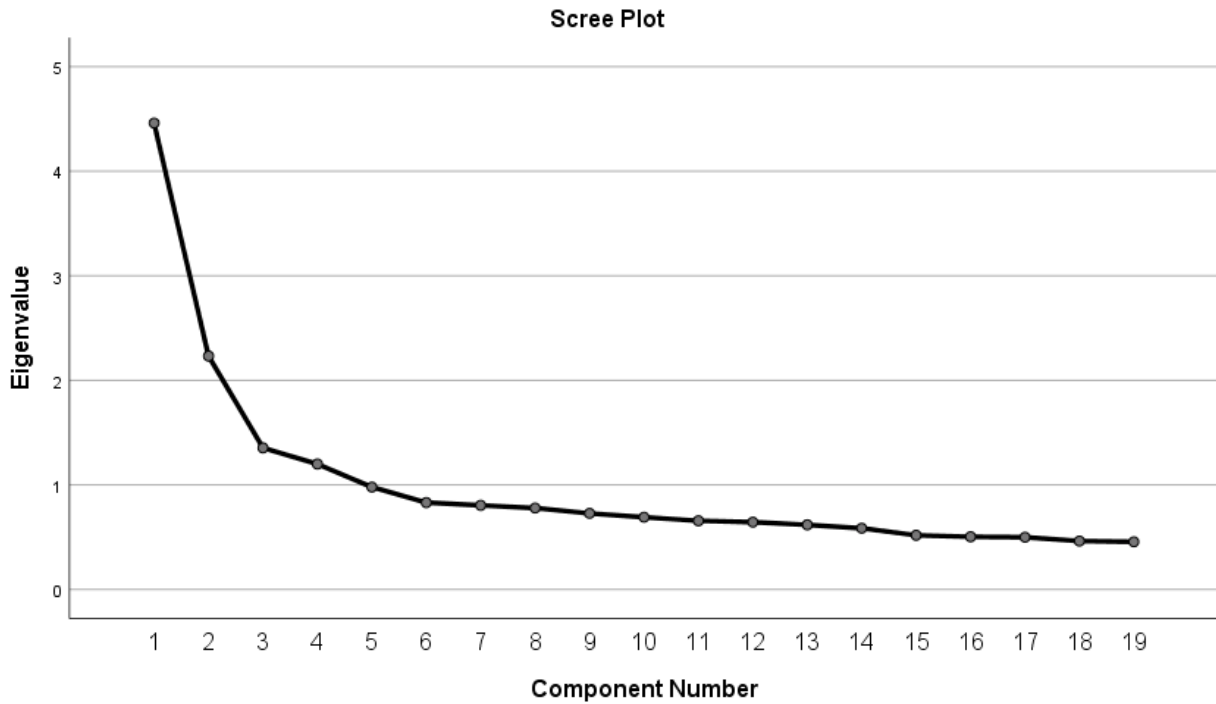
Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.461	23.477	23.477	4.461	23.477	23.477	2.626	13.819	13.819
2	2.232	11.748	35.225	2.232	11.748	35.225	2.576	13.557	27.376
3	1.354	7.127	42.352	1.354	7.127	42.352	2.391	12.583	39.959
4	1.2	6.314	48.665	1.2	6.314	48.665	1.654	8.707	48.665

Aggregating items within each of these four components, we see the following distributions of scores for each:

Simple Histogram of EconSum

Mean = 24.865
Std. Dev. = 5.62374
N = 1,000

Simple Histogram of SocSum

Mean = 27.675
Std. Dev. = 6.54631
N = 1,000

Simple Histogram of NatSum

Mean = 23.598
Std. Dev. = 5.07604
N = 1,000

145

Simple Histogram of TechSum

Mean = 13.715
Std. Dev. = 3.29099
N = 1,000

As we can see, all composite scores are relatively normally distributed, indicating that most people are relative centrists on most axes.

On a scale of 1-7, participants rated their ability to use a computer on average 5.37, with a standard deviation of 1.170. This item was not found to correlate highly with any of the scales, implying the slight skew (assuming reliability of self-reported proficiency) does not significantly affect the result (Pearson Correlation with Components 1 = .101; 2 = .073.; 3 = .098; 4 = .263).

Discussion

The five items representing component 3 constitute a single high reliability scale capturing value for nature. It does so while avoiding some of the pitfalls of 2-MEV by focussing more precisely on intrinsic value considerations, and by resisting the inclusion of instrumental concerns which are not particularly relevant to the description of ideological positions. This scale is orthogonal to both economic and social liberty scales, thus corroborating the suggestion of Curtice and Bryson (2001) that environmentalism ought to be seen as the third political attitude scale.

This alone is an interesting finding, which both supports the endeavour of this thesis and allows us to dispute a common refrain in popular discourse, that attitudes to the environment are a function of left-wing and right-wing. For instance, Roger Scruton (2012) argues that environmentalism is commonly associated with the left, when it should be with the right. In fact, like Bryson and Curtice, we find it is better described as neither. This 5 item scale looks to be a reliable alternative to 2-MEV as a more precise parameter of intrinsic environmental attitudes, and I submit that it is usable for anyone interested in environmental research.

But my hope was to go further than this in showing opposition between intrinsic value for nature and for technology. Two items in component 3 (*"Assuming the benefits...."* and *"There is a 1,000 year old tree..."*) force participants to consider a trade-off between a positive technological outcome and a positive natural one. Here, participants respond reliably in a way consistent with their stated intrinsic value for nature. However, we observe three additional items aiming to isolate intrinsic value of technology, all of which, contra my hypothesis, imply a distinct fourth technological value parameter. For the sake of this chapter I take it as assumed that the theoretical incompatibility between intrinsically valuing nature and technology views is true

(elsewhere in the thesis this position is defended in depth). What else could explain this orthogonality between nature and technology items?

Difficulty Isolating Intrinsic Value for Technology?

I tried, but nevertheless, I may have failed at striking upon the intrinsic realm in particular for the technological items. Human enhancement is rejected on many grounds besides its inherent unnaturalness, for instance, because of the unfair and undeserved advantages it may confer on individuals. The modern industrial society has conferred many kinds of value which, though brought about via technology, are not values *qua* technology. One may think themselves a general 'technology-lover' because they are enamoured with certain specific technologies with an instrumental benefit, like solar panels or spiralizers.

The instrumental concerns are potent and inevitably tangled into peoples' attitudes to these questions. The idea that technological endeavour has intrinsic value has not permeated through society to the same extent as that Nature has intrinsic value (even if not explicitly labelled as such). If this is the case, then we must disregard these items. But on the other hand, the fact that they all cluster reliably indicates they require a common explanation, and I still maintain that the most likely is that they successfully draw out intrinsic value for technology.

Preference Inconsistency?
An alternative explanation for the failure is that, like 2-MEV, my scale is evidence of the British public's lack of awareness of the true conflict between valuing nature and valuing technology. My technology factor is not exactly the same theoretical construct as the 2-MEV's utilisation factor. While 2-MEV asks rather vaguely *"ought we use nature, either because it is instrumental or intrinsically good to?"*, my items try to ask *"ought we see some intrinsic value in technological endeavors?"*. Both however are related, as technological endeavour involves the use, and so un-naturalising, of natural inputs. Despite theoretical differences, it seems that our findings mirror those curious findings of the 2-MEV, (whether that be for instrumental gains in 2-MEV's case, or because of an intrinsic technological value, in mine).

We saw in previous chapters that Nature refers to physical objects or processes not made or modified by humans, while artifact refers to physical objects or processes made or modified by humans. The predominant type of artifact is Technology (defined as intentional, functional artifact). Technology, by virtue of being the largest member of the class 'artifact', is the most common opposite of nature. It is puzzling to me then, that items "*I am a nature-lover"* and *"I am a technology-lover"* should be uncorrelated. Many philosophical accounts of love describe it as a specific and targeted stance towards some particular X, or an identification with some particular X. Martha Nussbaum says *"The choice between one potential love and another can feel, and be, like a choice of a way of life, a decision to dedicate oneself to these values rather than these"* (1990, p. 328) (Helm, 2021). If one is both a nature-lover and a technology-lover simultaneously, they love almost all the physical states of the world. They are not making, in Nussbaum's words, a choice between values. This love is generous to the point of meaninglessness.

Also, people seem not to have negatively correlated answers to, on the one hand, *"Humans should sacrifice material comforts to live more in tune with nature"*, and the question concerning an instance of such a case, sacrificing a tree for a railway line; with on the other hand, *"Humanity is better off living in the modern industrial world than it has been ever before in its 10,000 year history."*. In using the word 'industrial', the latter item goes out of its way to frame

the key change of modernity as being industry. This industrial age is typified by a wealth of material comforts. Nonetheless, the statistics show a significant portion of people who agree with this proposition even when they don't disagree with the former two propositions, and vice versa.

My two continuum items (*wildlife conservation..*, *1,000 year old tree*…) performed consistently with each other and the rest of the nature items. This is some evidence that when confronted with the trade-off, people do comprehend it properly (i.e. they achieve consistency across multiple items purporting to measure the same construct). However, the orthogonality of my three technology items imply that public awareness and understanding is limited.

Preference Inconsistency Across Political Value Measurement?

Preference inconsistency may be particularly rife in the nature/technology domain, but we should zoom out to observe that the other two established axes of political value have been, and continue to be, somewhat misunderstood by the public to varying extents. We could see each political axis is on its own slow journey from academia into public consciousness. The French Revolution motto *"Liberté, Egalité, Fraternité [out la mort]"* has received much attention around the incompatibility of these three political values. But Ozouf (1997) notes that the compatibility was not in doubt at the time. Isiah Berlin's seminal *Two Concepts of Liberty* (1958) wouldn't have amassed the critical acclaim it did if his insight on the incompatibility of different forms of liberty was an obvious pre-theoretical intuition. Even today in majoritarian democratic systems, we still struggle with the prevalence in common parlance of unidimensional left/right wing terminology, which political scientists commonly contend do not yield sufficient explanatory power (Heywood, 2017).

My assumption is that the level of preference consistency on a given political value spectrum is a function of political education. In particular, the extent to which a given individual, or given society, is engaged in debates along the spectrum. The more instances of issues present in public discourse, the more likely it is that the individual or group will recognise common patterns, and seek to abstract away some more general principle. Western politics has focussed heavily on matters of economic distribution for many generations. It is upon this axis that political parties most overtly distinguish themselves. It dominates political discourse and so educates the public. It is likely then, that we ought to see relative consistency on matters of economic distribution, and indeed, we have seen it outperform the other spectrum in many studies (Curtice and Bryson, 2001).

I've made a claim here about the trajectory of preference consistency with respect to political value, namely that it improves with greater education and discourse. But finding robust evidence to support my claim is made difficult by the very practices and objectives of political value surveying. Notice now how the BSA scale items are worded. The left/right items all focus around negative implications of residing on the economic right - exploitative bosses, businesses, and the rich. I am not pointing out the mere fact that the items are unidirectional, but rather that none of the items explicate the positive implications and justifications of the economic right, for instance, invoking the idea that people 'deserve to keep the fruits of their own labour', or 'shouldn't have to pay taxes for expenditure they don't choose', or 'have a right to private property'.

If we are to, on the basis of the BSA scale, identify someone as an economic rightist, then such positive attitudes associated with economic rightism are *imputed* to participants on the basis of

negative responses to left-wing attitudes, rather than the rightist attitudes being directly observed. Similarly on the Libertarian/Authoritarian spectrum, all six items on the scale focus on authoritarian attitudes. Positive attitudes we tend to associate with the libertarian end: gender and racial equality, legalisation of drugs, freedom of expression etc. can sensibly be thought to be held by those who reject the six items, but the scale doesn't show this explicitly.

It is likely to be the case that the few items we see on these scales are a result of a paring down of many scale items. This is generally thought to be good practice for factor analysis (Boateng, 2018). Indeed, a previous iteration of the BSA items, used in the British Election Study, included the following items alongside the items above on censorship and British values: *"Homosexual relations are always wrong; People in Britain should be more tolerant of those who lead unconventional lives"; and as mentioned earlier, "People should be allowed to organise public meetings to protest against the government"*. This was found to have a far lower Cronbach's alpha of 0.50 (Evans and Heath, 1995), implying participants were less able to see conflicts between the overtly libertarian and authoritarian attitudes. These problematic items were subsequently dropped in the later usage of the BSA scale.

Quite by design, the methodology works to eliminate any observation of preference inconsistency by restricting scales to items that force people into consistency. This creates reliable scales, but scales which have only partial and skewed coverage of the richer theoretical constructs that are purportedly measured. One response would be to see this practice as a misleading and unwarranted reduction. Another response is to acknowledge that the truth is more messy than presented in political science, but contend that it is precisely this sort of reduction that allows us to make any meaningful characterisation of a political landscape, and if it is predictively accurate and triangulated with qualitative data and theory, maybe it is good enough.

My high-reliability 5-item scale, predominantly focussed around the Nature end of the theoretical nature/technology spectrum, could be thought of as a partner in crime with these other scales. To the extent that they are considered successful at measuring the full width of their respective political spectrums, we could perhaps also say that mine is too. But this would be cynical. I seek not to hide the inadequacy of my scale in exposing the presence of widespread preference inconsistency. It is rather the case that this inconsistency is an interesting and important secondary finding from this study that I ought to reflect on. And I continue to do so in the next chapter.

Chapter 10 - Policymaker Interviews on Value for Nature and Technology

Introduction

The first half of this thesis advanced philosophical arguments that 1) there is an inherent conflict between valuing nature and valuing technology, and 2) that this ought to be conceived of as a distinct political spectrum. In Chapter 9, I surveyed the general public on intrinsic attitudes to nature and technology alongside other political attitudes. I found strong evidence that these issues are separate in the minds of the public from typical political values of economic and social liberty. However, I did not find strong evidence that intrinsic attitudes to technology and to nature respectively fall along a single spectrum. I argued that the results could be due to a combination of factors, namely:

A) Preference inconsistency, caused by a general lack of awareness or discourse or education on the subjects of nature and technology.
B) Methodological problems, namely the difficulty of capturing intrinsic value sentiments in a survey, when instrumental sentiments are also so strong in relation to the issues at hand.

In this chapter, I hope to gain further empirical insight on a number of fronts. Firstly, addressing A, I am interested in whether educating participants about the nature/technology spectrum can lead them to make more consistent choices.

Secondly, also addressing A, I am interested in studying the attitudes of people who are more familiar with and are influential on decisions pertaining to the topics at hand. I will therefore study UK Government policymakers in relevant policy areas, and whether they are amenable to having their policy areas framed according to the nature/technology spectrum.

Thirdly, addressing B, I am hoping to use a qualitative technique to do a better job of teasing out the rationales people have in responding in particular ways, and whether my attempts to improve upon the 2MEV scale have succeeded in isolating those intrinsic, principled attitudes and less those attitudes tied to practicalities or to other non-nature values-based considerations.

My primary objective is to qualitatively understand policymakers' deliberations when thinking about these topics, and the extent to which these match the philosophical literature. My secondary objective is to show that, once given a short primer on the nature technology spectrum, policymakers are able to give more consistent answers to questions posed in Chapter 9. A third objective is to understand whether the spectrum has applicability in the policy areas of the respondents.

Method

Interviews are a common method in political science, both for primary research and, as is being used here, as supporting research to triangulate with other theoretical or large N empirical methods. The method gives researchers access to the granularity of thought processes and opinions that surveys and other methods lack (Mosley, 2013, p.37). So-called 'elite interviews', in this case, policymaker interviews, are useful for understanding the views of impactful people,

in this case, those supporting political decision-making (Morris, 2009) (Harvey, 2011) (Putnam, 1973) (Aberbach et. al, 1981).

I conducted part-structured and part-semi-structured 15-25min interviews with 26 UK Government officials working on relevant topics. My selection strategy aims to balance relevance, where hand-selecting certain policy officials would be preferable; with the generalisability of findings, where a random sample would be preferable (Mosely, 2013, p.39-40). I purposively sampled from different policy areas and departments of general relevance to nature and technology. Using my access as a UK Government official, I advertised the call for volunteers in a mass email to the Science, Research and Innovation; Nuclear; and Energy and Climate Directorates in the Department for Business, Energy and Industrial Strategy (BEIS), and various teams responsible for aspects of the natural environment in the Department for Environment, Food and Rural Affairs (DEFRA). Participants were therefore self-selecting from a pool of ~100-300 relevant policy officials. Some of these random respondents led to instances of snowball sampling within teams mentioned above, but chain lengths never exceeded three.

Interview
Interviews were either face-to-face or conducted over video conferencing software. All interviews were recorded on a mobile device and later transcribed for coding, or using the recording function in the software. 14 of the interviews start with a scripted introduction (Annex A), in which I give a high-level explanation of the nature technology spectrum, while a randomised control group of 12 were not given the introduction. I randomised this by assigning participants to alternating groups in order of when they scheduled their interview. I tested the introduction for general coherence and iterated it with 3 trial interviews. The aim here is to convey the spectrum idea commonsensically and with minimal information, to replicate a level of understanding that might be expected to be common among ordinary policy officials in a hypothetical world in which the spectrum was widely adopted by academics and filtering into public and political discourse.

There is an interesting methodological question about acquiescence bias here. On the one hand, I want to know what participants truly think about this framing of their work, and I wouldn't want them to simply agree with the ideas posed out of politeness or a sort of vacant suggestibility. However, I am also testing an intervention. I am trying to simulate the effects of greater awareness and education, and show that one can be taught to think about these issues in a certain way, so some acquiescence is not a bias, but rather, the goal. The line I have attempted to draw is to explain the spectrum idea minimally, but being careful not to state this spectrum as fact, or as my own creation, but rather only suggesting that *"some recent political scientists claim"* that this spectrum exists.

In addition, I deliver the primer in a dry and unemotive tone of voice. Provocative questions at the end asking "does this actually apply to you?" invite participants to be critical about the theoretical framing. Also, arguably civil servants are less likely to be naively suggestible, given their job involves policy scrutiny and challenge and a need to unpick and interrogate political

rhetoric. Ultimately, the study design is valid in this respect so long as conclusions are limited to claims about what civil servants think *once primed* and not claims about what they already think.

Other script lines around political values, and the example of an issue crossing multiple spectrums, are designed to make a further attempt at teasing out matters of intrinsic value and guard against too much discussion of irrelevant factors. That said, it is also going to be important to see some discussions of non-intrinsic reasons, and how this weighs against intrinsic reasons in responses - if instrumental reasoning is so strong that it dwarfs any intrinsic or principled considerations, then this would cause me to reassess the salience and explanatory power of my proposed political spectrum.

In part 1, I conduct cognitive interviews using the same questionnaire as in Chapter 9, asking participants to score their agreement with a statement on a 7-point likert scale, then verbally explain their thinking behind their selections. These scores will be analysed quantitatively and using a thematic coding of responses. Due to practical and interviewer time constraints and sensitivity about interviewing civil servants on overtly partisan political matters, I do not ask social and economic liberty scale questions, and therefore cannot run a factor analysis in parallel to the previous chapter. However, I do ask an explicit question on the interplay between spectrums in part 2. For primed respondents, I ask a further semi-structured interview question on the applicability (or lack thereof) of the nature/technology spectrum to the participant's policy area.

Coding Strategy

For Parts 1 and 2, I used NVIVO content analysis software, I coded interview transcriptions and analysed the results in SPSS v.28. For Part 1 (the survey), as I have a strong idea about the theoretical constructs I am looking to identify in participant responses, I conduct a deductive content analysis, based on a predefined codebook.

I am specifically interested in value sentiments in responses. I also assume that theoretically there are essentially only two types of value sentiment, intrinsic and extrinsic (i.e. instrumental) (see chapter 1). Coding these for nature and technology respectively gives me the following 8 categories:

a) IV-N (Intrinsic Value for Nature)
b) EV-N (Extrinsic value for nature)
c) IV-T (Intrinsic value for Technology)
d) IdV-T (Intrinsic disvalue for Technology)
e) EV-T (Extrinsic value for Technology)
f) EdV-T (Extrinsic disvalue for Technology)
g) IdV-N (intrinsic disvalue for nature)
h) EdV-T (Intrinsic disvalue for Nature)

Each survey question response can score either 0 or 1 for expression of each of these categories. I also inductively code on question-specific themes for qualitative analysis. For Part

2, I anticipate a wider range of types and themes in responses, so I inductively code, constructing themes as they emerge from the discussion.

Results

Question-by-Question Analysis

1. I would describe myself as a nature-lover.

Simple Histogram of Q1

Mean = 4.96
Std. Dev. = 1.536
N = 26
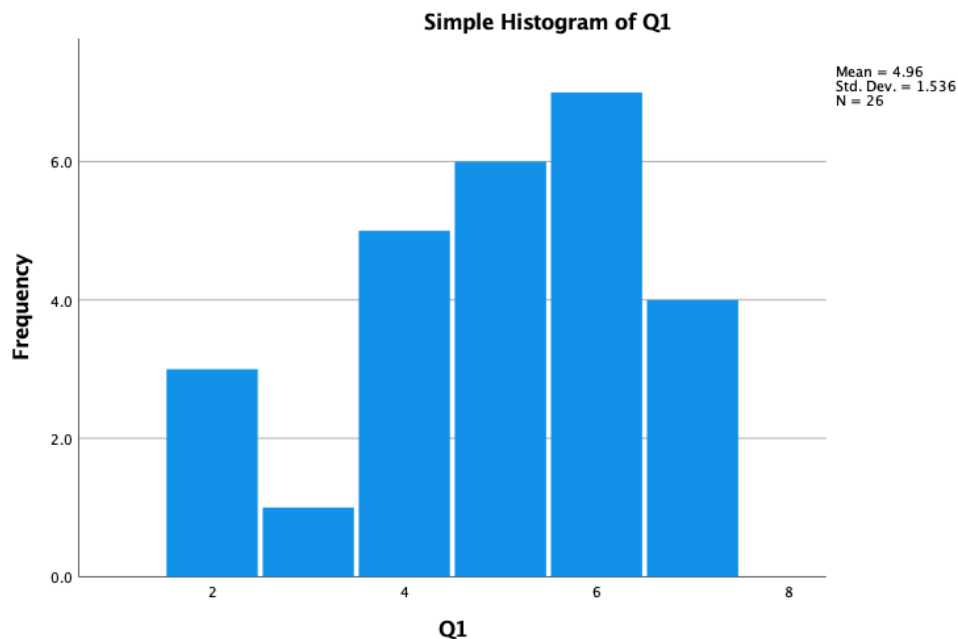
Where respondents cite particular individual benefits of natural objects, e.g. finding it relaxing or good for mental health to go for a walk in the woods, or enjoying the adventure of a mountain hike, then this would be coded as extrinsic value. For instance:

"I genuinely love nature, going into the mountains, seeing lochs and lakes are the most peaceful events in my year. Moment where I feel most calm. But, am I actively engaged in protecting nature? Not really. Do I know the names of the birds and flowers? Not really." p12

Conversely, if there was a more general wash of romantic enthusiasm, or some positive assessment of nature in the round beyond some particular use case, or some reflection of nature as a whole category in contrast with urbanity or technology, then that would be coded as intrinsic value. 14/26 responses I coded as indicating positive intrinsic value, while 14 I coded as indicating positive instrumental value. Where both were indicated, I coded both for the same answer.

The following were examples of intrinsic value responses:

"I've always loved nature since I was little and that led me onto undertaking a degree in marine science and finding out more about nature and how scientific and geological processes work. That has developed that love of nature more." - participant 5

"...because of work that I've done on environmental policy, it just opened my eyes to a whole world around biodiversity and everything like that. So yeah, I'm a big believer in, and lover of, nature." p20

"I live in the countryside and I really enjoy the forest and all the natural parks. I think it is an important aspect of human life and definitely something I care about." p7

"I have appreciated nature more and more as I grew up. I think living in the city for a longer means that it becomes more of a contrast when you leave the city. And so yeah, I see the appeal of it. It has an impact on me. I think when you're used to day-to-day life without it, then to face that contrast to be either the environment of words and technology and people and then to be confronted with something that is much bigger and more beautiful." p14

"I'll say that I think the natural world is a part of our heritage, we were given it from it in the past" p24

The next answer was coded for both, as it is about a personal benefit to being outdoors, but also has a deeper emotional element disconnected from an immediate aesthetic experience:

"I really like being in nature and the outdoors, I kind of value seeing or having access to areas that aren't built up. And feel sad when I hear about extinctions or like large populations of animals, or ecosystems being damaged." p19

And as an example of a more muted intrinsic appreciation:
"I definitely see the value in preserving it, but I don't personally think of myself as a nature lover." p21

On the other hand, those who gave low scores tended to be ambivalent to nature rather than actively hating it.

"In my personal life, i'm a fairly indoors person. I like going for a walk, but not the first thing I think that I really wanna be out in nature. I'd rather be inside reading a book." p2

"Somebody once said "What's your hobby?" And I said urban walking. Nature's OK. The alternative is better." p6


Discussion:

The idea that nature is 'part of our heritage' (p24) is ambiguous. Does 'our' refer to humankind? or to British people? Whoever the referent, what is clear is that to them, nature is something that has a long *history* and continues to be important. In Chapter 2 we define nature as that which has a certain history, namely one untouched by humans. Those who value nature simpliciter, e.g. Robert Elliot, Keekok Lee, and Eric Katz, would consider nature as a type of heritage.

P5 and p20 speak of how their appreciation of nature has grown in tandem with greater knowledge of it. This resonates with Ch2's discussion of Carlson's theory of cognitivism in environmental aesthetics: that one requires knowledge of natural sciences to appreciate nature aesthetically, just as art viewers view art with knowledge of art styles, art history, and social context.

P14 and p19 note the scarcity of nature, and the contrast of rural natural areas with built up areas. This coheres with Ch2's discussion of rarity in nature as a potential value-adding property, and to Ch5's discussion of urban vs. rural living preferences as being principally characterisable as a stance on nature and technology.

2. It is important that people are in touch with the natural environment
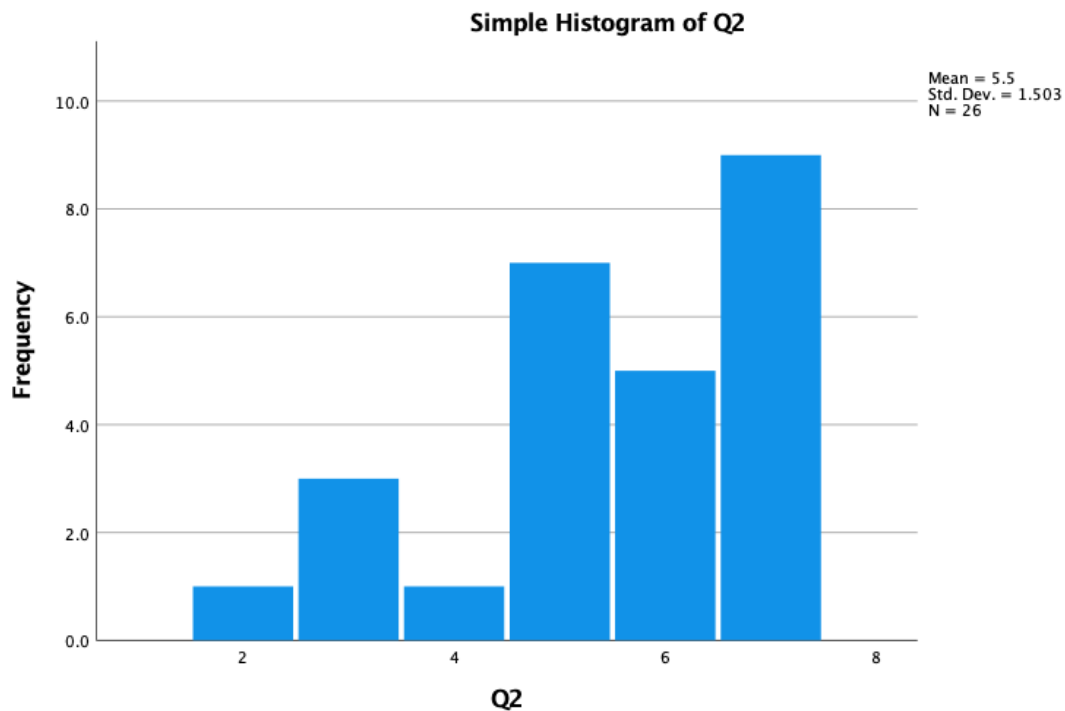
13 participants gave an instrumental justification for people staying in touch with nature, either for personal wellbeing reasons, or because doing so helps people to better understand climate change. For instance:

"For the same reasons I like being outdoors, I think there's a lot to be gained on a personal wellbeing basis for being in touch. There are also benefits to climate from greater understanding." p17

8/26 gave more intrinsic responses, such as:

"I think it is important that people don't just live lives completely wrapped up in technology and do experience nature." p13

"I think there's something about being cut off from nature that I find depressing in a sense. The fact that people wouldn't have an ability to access nature I think is kind of profoundly bad. Even if they may not love it, the idea that it's beyond their reach is something that I would say is bad. I think only being in modified environments all the time is probably strange for humans as a species. I find that quite strange." p11

"I think it's part of human nature to want to be surrounded by the natural world. So yeah, I think it's really, really important." p4

Notably, a few respondents hinted at libertarian notions, distinguishing between the personal prerogative to relinquish material comforts, and the prescriptive ethical imperative that *all* people should do so:

"I guess it depends on if it's important to you, then it's important, but I wouldn't ascribe any "you should be in touch with nature", like it is an obligation for an individual to do. It's up to them how much they like to go out in nature." p8

"This is challenging. It comes down to individual liberty. These are things that are going to be beneficial for humans and nature, but being dictated to people, that tension between requirements placed on people vs. need to give people the right to make their own decisions." p12

"So for me, I think it is really important and I think that people can benefit a lot by spending time outside. Like I know that they're documented science about how sort of spending time within nature makes people feel better, feel healthier, all of that. But I appreciate that not everybody is quite so believing of it. So that's why there's a slight sort of downgrade on the number. But for me it is, you know, really important." p20

Discussion:
Positive responders were generally not particularly articulate about *why* it is important to be in touch, but just repeatedly and adamantly asserted that it is. As discussed in Chapter 2 and 4, this is common for intrinsic value sentiments - that which is good 'just is' without needing further explanation.

In Ch5 we discussed the 'Appeal to Nature' fallacy, and whether it is indeed a fallacy or simply an ignored implied premise that nature is intrinsically valuable. Here we have a case in point: p4 invokes the idea that it is part of human nature to be surrounded by the natural world. Are they giving an *explanation* of why being surrounded by the natural world is good? And so have committed a fallacy? Or, are they implicitly relying on a premise that naturalness is valuable, and therefore making a sound argument?

Also for this question, other political values interfered with a pure signal on a nature/technology value spectrum. In what I'm calling the expressions of 'libertarianism' above, I am not sure whether those voicing these opinions would identify themselves as such. These people might not include 'being in touch with nature' as a *political* matter, and so not the subject of political liberty *per se*, but more just an exercise of personal preference, akin to asking someone their favourite ice cream flavour.

However, as argued throughout this thesis, decisions about nature are very much political and not personal. They require social coordination, policy, and public investment. If one intrinsically values nature, they should want others to do so as well to ensure it is protected. Unless of course, even after reflection, they are still a genuinely staunch libertarian, and this trumps their environmental politics.

3. *Humans should sacrifice material comforts to live more in tune with nature.*

Simple Histogram of Q3

Mean = 4.15
Std. Dev. = 1.567
N = 26
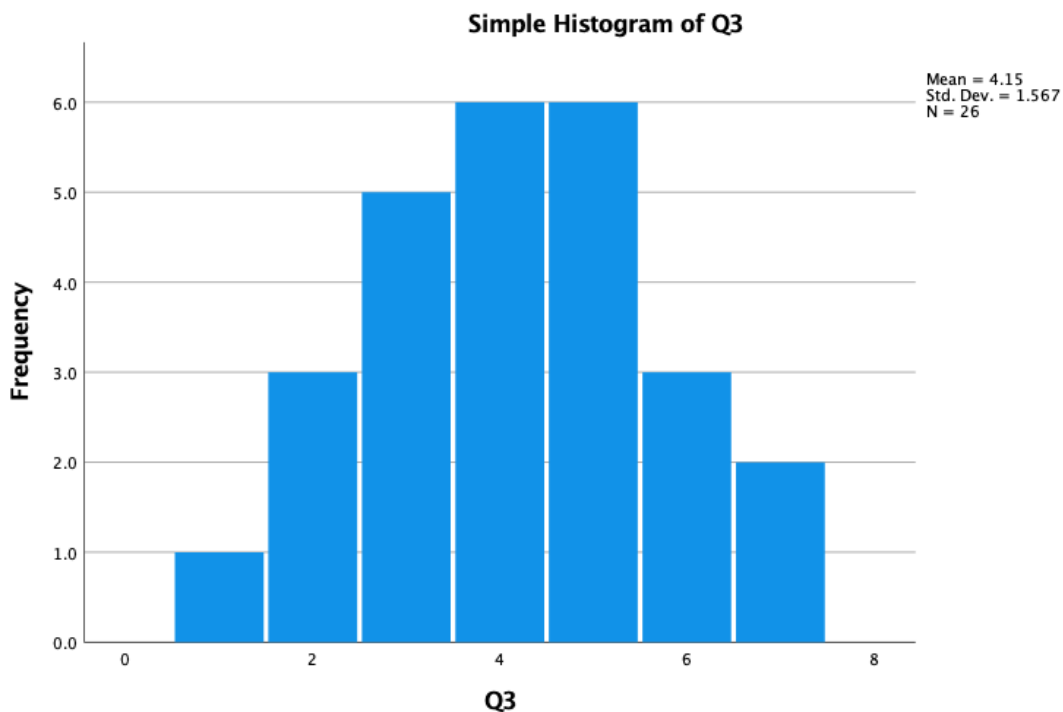
Respondents generally thought that there was a limit to how much humans could realistically be expected to sacrifice. There were only 4 responses coded as intrinsic, but of them, appetite for material reduction was only muted:

"I think the world is bigger than our own individual needs and our own individuality and so I think that we should be capable of sacrificing some of our own comforts for the benefit of nature. But I appreciate that there's a certain base level of human needs and comfort." p20

"Life should be comfortable. But if you, if you escape it too much, then you might be disconnected from the reality of the world. Kids should be allowed to play in the park and get bruises. That's fine. That's how you grew up. That's how you learn. Like, if we try if we disconnected ourselves so much and you know, created clothes, that meant that kids can never get a scratch. I think we'd lose something there." p24

This question also had an instance of interplay with another political axis. I interpreted this as an intrinsic valuation for nature as the respondent sees a benefit to 'the planet itself' as desirable, but it also notably associated material comforts with capitalism:

"Overconsumption and gluttony are drivers of the capitalist system. We've overindulged and to access and to the detriment of our planet, so yeah, I think that definitely I would be prepared to sacrifice human comforts, but for some tangible benefit in terms of carbon emissions or benefit to the planet itself." p25

Discussion:

There was less support for this question compared with similarly unidirectional pro-nature items Q1 and Q2. I find this unsurprising. For Q1 and 2, talk is cheap. Here, the participant is asked to sacrifice something they value for nature's sake.

P25, the anti-capitalist, found it difficult to decouple technology from socio-economic matters. They saw our technological comforts as indulgence, and indulgence as a vice of the rich. As argued in chapter 5, I do not think this coupling is valid. Technology positions are orthogonal to questions of wealth distribution. We can envisage all sorts of utopias involving varying quantities of economic liberty and technology.

4. ***Assuming the benefits to humans are equal, taxpayers' money would be better spent on wildlife conservation than on funding new feats of technology.***

Simple Histogram of Q4

Mean = 3.77
Std. Dev. = 1.531
N = 26
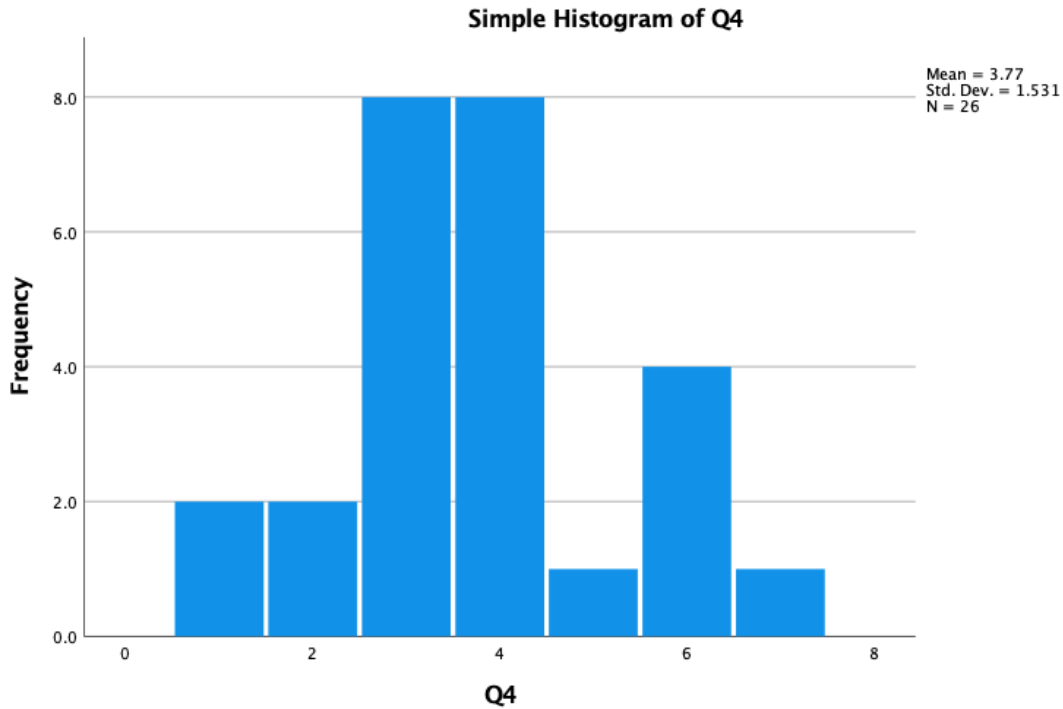
This question caused some confusion. 13/26 I coded as having difficulty seeing wildlife conservation and funding technology in trade-off, pointing out that technology can often be instrumental to wildlife preservation:

"There is a case for investment in both. Tech advancements can have indirect benefits to wildlife." p12

On 2 occasions, the questions did grasp the question as intended, the first invokes the attachment to the history of nature. The second finds nothing intrinsically worthy about technological pursuits:

"I think that it's important to preserve the natural environment because it's been there for a long time and you can very quickly eliminate it. So there's something kind of short sighted about destroying it." p11

"If you can genuinely find that the benefits to humans are completely equal, then I don't see why we should be inventing new technologies for the sake of it." p21

Discussion:
This question was my most explicit attempt to force participants to compare the intrinsic value of nature and technology, by suggesting, roughly, that the instrumental benefits were equal. But this also served to show the limitations of attempting to invoke precise philosophical constructs in laypeople with a short sentence of natural language. The idea was generally lost on people that the benefits to humans of each option could be equal, and yet, there still remained something at stake, something of value.

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5. *There is a 1,000-year-old tree in a nearby woodland. A company threatens to tear it down to make way for an important railway line. Building around the tree would come at large cost to the taxpayer. Despite the cost, I would support a campaign to protect the tree.*

Simple Histogram of Q5

Mean = 4.38
Std. Dev. = 1.835
N = 26
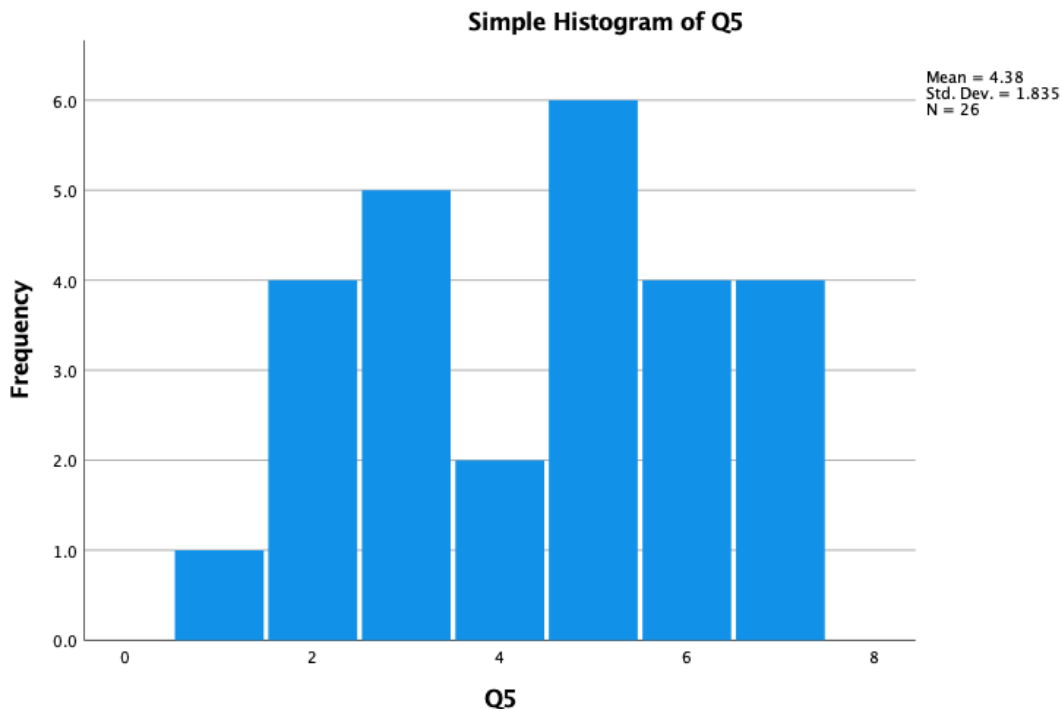
This question was generally well comprehended, drawing out 9 positive intrinsic value sentiments, and other instances where people ruled in favour of the trainline but seemed to grasp that the choice was non-obvious.

One common notion, which I coded as intrinsic value, was the idea of the tree having a historical importance:

"the tree is of public interest and should be considered a natural legacy or conservation site" p7

"That feeds to legacy, tradition, protecting what's come before. Over-and-above decisionmaking in vogue at the time." p12

"If you've got a venerable old oak tree, that's a kind of touchpoint of the landscape and terrain and the longevity, it kind of feels like it has value." p17

"this is about heritage. It's something that's 1000 years old. It's been left there by 10 or 30 generations of humans. We've decided to leave it there. I would presume that there's some cultural significance and we would lose something by cutting that down" p24

"You know, that has seen a substantial amount of historical change in the time and it almost sort of takes us back to our roots a little bit, right - no pun intended. I just think that that's something that should be cherished and protected, and it's probably not necessarily an economic or logical argument, but I think that's where, like, just the good instinctive, that's something that we should do regardless of the increased cost." p20

This idea of a self-confessed emotional or illogical response came out elsewhere too, and where it did, I coded it as intrinsic value:

"You just described it in quite a sort of romantic way, so I think there's not necessarily a kind of rational reason behind this, but I think something that's existed for that long just instinctively feels kind of…that it's hard to put a value on it. I just instinctively thought it would seem like a very negative thing if something that had been around for that long were to end up being destroyed." p23

*"we've already created an enormous amount of disruption to our natural habitats.
So it is purely an irrational, I suppose, desire to kind of quell that where we can." p25*

Meanwhile, for other respondents, the value of the tree was not lost on them, but it did not override a more rational 'cost-benefit analysis' approach to deducing an answer, leading them to score low:

"On principle, I'm pretty caught by that one. I see the pros and cons, and want to know the specific details. Is this tree really special? Is the trainline useful? If it was a uniquely old tree, I would go stronger. Maybe I do have a slightly romantic side to nature."p1

Discussion:
This question worked particularly well on policymakers, who observed that rail travel often yields a climate benefit, and so the question distinguishes a value judgement about a natural object from broader climate change issues, which was harder to achieve elsewhere in the survey. As noted for question 1, the notion of heritage and historical importance chimes with Chapter 2. Also here we have expressions of a romantic or 'irrational' attachment to nature. This chimes with the linkage of environmentalism to the Romantic movement in chapter 8 (as well as the deep ecologists of chapters 1 and 2).

Meanwhile, those scoring lowly didn't let this sentimental attachment override what seems to be a clear utilitarian benefit of building the railway. The use of cost-benefit-analysis is commonplace in government economic impact assessments, and as outlined in Ch1, this approach to the problem is criticised as reductionistic by deep ecologists. They argue that a cost-benefit model implies nothing is sacred. The mere willingness to bargain away the value of a tree for some economic utility gains is problematic.

6. ***I would describe myself as a technology-lover.***

Simple Histogram of Q6

Mean = 4.92
Std. Dev. = 1.623
N = 26
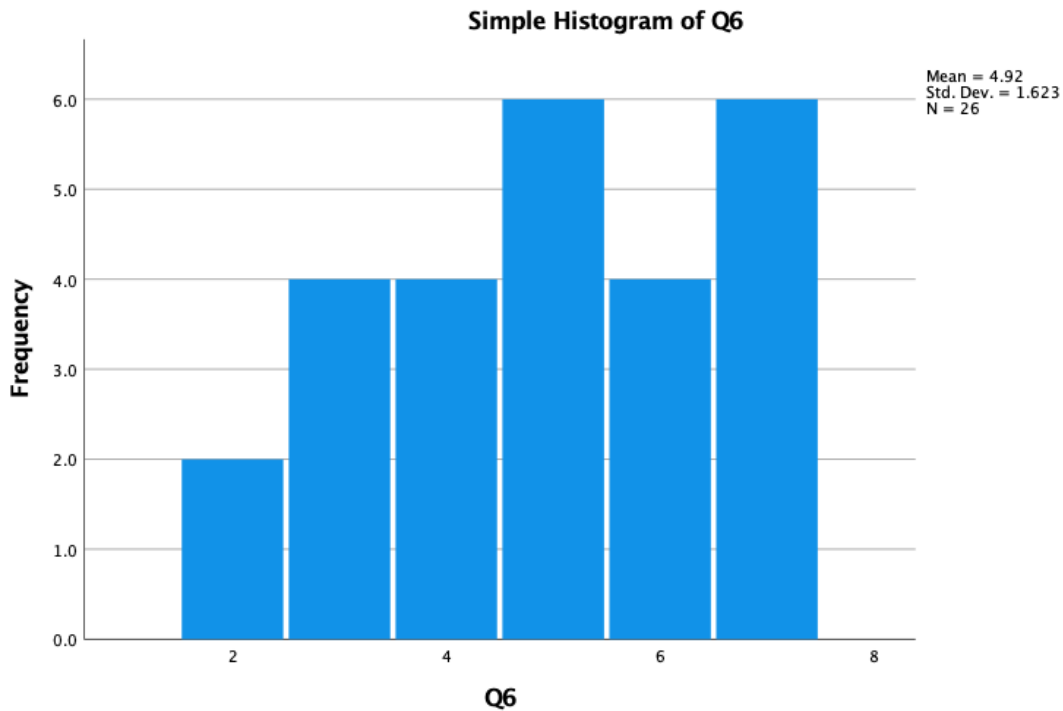
Mirroring Q1, this question received many instrumental responses, listing particular technologies and their benefits. But 9 respondents indicated a more general wash of enthusiasm, which I interpreted as intrinsic value for technology, for instance:

"I have a naive belief in technological progress" p1

"I would definitely consider myself to be a technology maniac" p7

"I'm interested in how technology changes, how it works, etc." p20

"I like things moving ahead at pace. I think really exciting things are happening. I sort of think we should be trying to push ahead all the time." p11

"I'm surrounded by tech constantly in my life. I probably couldn't function as a human being if I didn't have any of the devices that I currently use, and I'm also very optimistic about all the great gadgets and gizmos I'll get to use in the future. And then on a wider level, as an economist, it's hard to see how you can't have economic growth in the future without technological improvements at some point and a country which has economic growth benefits not just from material gain, but also if people can see that their lives and the future will get better and to their children, there's a much greater buy-in and you're much less willing to destabilize social and political institutions, which I value greatly. That's almost a bedrock of civilization." p8

Meanwhile, a typical ambivalent response was as follows:

"I'm not sort of an early adopter of most things, not so interested in all that's going on in the tech world and what the latest new releases will be and how it will work." p19

Few negative responses were as thoughtful as this:
"Yeah, it's not something I kind of seek out, reading about technology or obsessing about particular products. I think a lot of the technology that we interact with is not that exciting or stimulating in a way and it's more used to kind of narrow some of your outlook. So I'm a bit cynical about the application of technology and people's lives." p23

Discussion:

Respondents, and particularly the more ambivalent ones, tended to have a quite narrow conception of what is considered technology, interpreting it as a matter of interest in the latest gizmos and gadgets. This contrasts with my definition of technology as 'intentional functional artifact', which encompasses a large portion of the physical stuff and processes around us. This could indicate that in thinking about technology's value, people take for granted the vast array of technology that already exists, focussing their attention merely on the cutting edge. Perhaps a more holistic conception would lead to greater appreciation?

It is also interesting to compare responses to this with Q1 ('...nature lover'). There was a moderate negative correlation between the two (spearman's rho correlation coefficient -0.331). An explanation for why this wasn't stronger could be, again, that answers were positively skewed because 'talk is cheap'. These questions do not force a choice.

7. I think we should develop technology to enhance human bodies and minds.

Simple Histogram of Q7

Mean = 4.19
Std. Dev. = 2.079
N = 26

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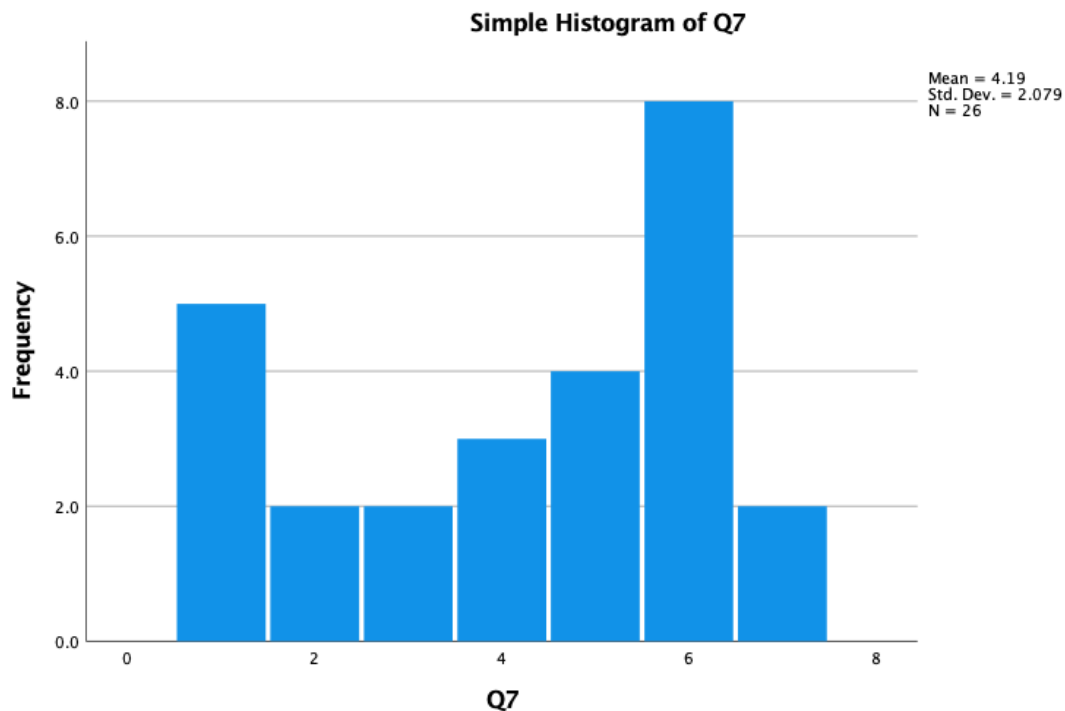
This was the most polarising item, the only one with a standard deviation above 2 scale points. Though participants raised many instrumental benefits (e.g. medical) and disbenefits (e.g. inequality increasing if the technology was not uniformly distributed), the item did draw out many principled reactions. I coded 7 positive intrinsic responses. For instance:

"Ohh cyborgs. Umm yeah 6. I see no ethical problems whatsoever with that. Bodies and minds need an awful lot of help." p9

"Well, transhumanism type stuff could be very cool and I don't have an immediate negative reaction" p19

"supportive in principle, with concerns about the implementation. I don't see any issue with changing minds and bodies in and of itself" p2

"I don't see anything wrong in principle with doing that. But I think most often what people are scared of and what the most obvious threat is driven not by the capabilities of technology itself, but the ends that it's put towards. And so it is society that's neglecting loads of things for the sake of exponential enhancement for a small number of people or to egotistical ends. Then that undermines the capabilities of the technology." p14

Meanwhile, there were 8 potent negative intrinsic reactions:

"we've gone through evolution over millions of years, to become the form that we're in and. I think sort of using technology to modify it runs a risk of unsettling the balance between nature and mankind." p20

"And I think it's a bit fundamentalist, but there's kind of a reason why we've evolved the way we've evolved and I don't think it's really our place to start messing with that." p23

"I think we can develop that technology into machines as opposed to the human mind. And this is preferable because it is altering an object as opposed to a human body. There are potentially human rights elements. I think it would change how we currently look at human rights and the human body, and I'm not sure that would be a good idea." p5

"That scares me. I've seen [the Will Smith film] *I, Robot too many times"* p15

"I just find that invasive and abusive and I would never want that in me, and find it weird that others would want that in them. I find it icky and dystopian." p12

"No, that's got a horrible yuck factor. Implants and things like that I find a bit weird. You know, we've had millions of years of evolution to make us. We are what we are, it doesn't all work all the time, and eventually we die. But sort of saying we're all gonna download our brains in the next singularity, and, you know, wander around some nonexistent metaverse instead of having

ordinary human lives, I don't see that as progress adding to the human condition. It's diverting from the human condition." p6

Discussion:

This question was my attempt to provoke even those *prima facie* advocates of technology with a controversial practice. Among responses I coded as positive, many seemed to answer as if rebutting a presumption of negativity about human enhancement e.g. *"I don't see anything wrong in principle with doing that"* p14. Nevertheless, when taken in context of the whole answer and assessing respondents' tone and scoring, I found these phrasings of these responses were enthusiastic enough to code positively, rather than just 'not negatively'. Perhaps this presumed negativity is because it is an idea commonly denigrated in popular culture, such as in films like I, Robot as mentioned by p15.

Among intrinsic negative responses, some spoke of the preservation of humanity's evolutionary trajectory, evoking discussion from George Annas and Francis Fukuyama in Ch7 that we should preserve humanness. Meanwhile, others demonstrated, and in one case explicitly name-checked, the notion of an inarticulable 'yuck factor', as described in Leon Kass's 'wisdom of repugnance' (also Ch7).

P14 gives an articulation of Groll and Lott's 'inert view', which sees human nature as neither normatively good or bad. Meanwhile, some other responses fell victim to the slippery slope logic discussed in chapters 4 and 8, suggesting that as we already do some (e.g. medical) intervention, that means we shouldn't rule out any type of enhancement.

8. ***Humanity is better off living in the modern industrial world than it has been ever before in its 10,000 year history.***

Simple Histogram of Q8

Mean = 5.62
Std. Dev. = 1.499
N = 26
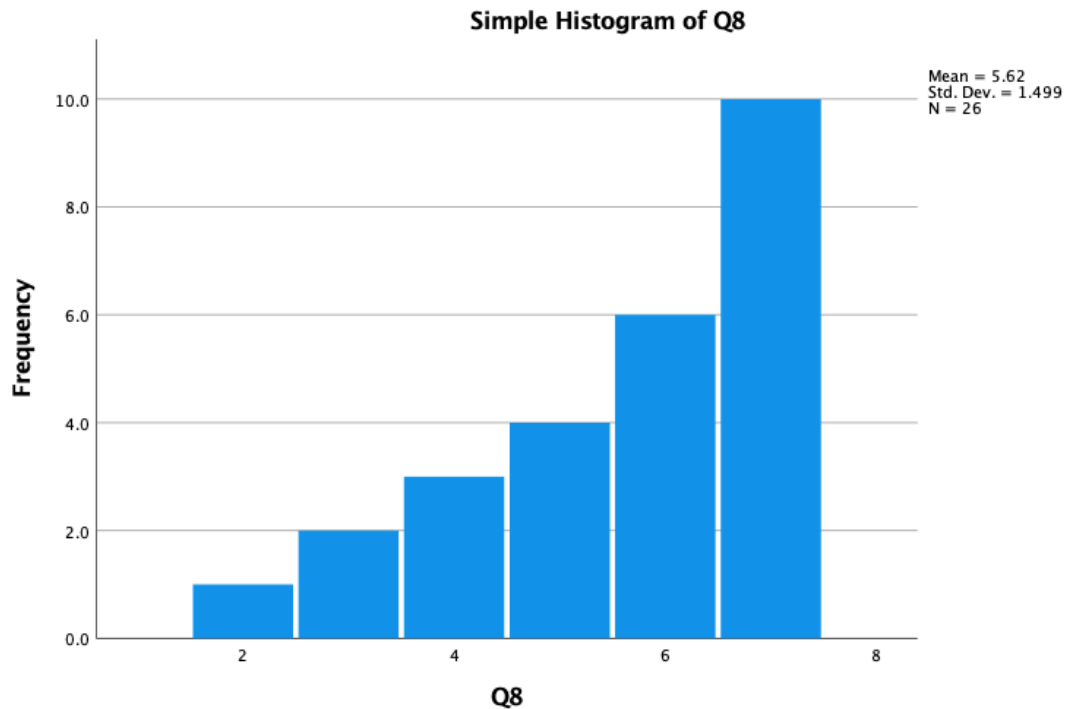
This question generally struggled to isolate intrinsic value, only doing so on three occasions. This positive answer was very typical:

"You look at the kind of statistics, breakthroughs in healthcare and the geopolitical stability that has been brought through economic progress has made a massive difference in thousands and, well, millions of peoples lives and have drawn them out of poverty, have allowed them to live longer." p23

Meanwhile, a minority thought we genuinely were not living in the best of times:

"I don't think we're at a present moment of triumph per se. I think you're seeing that with a sort of increasing evidence of the climate crisis, the sort of breakdown of capitalist systems, mass inequality. I'm going to say a four because as much as all of those sort of emerging trends are really negative and we have seen the breakdown of our planet." p25

Discussion:
My intention was to evoke a sense of an intrinsic (dis)value for the broad process of industrialisation/modernisation, which comprises instances of technological progress, as described in chapters 3, 4 and 8. I thought in the context of the survey, this would be possible to extract. But in practice, the broadness of the question meant it also admitted many instrumental responses about particular modern comforts.

More noise was added by respondents raising other less relevant but nevertheless important phenomena that also account for our differing standard of wellbeing, such as changes in the rule

of law, politics, and social attitudes over the time period. This again shows a difficulty in extracting sentiments about technology and nature from their socio-economic context.

General questions:

Participants were asked to broadly reflect on the issues of the survey with the following question:

> 9. *In your experience, do you think that attitudes on nature and technology issues align with the political left and right respectively? Or are they separate?*

In keeping with the results of the public survey factor analysis, 23/26 policymakers said that the nature and technology issues are not easily reducible to matters of left and right. Many of these answered by giving examples of groups on the left and right that endorse nature and technology respectively, (for instance, climate activists and green parties are more socialist; but on the other hand, there are rural conservationist conservatives).

Only 2 said that left was more definitively linked to nature and right to technology, while 1 said it had been the case in the past that nature was left and technology was right, but this has changed in recent years with the right's pro-climate stances.

A disclaimer on this question is that civil servants, with their political neutrality and commitment to serving the government of the day, may have hid their true feelings about whether particular political parties in fact truly and deeply support certain natural or technological goals. Participants noted government commitments around climate change and around investment in R&D as evidence that the governing party (incumbent or historically) does value these things, and bound by the Civil Service code, they may have felt unable to call out these commitments as unsatisfactory.

Primed participants were also asked:

> 10. *Can you recognise the applicability of the nature and technology value spectrum in discussions you have had with your stakeholders, colleagues and or ministers? [Prompt: or in broader political debates around your policy area?]*

Here, 9/14 said the spectrum was inapplicable to their work area and the majority of these said they saw nature and technology as united as technology is an instrument to solving climate change:

"No, I think it's a bad idea. I I don't think they ought to be in conflict. I think they can work together." p6

"No. I think you can perfectly easily value both of them at the same time and if anything, it often helps to value both. And people who are big fans of fighting climate change will often recognize

that technology advancements are a very big deal. And in terms of valuing technology, I just see no reason why you can do both at the same time. And I've never had a discussion where somebody said 'we should pay for this technology advancement, which in some way damages a bit of nature' that trade off I have never seen happen. Often, usually it's 'this technology will help a bit of nature'." p8

"I'm not sure that it is something I necessarily strongly recognize, and particularly from my work, I was working on a trade deal and we were seeing lot of the future pathways to Net Zero by 2050 rely on developing some currently nascent technology and ultimately there I think you're trying to achieve environmental and climate related positive outcomes whilst pushing clean and green technology." p20

The remaining 5/14 were more amenable to the spectrum in some way, for instance:

"I would expect those value-clashes to come either at the very top level e.g. cabinet minister level where people may be trading off funding. But it may also happen at the local level in the case of the 1000 year old tree, i'm sure plenty of things come up like that. I do recognise it more widely though." p2

"An example of when I think nature comes against technology is in nuclear debates. Nuclear power is a modern technology and it has risks to local nature, like the radiation poisoning waste all these sort of worries and there's loads of lobbying groups. And perhaps I call it misconception at times, but people are willing to give up technology, or like power generation, to preserve the local environment" p16

"Yes. So my team is very pro technology, and there is very little consideration of the natural world in it. And so if you were to use that scale, then you'll be all the way to the technology side." p24

Overarching Analysis

The statistical techniques used with last chapter's large N, multi-construct survey are inappropriate here. Cronbach's alpha cannot be used as variables are in most cases not normally distributed, as shown by the red-highlighted items on the Shapiro-Wilk test of normality in figure 1, and the sample size is too low for the Central Limit Theorem to apply. I cannot use factor analysis either as I did not survey participants on social and economic questions.

Figure 1 - Shapiro-Wilk Test of Normality

	Statistic	df	Sig.
Q1	.907	26	.023
Q2	.858	26	.002
Q3	.961	26	.407

Q4	.929	26	.073
Q5	.926	26	.062
Q6	.915	26	.034
Q7	.870	26	.004
Q8	.847	26	.001

* This is a lower bound of the true significance.
a Lilliefors Significance Correction

Nevertheless, it is possible to make some crude characterisations of the survey response data. Figure 2 plots total nature scores (items 1-5) against total technology scores (items 6-8). Aggregating these items is justified by Chapter 9's findings that they do each share an underlying construct. Working with these raw scores, I find a very weak negative relationship: a spearman's rho correlation coefficient of -0.142 (r-squared of 0.03). These statistics are consistent with the survey results in finding no strong relationship between the nature and technology construct.

**Figure 2: Sum Nature Items (1-5) vs. Technology Items (6-8) - Raw Scores**
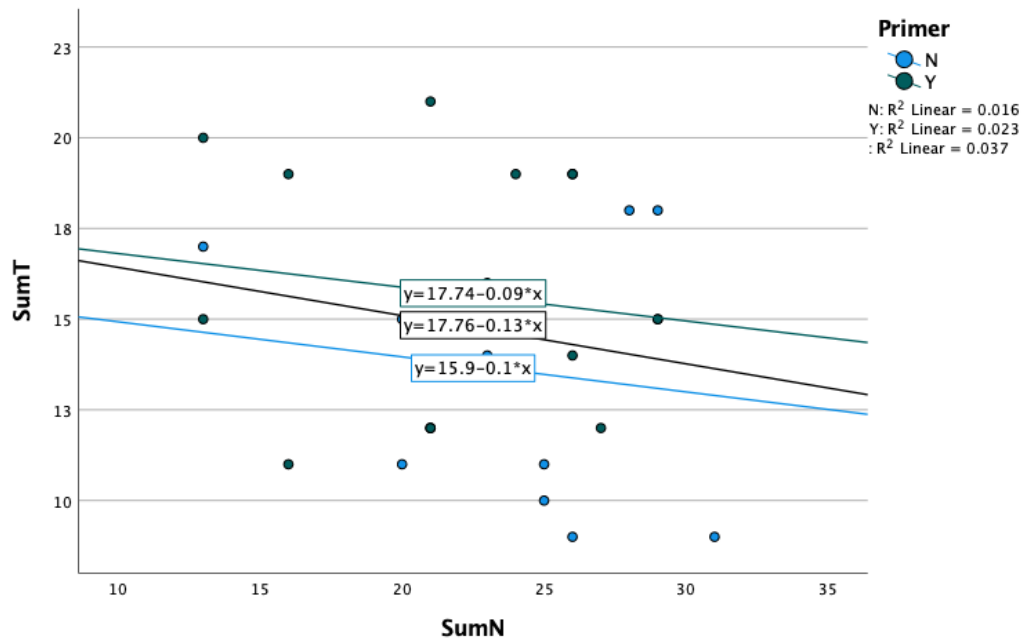
However, our qualitative coding adds more to the story. As hypothesised, reasons given by respondents did tend to identify extrinsic (instrumental) value for nature and technology as well as intrinsic values. Of a total of 208 applicable question responses, only 65 contained an intrinsic (dis)value sentiment.

Within this, some questions were better than others in teasing out intrinsic responses, as shown by Figure 3. Only two questions scored for intrinsic disvalue. The explanation here might be different for each question, but broadly speaking, with all questions framed positively, none

invited a strong negative reaction. The one major exception to this was the human enhancement question which, as mentioned above, is commonly thought to be a controversial practice.

Figure 3 - No. of Intrinsic Value and Disvalue Sentiments by Question
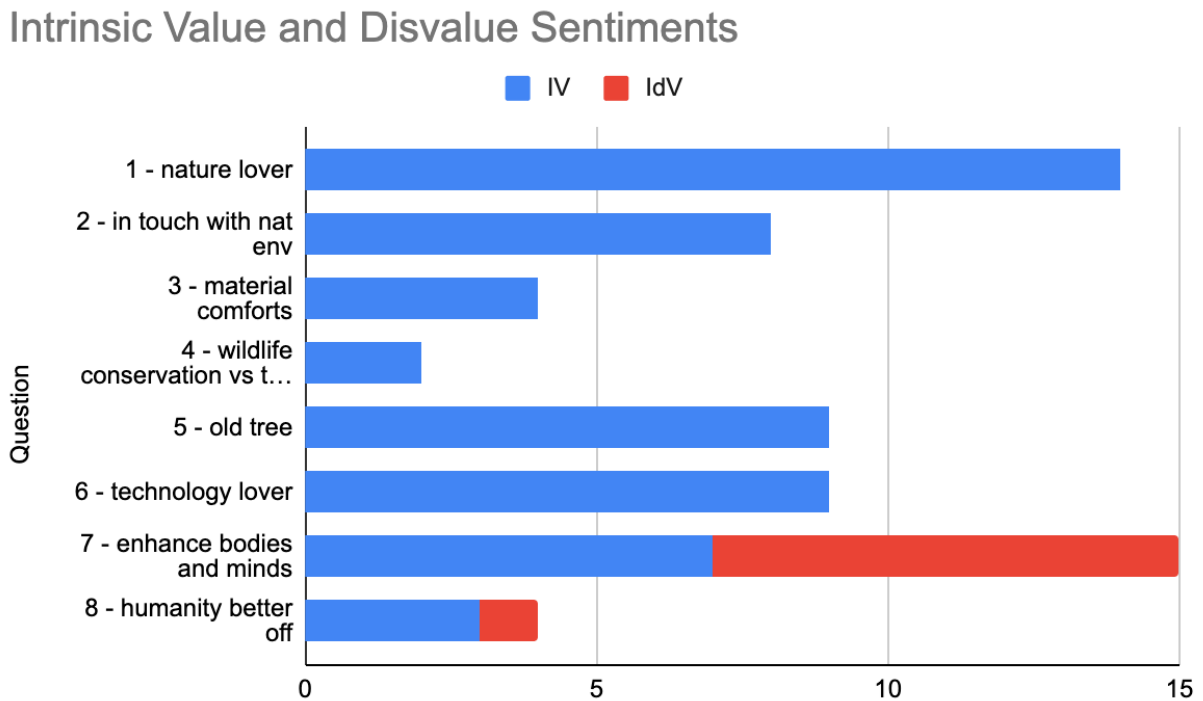

I created a new 'cleaned' dataset, preserving raw scores only where responses given involved an intrinsic value sentiment, and otherwise set answers to null.[9] When doing so, I find stronger negative correlations in keeping with my theory.

Figure 4 plots a total intrinsic value adjusted pro-nature score against the equivalent technology score, for all respondents. The graph shows that in many cases, participants only expressed intrinsic value sentiments for one or the other. Now we see a strong negative correlation, with a Spearman's rho of -0.530 (statistically significant at the 0.01 level), and an r-squared of 0.32.[10]

Figure 4: Sum Nature Items (1-5) vs. Technology Items (6-8) - Intrinsic Value Scores

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[9] Note, while I did code them and did consider them in the question-by-question analysis, creating a new dataset with instances of intrinsic *disvalue* in the same way was not fruitful, as the negative sentiments were too infrequent (in nature's case, non-existent).

[10] For the behavioural sciences, an r-squared of 0.3 is considered a 'medium effect size'. As Cohen notes, "*many of the correlation coefficients encountered in behavioural science are of this order of magnitude, and, indeed, this degree of relationship would be perceptible to the naked eye of a reasonably sensitive observer*" (Cohen, 1988, p.80).
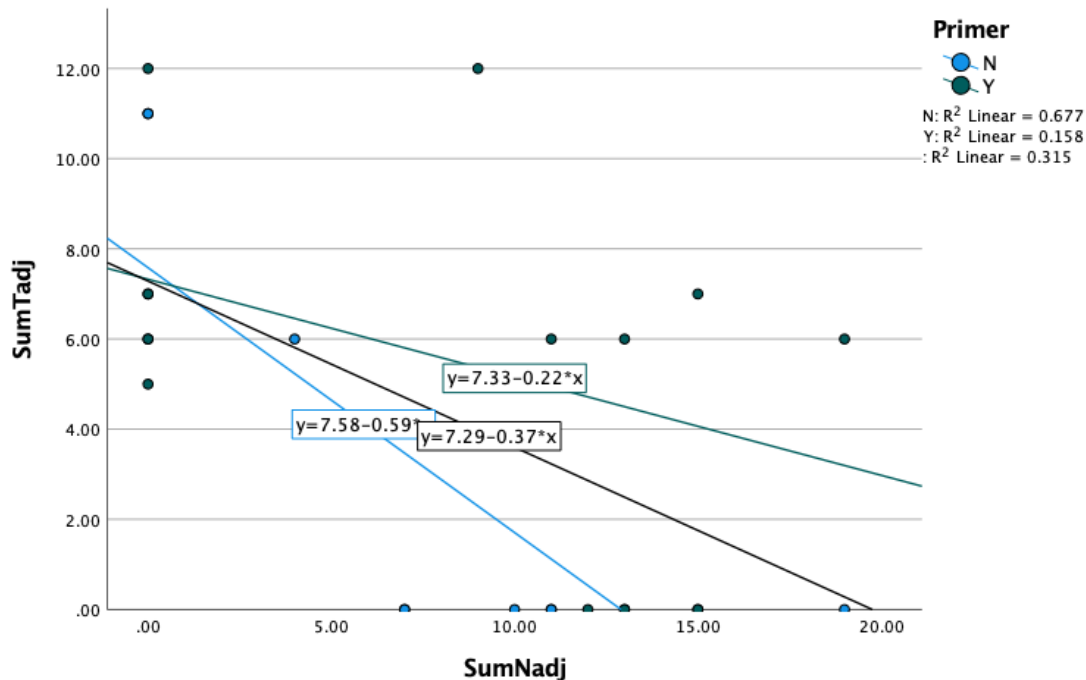
Returning back to figure 2, it is clear the primer did little to influence the correlation of raw scores (spearman's rho=-0.41 with no primer and -0.142 with primer). Meanwhile, as seen in figure 4, when isolating intrinsic value sentiments, the primer actually made things worse! Without the primer, respondents gave incredibly strongly negatively correlated intrinsic value sentiments (spearman's rho = -0.828 , r-squared = 0.677). With the primer, they were less able to see a tradeoff (rho = 0.367, r-squared 0.158). Note that this sample size is too small for reliable use of Spearman's rho, so figures should only be taken as illustrative.

Group Comparisons:

Policy Area
I split the data into two groups by policy area. 'Sci' included all officials working in policy areas involving science, technology, innovation, and research and development. 'Env' included those working on climate change / 'Net Zero', nuclear, natural environment and land/sea management, and environmental aid.

Figure 5 shows the mean scores for each group for summed nature and technology items both for the raw data, and for isolated intrinsic value sentiments. Each group expressed higher value for their 'side' of the debate. This was unsurprising given these officials had chosen to forge careers promoting technology or nature respectively. Consider again p5 and p20, who were explicit about their valuation being linked to a career choice: *"I've always loved nature since I was little and that led me onto undertaking a degree in marine science…"; "…because of work*

that I've done on environmental policy, it just opened my eyes to a whole world around biodiversity".

Figure 5 - Group Statistics - Policy Areas

	Area	N	Mean	Std. Deviation	Std. Error Mean
SumN	Sci	16	22	5.416	1.354
	Env	10	24	4.989	1.578
SumT	Sci	16	16.06	3.214	0.803
	Env	10	12.6	3.34	1.056
SumNadj	Sci	16	6.38	6.323	1.581
	Env	10	10.8	6.015	1.902
SumTadj	Sci	16	5.19	4.694	1.173
	Env	10	2.9	3.143	0.994

Departments

Figure 6 shows similar trends. Defra, whose participants all worked in natural environment policy areas, showed a strong love of nature and rejection of technology relative to BEIS. Such is the nature of BEIS that it covers science and technology, along with net zero policies. We see a larger variance in BEIS views consistently across the categories.

Figure 6 - Group Statistics - Department

	Department	N	Mean	Std. Deviation	Std. Error Mean
SumN	BEIS	21	22	5.273	1.151
	Defra	5	26	4.123	1.844
SumT	BEIS	21	15.19	3.763	0.821
	Defra	5	12.8	2.387	1.068
SumNadj	BEIS	21	7.1	6.572	1.434
	Defra	5	12.2	4.382	1.96
SumTadj	BEIS	21	4.48	4.501	0.982
	Defra	5	3.6	3.286	1.47

Overarching Discussion:

When isolating intrinsic value sentiments in the data, this study has shown promising evidence that policymakers tend to think in a manner consistent with the main theoretical assertion of this thesis: that the intrinsic value for nature and technology are at odds. Despite this positive headline result, the study faced key challenges:

Priming
Curiously, participants were *less* able to answer consistently when taught about the spectrum using the primer in the cleaned data set. On figure 4's upper right hand side, we can see a group of primed participants who scored relatively high on both nature and technology intrinsic value. Perhaps, on reflection, the primer created a sort of double-edged acquiescence bias among this group. In giving a positive description to both sides of the argument, the primer roused support for both and effectively created centrist participants who could see both sides. The same respondents pre-priming might have intuited one and not the other.

This explanation is given some support by comparing mean scores between primed and unprimed participants. Means for Nature items and Intrinsic Nature items remained stable but for tech items, means grew by an average of over 2 scale points.

Figure 7 - Group Statistics - Primer

	Primer	N	Mean	Std. Deviation	Std. Error Mean
SumN	N	12	23.92	4.889	1.411
	Y	14	21.79	5.522	1.476
SumT	N	12	13.58	3.728	1.076
	Y	14	15.71	3.361	0.898
SumNadj	N	12	8.08	6.23	1.798
	Y	14	8.07	6.9	1.844
SumTadj	N	12	2.83	4.448	1.284
	Y	14	5.57	3.777	1.009

Another explanation might be that some respondents misread the primer as implying nature and technology's value are on the same side of a spectrum. However, if so, I would have expected there to be more confusion in responses to question 9. Another explanation might be that the primer evoked a contrarian reaction. People read it thinking *"I can prove these political scientists wrong, as I can value both of these things without contradiction"*. Again, comparing means may cohere with this explanation, but given that I thought participants were generally engaging in the survey in good faith and were earnestly happy to help with the research and interested, it seems unlikely that this would be their state of mind.

Intrinsic vs. Instrumental
Despite best attempts with the questionset and priming material, this study wrestled with the difficulty hypothesised in Chapter 9: it is hard to reliably isolate the idea of intrinsic value among

laypeople using natural language and minimal theoretical background. Questions aiming to pinpoint a value for nature are easily conflated with hugely important matters of climate change, where the value basis is often less about protecting nature for its own sake, but rather maintaining human quality of life. Likewise, questions aiming to pinpoint a general value for technology *simpliciter* are easily responded to with an instrumental justification for valuing some particular technology.

In this respect, some questions (e.g. q5 and 7) performed better than others, (e.g. q4 and 8). With more time and resources, it looks hopeful that future surveying could iterate between interviews and questionsets to hit upon a reliable intrinsic value scale.

In Chapter 9, I speculated that inconsistent results were potentially a sign of a wide-scale 'preference inconsistency'. Notwithstanding the fact that policymakers differ from the public at large, I now think it is more likely the Chapter 9 results are symptomatic of 'failure to isolate intrinsic value' than of 'preference inconsistency'.

The survey's failure to reliably elicit intrinsic value responses should not be cast purely as a methodological failure, as this would miss a key point: this chapter's dataset shows us something about the relative importance of instrumental values to policymakers, namely, that it is high, and perhaps too high to just ignore in a reduction of attitudes to a single spectrum.

As acknowledged throughout this thesis, the prevalence of high instrumental value for both nature and technology inevitably means that a nature/technology intrinsic value spectrum could never be claimed to explain the entire variance in attitudes to the policy questions raised. The Nature/Technology Value Spectrum should be seen as only one effect among many.

Perhaps then, despite the promising potential that an intrinsic value scale could be devised to match the theory, we should remain unconvinced that the Nature/Technology spectrum will, or indeed ought to, be adopted by the layperson as a defining part of the everyday political vocabulary. Its general predictive power is likely to remain low compared with economic and social liberty spectrums.

That said, the spectrum is evidently salient in some particular policy scenarios, for instance, developing human enhancement technologies, or preservation of wildlife. For now, I think it is best to think of the spectrum as an idea that resides in the annals of academic philosophy, but occasionally makes an appearance on the mainstage of public discourse to diagnose positions on some particular issue. Over time, as biotechnology becomes ever more powerful, as humanity brushes up against the limits of nature's carrying capacity on earth, and as 'true nature' dwindles, these issues may come to dominate politics more and more.

Chapter 11 - Conclusion

The year is 2121. Genetic modifications have swept across the world. A procedure is routinely performed on babies to increase their base levels of serotonin. Most people regulate their mood with drugs and artificial pleasures. The natural world is an anachronism. Non-human biology is a canvass for technological creativity. People compete to display the aesthetic virtues of their artificial forests and creatures in sophisticated evolutions of Crufts and the Chelsea Flower Show.

There is some resistance to this trend. Some get a palpable itch that they are living in designed, ersatz realities. Like those responding negatively to Nozick's Brain in a Vat conundrum, they yearn for something authentic and real. They yearn for a natural experience.

Meanwhile, others see the technological turn as our true calling. Technological progress, having performed miracles on poverty, disease, hunger, and other 21st century problems, becomes a quasi-religious mentality. With some such apostles editing and manipulating themselves beyond recognition, the human category is breached. It becomes unclear who politics is for.

Those striving to protect natural experience will accordingly strive to deny these post-humans rights and recognition. But the pro-technologists and indeed post-humans themselves will disagree. Political suppression of post-humans leads to violence and war. With one side embracing enhancement, and the other taking a principled opposition, there could only ever be one winner.

Only 30 years later, a post-human discovers a way to upload brains to the cloud. Schisms split between those who are literally and figuratively attached to their bodies as a remnant of a primate origin, and those who are keen to embrace the new way. The debate will rage on in eternity…

The main philosophical claim of this thesis is that many *prima facie* esoteric philosophical, ethical, and policy debates in the once-disparate vicinities of nature and technology can be better understood with reference to a simplifying framework: a spectrum of intrinsic value covering, on the one hand, value for nature and on the other, a value for technology.

I started by steel-manning the messy claims of various environmental ethicists by synthesising their positions with modern axiology, seeking to clarify both what is meant by intrinsic value (Moorean v.s. Kantian senses) and what the object of value is for these thinkers (naturalness, aesthetics, life, rarity). I defined nature (absence of human intervention) in opposition to artifact (human-made or modified). I drew an identity between 'natural' and 'wild'. And then I argued that assigning moral value to non-human biology (e.g. animals) is a separate matter from whether such animals are natural or artificial. It is the naturalness we are interested in here.

Next, I constructed a working definition of technology as intentional functional artifact, which seemed to match intuitions other than for my discovery of 'techno-gettier cases'. I then build an original case for technology's intrinsic value. First, I appealed to real world intuitive examples like spacecraft. Next, I offered three theoretical arguments: The first was about how technology offers a unique form of liberty, which is analogously valuable to how eminent philosophers like Amartya Sen have argued for other forms of liberty (social, economic) being valuable. The second was an argument that the act of technology production is a virtue, similar to how Virtue Epistemology theorists like Ernst Sosa have thought about knowledge. The third looked at

technology's valuable relational properties, including aesthetic merit and its value as an instance of human creativity. I ended by observing that it is likely such arguments have not been made before because technological value is, on the face of it, subsumed into the value of knowledge - which has a longer philosophical history.

I then discussed the inherent conflict between holding intrinsic value for nature and for technology. I formally introduced the idea of a political spectrum, and advanced that the nature/technology debate qualifies as one. I discussed many policy debates occurring along this spectrum. I highlighted the metaphysical tension between nature and artifact (of which the major subset is technology). I considered the orthogonality of this spectrum to spectrums of social and economic liberty, successfully identifying that all 8 octants are valid political positions. I showed many benefits of the spectrum view, including in surpassing the empty concept of 'anthropocentrism', and clarifying the so-called Appeal to Nature Fallacy.

Next, I prepared the groundwork for examining debates around human enhancement biotechnology. The groundwork was needed as it was not immediately obvious whether humans are themselves natural or artificial. I argued that humans are semi-natural, and show that all other positions lead to absurdity. I explored what happens to our definitions of nature and artifact should we one day have another category of intelligent life, call them post-humans, who we would still want to think are capable of artifice, and who still have some amount of naturalness left in them.

With groundwork prepared, I then moved to the subject of human enhancement. My claim was simply that the debate over human enhancement's unnaturalness is just one instance of the wider values trade-off we have outlined in previous chapters, concerning the way humans interact with not just other humans, but all physical material. Viewing the debate as operating at the political level quashes bioethicists' absurd demand to draw a 'line in Darwin's sand' - i.e. define some magical point at which human enhancement suddenly becomes wrong.

Moving from the idealised world of axiology to the messy world of political science, in Chapters 9 and 10 found some supporting evidence for the theory once intrinsic value sentiments were isolated, but also that a reduction to a spectrum based on intrinsic value is insufficient. In reality, the concerns at the forefront of the minds of policy makers and the public are predominantly instrumental. Climate change is not just an environmental harm, it is also a harm to people's welfare in many ways. The nature technology intrinsic value spectrum is therefore only providing reasons pro tanto. Nevertheless, there are particular debates where intrinsic considerations do play a key role. We saw this in cases across human biotechnology and across environmental policy, including geoengineering, marine habitat regeneration, and nuclear power.

Is the nature technology value spectrum then a true political spectrum, like left vs. right or libertarian vs. authoritarian? Or is it something else? And does this even matter? While no clear criteria exists for what constitutes a political spectrum beyond what I have suggested, I feel there is still good reason to treat this values trade-off as in some way a political spectrum. In all of these cases, invoking the idea of a political spectrum is helpful to show that preferences are ideological. When a nature-lover loves nature they are not being 'irrational', just expressing an ideological preference. The spectrum helps create understanding in debate, something that those on the left and right take for granted when arguing with the other.

One of my criteria was that a political spectrum ought to be timeless. We see that while the policy specifics may change, fundamental debates around economic and social liberty run back

as far as politics itself. The nature technology value spectrum may be late to the party, but it looks set to stay for a long time, perhaps outliving humanity as we know it.

Having articulated this political spectrum, a secondary aim of this thesis was to locate myself upon it. I posed a direct challenge to the ecocentrism movement in environmental ethics, which I, and it seems many others empirically surveyed, simply do not inuit at all. On the other hand, I really do feel the love for technological pursuits, and I am quite surprised that this love has not been the subject of analytical philosophy before now, given how much they constitute our lives. For me, the technophilic impulse is drawn from the same well as that which makes me a proponent of The Enlightenment, and not Romanticism. I illustrated the parallels between these debates, in the hope that I can convince what I assume is a majority of pro-enlightenment readership to join me. I have opened up some different strategies for substantiating this intuition, and I hope this will spark further debate and exploration.

Bibliography

Chapter 1

Attfield, R (1981) 'The Good of Trees', Journal of Value Inquiry 15: 35-54

Bostrom, N. (2002). 'Existential risks: analyzing human extinction scenarios and related hazards'. Journal of Evolution and Technology, 9.

Brennan, A. and Lo,Y.-S. (2021) 'Environmental Ethics', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2021/entries/ethics-environmental/> (Accessed: 03/12/22).

CUP (2021), Definition of technocracy from the Cambridge Business English Dictionary © Cambridge University Press

Curtice, J., & Bryson, C. (2001) 'The measurement of socio-political orientations', in European Social Survey Core Questionnaire Development (pp. 233-257). City University, London: European Social Survey.

Dasgupta, P. (2021), The Economics of Biodiversity: The Dasgupta Review.

DEFRA (2011), 'An introductory guide to valuing ecosystem services'

Ellul, J. (1980) 'The Technological System' The Continuum Publishing Corporation, New York

Frankena, W. K., (1973) 'Ethics', second edition, Englewood Cliffs: Prentice Hall.

Goddard, G. (2022) 'Biomimetic design: 10 examples of nature inspiring technology' Science Focus URL =https://www.sciencefocus.com/future-technology/biomimetic-design-10-examples-of-nature-inspiring-technology/ (Accessed: 03/12/22)

Gruzd A. and Haythornthwaite C (2013) 'Enabling community through social media' J Med Internet Res;15(10):e248. doi: 10.2196/jmir.2796. PMID: 24176835; PMCID: PMC3842435.

https://www.gov.uk/government/publications/an-introductory-guide-to-valuing-ecosystem-services (Accessed: 03/12/2022)

IPCC, (2022) 'Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change', Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926

Kaplan, D. (2017) 'Philosophy, Technology, and the Environment', MIT Press, ix + 255 pp., ISBN 9780262533164

Kerschner C. and Ehlers M.-C. (2016) 'A framework of attitudes towards technology in theory and practice', Ecological Economics, Volume 126, Pages 139-151, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2016.02.010. https://www.sciencedirect.com/science/article/pii/S0921800916302129 (Accessed: 03/12/22).

Mack, Eric, (2018) 'Robert Nozick's Political Philosophy', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2018/entries/nozick-political/>(Accessed: 03/12/22).

McKinnon, M.C., Cheng, S.H., Dupre, S. et al. (2016) 'What are the effects of nature conservation on human well-being? A systematic map of empirical evidence from developing countries.' Environ Evid 5, 8 https://doi.org/10.1186/s13750-016-0058-7

Mitcham, C. (1994) 'Thinking Through Technology', University of Chicago Press, Chicago

Mumford, L. (1970) The myth of the machine The Pentagon of Power, vol. 2, San Diego, Harcourt Brace Jovanovich

Müller, Vincent C., (2021) 'Ethics of Artificial Intelligence and Robotics', The Stanford Encyclopedia of Philosophy (Summer 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2021/entries/ethics-ai/>. (Accessed: 03/12/22)

Nozick, R., (1974) 'Anarchy, State, and Utopia', New York: Basic Books.

Rolston, H. (1975) 'Is There an Ecological Ethic?' Ethics 85: 93-109

Routley, R. (1973) 'Is there a need for a new, an environmental ethic?' Proceedings of the 15th World congress of Philosophy, 1: 205–10, Sophia: Sophia Press.
Sagoff, M. (2007) 'The Economy of the Earth: Philosophy, Law, and the Environment (2nd ed.)'. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511817472

Sparrow R. (2016) 'Human Enhancement for Whom?' in Clarke, Savulescu, Coady, Guibilini, and Sanyal.

Vogel (2017), 'Philosophy, Technology, and the Environment Reviewed by Steven Vogel', Denison University. URL = https://ndpr.nd.edu/reviews/philosophy-technology-and-the-environment/ (Accessed: 03/12/22)

Woodhead, A.J., Hicks, C.C., Norström, A.V., Williams, G.J., Graham, N.A.J.. (2019) 'Coral reef ecosystem services in the Anthropocene'. Funct Ecol. 2019; 33: 1023– 1034. https://doi.org/10.1111/1365-2435.13331

Zimmerman, M. and Bradley, B. (2019) 'Intrinsic vs. Extrinsic Value', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2019/entries/value-intrinsic-extrinsic/>(Accessed: 03/12/22).

Chapter 2

Attfield, R. (1981). 'The Good of Trees'. Journal of Value Inquiry 15: 35-54

Bell, D, (2020) 'Communitarianism', The Stanford Encyclopedia of Philosophy (Fall 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2020/entries/communitarianism/>.(Accessed: 03/12/22).

Berleant, A. (1995). 'The Aesthetics of Environment.' Temple University Press.

Bradley, B. (2006) 'Two Concepts of Intrinsic Value.' Ethic Theory Moral Prac 9, 111–130 https://doi.org/10.1007/s10677-006-9009-7

Brennan, A. (1984). 'The Moral Standing of Natural Objects'. Environmental Ethics 6: 35- 56.

Brennan, A. and Y.-S. Lo, (2010). Understanding environmental philosophy. Understanding Environmental Philosophy. 1-234.

Brennan, A. and Y.-S. Lo, (2020) 'Environmental Ethics', The Stanford Encyclopedia of Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/ethics-environmental/>.(Accessed: 03/12/22).

Carlson, A. (2020), 'Environmental Aesthetics', The Stanford Encyclopedia of Philosophy Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/environmental-aesthetics/> (Accessed: 03/12/22).

Carrington D. (2018) 'humans just 0.01% of all life' The Guardian Online URL = https://www.theguardian.com/environment/2018/may/21/human-race-just-001-of-all-life-but-has-destroyed-over-80-of-wild-mammals-study (Accessed: 03/12/22).

Carroll, N., (1993), 'On Being Moved By Nature: Between Religion and Natural History' in Landscape, Natural Beauty and the Arts, S. Kemal and I. Gaskell (ed.), Cambridge: Cambridge University Press.

CBD (2021) Convention on Biological Diversity https://www.cbd.int/ (Accessed: 03/12/22).

Chang, R. (1997) 'Incommensurability, Incomparability, and Practical Reason' R. Chang (ed.), Cambridge: Harvard University Press.

Callicott, J.B., (1980).'Animal Liberation, A Triangular Affair'. Environmental Ethics.

Delahaye, J. & Vidal, C. (2018). Universal Ethics: Organized Complexity as an Intrinsic Value.

Elliot, R. (1982). 'Faking nature'. Inquiry: An Interdisciplinary Journal of Philosophy 25 (1):81 – 93.

Elliot, R. (1992) 'INTRINSIC VALUE, ENVIRONMENTAL OBLIGATION AND NATURALNESS' The Monist , APRIL 1992, Vol. 75, No. 2, The Intrinsic Value of Nature (APRIL 1992), pp. 138-160 Published by: Oxford University Press Stable URL: http://www.jstor.com/stable/2790328 (Accessed: 16 Jan. 2021).

Faith, D.P. (2019) 'Biodiversity' The Stanford Encyclopedia of Philosophy (Fall 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2019/entries/biodiversity/>. (Accessed: 03/12/22).

Frankena, William K. (1973), 'Ethics', second edition, Englewood Cliffs: Prentice Hall. [1, 6]

Godlovitch, S. (1994), 'Icebreakers: Environmentalism and Natural Aesthetics,' Journal of Applied Philosophy, 11: 15–30.

Green, K. (1996) "Two Distinctions in Environmental Goodness.' Environmental Values 5, no. 1 (1996): 31–46. doi:10.3197/096327196776679384.

Hansson, S. O. (2017) 'Science and Pseudo-Science', The Stanford Encyclopedia of Philosophy (Summer 2017 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2017/entries/pseudo-science/>. (Accessed: 03/12/22).

Hassan, P. (2017) 'Does Rarity Confer Value? Nietzsche on the Exceptional Individual.' Journal of Nietzsche Studies, vol. 48, no. 2, 2017, pp. 261–285. JSTOR, ww.jstor.org/stable/10.5325/jnietstud.48.2.0261. (Accessed: 03/12/22).

Hettinger, N. and Throop, B., (1999). 'Refocusing Ecocentrism', Environmental Ethics, 21: 3–21

Hsieh, N. (2005) 'Equality, Clumpiness and Incomparability' Utilitas, 17(2), 180-204. doi:10.1017/S0953820805001512

Jamieson, D. (2018) 'Loving Nature' Journal of Aesthetics and Art Criticism 76 (4):485-495.

Johnson, R. and Cureton A. (2019) 'Kant's Moral Philosophy', The Stanford Encyclopedia of Philosophy (Spring 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2019/entries/kant-moral/>. (Accessed: 03/12/22).

Kagan S. (1998), 'Rethinking Intrinsic Value' The Journal of Ethics Vol. 2, No. 4, Intrinsic Value (1998), pp. 277-297 (21 pages) Published By: Springer

Katz, E. (1992) , The big Lie: The Human Restoration of Nature 231-41 https://hettingern.people.cofc.edu/Nature_Technology_and_Society_Fall_2010/Katz_The_Big_Lie.pdf (Accessed: 03/12/22).

Katz, E. (1997) 'The Big Lie: Human restoration of Nature.' Nature as Subject: Human Obligation and Natural Community (pp. 93-107), E. Katz, ed. Lan- ham, MD: Rowman & Littlefield

Katz, E. (1998) 'Review of Faking Nature: The Ethics of Environmental Restoration', by R. Elliot. Ethics and the Environment, 3(2), 201–205. http://www.jstor.org/stable/40338952 (Accessed: 03/12/22).

Kniess, J. (2019) 'Bentham on animal welfare' British Journal for the History of Philosophy, 27:3, 556-572, DOI: 10.1080/09608788.2018.1524746

Korsgaard, C. (1983) 'Two Distinctions in Goodness', Philosophical Review, 92: 169–95. [3, 4]

Kramm, M. (2020) 'When a River Becomes a Person' Journal of Human Development and Capabilities, 21:4, 307-319, DOI: 10.1080/19452829.2020.1801610

Lee, K. (1999). 'The natural and the artefactual: The implications of deep science and deep technology for environmental philosophy.' Lanham, Md: Lexington Books.

Löschke, J. (2020). 'Harmony and intrinsic value.' Journal of East-West Thought, 2(10):27-44

Maclaurin, J. and Sterelny, K. (2008), 'What Is Biodiversity?' University of Chicago Press,

Mason, E., (2018) 'Value Pluralism', The Stanford Encyclopedia of Philosophy (Spring 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2018/entries/value-pluralism/>. (Accessed: 03/12/22).

McKibben, B. (1989). The End of Nature. New York: Random House

Michael P. N. and Callicott, J.B. (2008) 'The Wilderness Debate Rages On: Continuing the New Great Wilderness Debate'. Athens, GA: The University of Georgia Press 2008. 723 pages ISBN 978-0-8203-3171-3

Mill, J. S. (1869). 'On Liberty'. London: Longman, Roberts & Green

Misra, S. (2014) 'Philosophical Thoughts with Artistic Values', International Journal of Humanities and Social Science Vol. 4, No. 5(1); March 2014 129

Moore, G.E. (1903). 'Principia Ethica', Cambridge University Press

Naess, A. (1989) 'Ecology, Community and Lifestyle'. Translated and edited by D. Rothenberg. Cambridge University Press, Cambridge, UK.

Naess, A. and Sessions, G. (1984) 'Basic Principles of Deep Ecology' A www.deepecology.org https://conbio.org/about-scb/who-we-are (Accessed: 03/12/22).

Norton, B.G. (1992) 'EPISTEMOLOGY AND ENVIRONMENTAL VALUES.' The Monist, vol. 75, no. 2, 1992, pp. 208–226. JSTOR, www.jstor.org/stable/27903286. (Accessed: 03/12/22).

O'Neill, J. (1992) 'THE VARIETIES OF INTRINSIC VALUE' The Monist , APRIL 1992, Vol. 75, No. 2, The Intrinsic Value of Nature (APRIL 1992), pp. 119-137 Published by: Oxford University Press Stable URL: https://www.jstor.org/stable/27903282

Oksanen, M. (1997) 'The Moral Value of Biodiversity.' Ambio, vol. 26, no. 8, 1997, pp. 541–545. JSTOR, www.jstor.org/stable/4314663. (Accessed: 03/12/22).

Parker D.H. (2003) 'The Principles Of Aesthetics' Project Guthenberg, University of Michigan

Pearce, D. (2004) 'The Hedonistic Imperative' http://www.hedweb.com/hedab.htm. (Accessed: 03/12/22).

Regan, T. (1988). 'The Case for Animal Rights.' Routledge, London

Rodogno, R. (2010) 'Sentientism, Wellbeing, and Environmentalism.' Journal of Applied Philosophy, vol. 27, no. 1, Wiley, 2010, pp. 84–99, http://www.jstor.org/stable/24355969. (Accessed: 03/12/22).

Rolston H. (1975). 'Is There an Ecological Ethic?' Ethics 85: 93-109

Rolston, H. ((2011). 'A New Environmental Ethics: The Next Millennium for Life on Earth' (1st ed.). Routledge. https://doi.org/10.4324/9780203804339

Rolston, H. (1986) 'Philosophy Gone Wild: Essays in Environmental Ethics'. Amherst, NY: Prometheus

Routley, R. (1973). 'Is There a Need for a New, an Environmental, Ethic?' Proceedings of the XVth World Congress of Philosophy 1: 205-210

Saito, Y. (2021) 'Aesthetics of the Everyday', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), forthcoming URL = <https://plato.stanford.edu/archives/spr2021/entries/aesthetics-of-everyday/>.(Accessed: 03/12/22).

Sandler, R. (2012) 'Is artefactualness a value-relevant property of living things?' Synthese, Vol. 185, No. 1, PHILOSOPHICAL PROBLEMS ABOUT LIFE (March 2012), pp. 89-102 Published by: Springer Stable URL: https://www.jstor.org/stable/41411210 (Accessed: 03/12/22).

Sansone, C., & Harackiewicz, J. M. (Eds.). (2000). 'Intrinsic and extrinsic motivation: The search for optimal motivation and performance.' Academic Press.

Sarkar, S. (2005). Biodiversity and Environmental Philosophy: An Introduction. Cambridge University Press.

Sartwell, C. (2017) 'Beauty', The Stanford Encyclopedia of Philosophy (Winter 2017 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2017/entries/beauty/>. (Accessed: 03/12/22).

Scruton, R. (2011) Beauty: A Very Short Introduction. Oxford ; New York: Oxford University Press, 2011. Print.

Sen, A. (1980) 'Plural Utility.' Proceedings of the Aristotelian Society 81 (1980): 193–215. http://www.jstor.org/stable/4544973. (Accessed: 03/12/22).

Shelley, J. (2020) 'The Concept of the Aesthetic', The Stanford Encyclopedia of Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/aesthetic-concept/>.(Accessed: 03/12/22).

Siipi, H. (2008) 'Dimensions of Naturalness.' Ethics and the Environment, vol. 13, no. 1, 2008, pp. 71–103. JSTOR, www.jstor.org/stable/40339149. (Accessed: 03/12/22).

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

Taylor, P.W. (1981). 'The ethics of respect for nature.' Environmental Ethics (3):197-218.

Weston, A. (1992) 'BETWEEN MEANS AND ENDS.' The Monist, vol. 75, no. 2, 1992, pp. 236–249. JSTOR, www.jstor.org/stable/27903288. (Accessed: 03/12/22).

White, P.S. (2013) 'Derivation of the Extrinsic Values of Biological Diversity from Its Intrinsic Value and of Both from the First Principles of Evolution' Conservation Biology, December 2013, Vol. 27, No. 6, pp. 1279- 1285 Published by: Wiley for Society for Conservation Biology Stable URL: https://www.jstor.org/stable/24480257 (Accessed: 03/12/22).

Wiggins, D., (1997) 'Incommensurability: Four Proposals', in Chang 1997

Williams, B. (1981) 'Moral Luck' Cambridge: Cambridge University Press.

Williams, B. (1995). 'Must a concern for the environment be centred on human beings?' In Making Sense of Humanity and Other Philosophical Papers.

Yee, S (2009) 'The Intrinsic and Instrumental Values of Diversity: Some Philosophical and Legal Considerations', Multiculturalism and International Law: Essays in Honour of Edward

McWhinney (2009), 207-226, Available at SSRN: https://ssrn.com/abstract=2043038 (Accessed: 03/12/22).

Zimmerman, M.J. and Bradley, B. (2019) 'Intrinsic vs. Extrinsic Value', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2019/entries/value-intrinsic-extrinsic/> (Accessed: 03/12/22)

Chapter 3

Adajian, T. (2022) 'The Definition of Art', The Stanford Encyclopedia of Philosophy, Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2022/entries/art-definition/>. (Accessed: 03/12/22)

Davies, S. (2006), 'The Philosophy of Art', Oxford: Basil Blackwell.

Dickie, G. (2001), 'Art and Value', Oxford: Blackwell Publishing.

Dipert, R. R. (1993). 'Artifacts, Art Works, and Agency' (Philadelphia, Pa.: Temple University Press).

Dusek, V. (2006) 'The Philosophy of Technology: An Introduction'. ISBN: 978-1-405-11162-1 Wiley-Blackwell

Eldridge, R. (1985), 'Form and Content: An Aesthetic Theory of Art,' British Journal of Aesthetics, 25(4): 303–316.

Franssen, M. Lokhorst, G.J., and van de Poel, I., (2018) 'Philosophy of Technology' The Stanford Encyclopedia of Philosophy (Fall 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2018/entries/technology/>.(Accessed: 03/12/22)

Gettier, E.L. (1963) 'Is Justified True Belief Knowledge?' Analysis, Volume 23, Issue 6, 1 June 1963, Pages 121–123, https://doi.org/10.1093/analys/23.6.121.

Hansson, S. O. (2017) 'Science and Pseudo-Science', The Stanford Encyclopedia of Philosophy (Summer 2017 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2017/entries/pseudo-science/>. (Accessed: 03/12/22).

Hilpinen, R. (1993). 'Authors and Artifacts,' Proceedings of the Aristotelian Society, 93: 155-78.

Kroes, P. A. and Meijers, A. W. M. (eds) (2006). 'The Dual Nature of Technical Artefacts' Studies in History and Philosophy of Science, 3 7 (special issue): 1-158.

Lehrer, K. and Paxson, T. (1969) 'Knowledge: Undefeated Justified True Belief ' The Journal of Philosophy, Vol. 66, No. 8 (Apr. 24, 1969), pp. 225-237 Published by: Journal of Philosophy URL= http://www.jstor.org/stable/2024435 (Accessed: 03/12/22)

Miller, S. (2008) 'Intellectual Property and Biotechnology: Biological Inventions.' J Commer Biotechnol 14, 349–351. https://doi.org/10.1057/jcb.2008.15

Mitcham, C. (1994) 'Thinking Through Technology: The Path Between Engineering and Philosophy' Chicago: University of Chicago Press. URL= https://bibliodarq.files.wordpress.com/2015/09/mitcham-c-thinking-throught-technology-the-path-between-engineering-and-philosophy.pdf (Accessed: 03/12/22)

NASA (2021), 'Space Debris and Human Spacecraft - Orbital Debris and Human Spacecraft' https://www.nasa.gov/mission_pages/station/news/orbital_debris.html (Accessed: 03/12/22)

Preston, B. (2020) 'Artifact', The Stanford Encyclopedia of Philosophy (Fall 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2020/entries/artifact/>. (Accessed: 03/12/22)

Verbeek, P.-P. and Vermaas, P.E. (2009). Technological Artifacts. In A Companion to the Philosophy of Technology (eds J.K.B. Olsen, S.A. Pedersen and V.F. Hendricks). https://doi.org/10.1002/9781444310795.ch28

Weiss, E. B. (1980) "UNITED STATES: SUPREME COURT DECISION IN DIAMOND v. CHAKRABARTY (Biological Research; Genetic Engineering; (Patentability of Microorganisms)." International Legal Materials, vol. 19, no. 4, 1980, pp. 981–991. JSTOR, www.jstor.org/stable/20692193. Accessed 9 July 2021.

Zagzebski, L. (1994) 'The Inescapability of Gettier Cases' The Philosophical Quarterly (1950-) Vol. 44, No. 174 (Jan., 1994), pp. 65-73 (9 pages) Published By: Oxford University Press

Zangwill, N. (1995), 'Groundrules in the Philosophy of Art,' Philosophy, 70: 533–544. DOI: 10.2307/2220147 https://www.jstor.org/stable/2220147 (Accessed: 03/12/22)

Chapter 4

Bahm, A.J. (1965) 'Comparative Aesthetics' The Journal of Aesthetics and Art Criticism, vol. 24, no. 1, Wiley, American Society for Aesthetics, 1965, pp. 109–19, https://doi.org/10.2307/428253.

Berlin, I. (1958) 'Two Concepts of Liberty,' Oxford: Clarendon Press.

Bhatt, R. (2013) 'Rethinking Aesthetics: The Role of Body in Design' New York: Routledge.

Carter, I. (1999) 'A Measure of Freedom' Oxford: Oxford University Press..
Crisp, R. (2005) 'Value, reasons and the structure of justification: how to avoid passing the buck' Analysis, Volume 65, Issue 1, January 2005, Pages 80–85, https://doi.org/10.1093/analys/65.1.80

Cropley, D. H., Kaufman, J., and Cropley A. J. (2008). 'Malevolent Creativity: A Functional Model of Creativity in Terrorism and Crime.' Creativity Research Journal 20.2: 105–15

Drobnick, J. (2005) 'Volatile Effects: Olfactory Dimensions of Art and Architecture"' in David Howes (ed.), Empire of the Senses: The Sensual Culture Reader, Oxford: Berg, pp. 265–280.

Edwards, S. (2012) "Is Internet Access A Human Right?". Human Rights Now. 10 January 2012. https://blog.amnestyusa.org/middle-east/is-internet-access-a-human-right/ (Accessed: 03/12/22)

Ellul, J. (2020) 'The Technological Society.' New York: Knopf, 1967. Print. MLA (7th ed.)

European Union (2014) 'Technology readiness levels (TRL)' Extract from Part 19 - Commission Decision C(2014)4995" https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf (Accessed: 03/12/22)

Florez, D. 'Is technology (still) applied science?' Technology in Society, Volume 59,2019,101193,ISSN 0160-791X,https://doi.org/10.1016/j.techsoc.2019.101193. (https://www.sciencedirect.com/science/article/pii/S0160791X19300399) (Accessed: 03/12/22)

Forsey, J. (2013) 'The Aesthetics of Design' Oxford: Oxford University Press.

Forsey, J. (2014) 'The Promise, the Challenge, of Everyday Aesthetics' Aisthesis, 7(1): 5–21. URL = https://oajournals.fupress.net/index.php/aisthesis/article/view/828 (Accessed: 03/12/22)

Gaut, B. (2010) 'The Philosophy of Creativity' Philosophy Compass 5/12 (2010): 1034–1046, 10.1111/j.1747-9991.2010.00351.x

Gaut, B. (2014) 'Mixed Motivations: Creativity as a Virtue' Royal Institute of Philosophy Supplement, 75, 183-202. doi:10.1017/S1358246114000198

Greco, J. (2003) 'Knowledge as Credit for True Belief', in DePaul & Zagzebski 2003: 111–134

Greco, J. (2007) 'The Nature of Ability and the Purpose of Knowledge' Philosophical Issues, 17: 57–69. doi:10.1111/j.1533-6077.2007.00122.x

Greco, J. (2009) 'Knowledge and Success From Ability' Philosophical Studies, 142(1): 17–26. doi:10.1007/s11098-008-9307-0

Greco, J. (2012) 'A (different) virtue epistemology' Philosophy and Phenomenological Research, 85(1): 1–26. doi:10.1007/s11098-008-9307-0

Greco, J. (2020) 'The Transmission of Knowledge' Cambridge: Cambridge University Press. doi:10.1017/9781108560818

Guinness World Records, (2016) P. 124 'Record Breaking Buildings' 2016 ISBN 1910561037, 9781910561034

Gustafsson, J.E. (2020), 'A Paradox for the Intrinsic Value of Freedom of Choice' Noûs, 54: 891-913. https://doi.org/10.1111/nous.12290.

Heidegger, M. (1977) 'The Question Concerning Technology' Basic Writings Ed. David Farrell Krell (Harper & Row, 1977), 287.

Herbert S. (1969) 'The Sciences of the Artificial' Cambridge, MA/London: MIT Press.

Jones, P. and Sugden, R. (1982) 'Evaluating Choice', International Review of Law and Economics 2 (1): 47–65.

Kaebnick, G.E. (2013) 'Engineered Microbes in Industry and Science: A New Human Relationship to Nature?' Synthetic Biology and Morality (Basic Bioethics) (p. 51). MIT Press. Kindle Edition.

Kaplan, D. (2017) 'Philosophy, Technology, and the Environment' MIT Press, 2017, ix + 255 pp., ISBN 9780262533164

Katz, E. (2005) 'On the neutrality of technology: the Holocaust death camps as a counter-example' Journal of Genocide Research, 7:3, 409-421, DOI: 10.1080/14623520500190363

Klang, M., Murray, A. (2005). Human Rights in the Digital Age. Routledge. p. 1. (Accessed: 03/12/22)

Lackey, J. (2007) 'Why we don't deserve credit for everything we know' Synthese, 158(3): 345–361. doi:10.1007/s11229-006-9044-x

Lustig, A. (2013) 'Appeals to Nature and the Natural in Debates about Synthetic Biology' in Synthetic Biology and Morality (Basic Bioethics) (p. 15). MIT Press. Kindle Edition.

Mitcham, C. (1994), 'Thinking Through Technology: The Path Between Engineering and Philosophy', Chicago: University of Chicago Press. URL = https://bibliodarq.files.wordpress.com/2015/09/mitcham-c-thinking-throught-technology-the-path-between-engineering-and-philosophy.pdf (Accessed: 03/12/22)

NASA (2012) 'Technology Readiness Levels' https://www.nasa.gov/directorates/heo/scan/engineering/technology/technology_readiness_level (Accessed: 03/12/22)

Novitz, D. (1999) 'Creativity and Constraint.' Australasian Journal of Philosophy 77.1 (1999): 67–82

Parker, D.H. (1921) 'The Principles of Aesthetics' Philosophical Review 30:431.

Perullo, N. (2016) 'Taste as Experience: The Philosophy and Aesthetics of Food' New York: Columbia University Press.

Pritchard, D., Turri J., and Carter, J.A. (2018) 'The Value of Knowledge', The Stanford Encyclopedia of Philosophy (Spring 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2018/entries/knowledge-value/>. (Accessed: 03/12/22)

Riggs, W. D. (1998) 'What Are the 'Chances' of Being Justified?' The Monist, 81(3): 452–472. doi:10.5840/monist199881319

Riggs, W. D. (2002) 'Reliability and the Value of Knowledge' Philosophy and Phenomenological Research, 64(1): 79–96. doi:10.1111/j.1933-1592.2002.tb00143.x

Riggs, W. D. (2009) 'Two Problems of Easy Credit' Synthese, 169(1): 201–216. doi:10.1007/s11229-008-9342-6

Riggs, W. D., (2002) 'Reliability and the Value of Knowledge', Philosophy and Phenomenological Research, 64(1): 79–96. doi:10.1111/j.1933-1592.2002.tb00143.x

Ryle, G. (1949) 'The Concept of Mind' London: Hutchinson.

Saito, Y. (2021) 'Aesthetics of the Everyday' The Stanford Encyclopedia of Philosophy (Spring 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2021/entries/aesthetics-of-everyday/>. (Accessed: 03/12/22)

Schellekens, E. (2021) 'Conceptual Art', The Stanford Encyclopedia of Philosophy (Summer 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2021/entries/conceptual-art/>. (Accessed: 03/12/22)

Schummer, J., MacLennan, B., Taylor, N. (2009) 'Aesthetic Values in Technology and Engineering Design' In Handbook of the Philosophy of Science, Philosophy of Technology and Engineering Sciences, North-Holland, 2009, Pages 1031-1068, ISSN 18789846, ISBN 9780444516671, https://doi.org/10.1016/B978-0-444-51667-1.50042-2. (https://www.sciencedirect.com/science/article/pii/B9780444516671500422) (Accessed: 03/12/22)

Schwartz, J. (2020). 'The Intrinsic Value of Scientific Knowledge and Understanding.'
10.1093/oso/9780190069063.003.0003.

Sen, A. (1984) 'Well-Being, Agency and Freedom: The Dewey Lectures 1984', The Journal of Philosophy 82 (4): 169–221.

Sen, A. (1993) 'Markets and Freedoms: Achievements and Limitations of the Market Mechanism in Promoting Individual Freedoms', Oxford Economic Papers 45 (4): 519–541.

Sen, A. (1998) 'Freedom of Choice: Concept and Content', European Economic Review 32 (2–3): 269–294.

Shepherd, M. (2023) '101 Engineering Quotes From the Minds of Innovators' WorkflowMax. https://www.workflowmax.com/blog/101-engineering-quotes-from-the-minds-of-innovators (Accessed: 03/01/23)

Shelley, J. (2003) 'The Problem of Non‑Perceptual Art, The British Journal of Aesthetics, Volume 43, Issue 4, October 2003, Pages 363–378, https://doi.org/10.1093/bjaesthetics/43.4.363

Shusterman, R. (1999) 'Somaesthetics: A Disciplinary Proposal' Journal of Aesthetics and Art Criticism, 57(3): 299–313.

Skolimowski, H. (1966) 'The Structure of Thinking in Technology' Technology and Culture, 7(3): 371–383. doi:10.2307/3101935

Sosa, E. (2003) 'The Place of Truth in Epistemology', in DePaul & Zagzebski 2003: ch. 7.

Sosa, E. (2007) 'Apt Belief and Reflective Knowledge' Volume 1: A Virtue Epistemology, Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780199297023.001.0001

Sugden, R. (2007) 'The Value of Opportunities over Time When Preferences Are Unstable', Social Choice and Welfare 29 (4): 665–682.

Tomasi, J. (2012) 'Free Market Fairness' Princeton: Princeton University Press, 2012. Pp. xxvii, 348.) doi:10.1017/S003467051200.

Turri, J., Alfano, M., and Greco, J. (2019) 'Virtue Epistemology', The Stanford Encyclopedia of Philosophy (Fall 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2019/entries/epistemology-virtue/>. (Accessed: 03/12/22)

Van De Poel, I & Kroes, P. (2014). 'Can Technology Embody Values?'.
10.1007/978-94-007-7914-3_7.

van der Meulen, N. and Wiesel, J. (2017) Culinary Turn: Aesthetic Practice of Cookery, Bielefeld: transcript Verlag. [van der Meulen and Wiesel 2017 available online]

Winner, L. (1980). 'Do artifacts have politics?' Daedalus, 109, 121–136.

Zagzebski, L. (1996) 'Virtues of the Mind: An Inquiry into the Nature of Virtue and the Ethical Foundations of Knowledge', Cambridge: Cambridge University Press.

Zagzebski, L. (1998) 'Advantages and disadvantages of virtue epistemology' Virtue epistemology, 1998, doi:10.4324/9780415249126-P057-1. Routledge Encyclopedia of Philosophy, Taylor and Francis, https://www.rep.routledge.com/articles/thematic/virtue-epistemology/v-1/sections/advantages-and-disadvantages-of-virtue-epistemology. (Accessed: 03/12/22)

Zagzebski, L. (2003) 'Intellectual Motivation and the Good of Truth', in DePaul & Zagzebski 2003: 135–154.

Zagzebski, L. (2003) 'The Search for the Source of Epistemic Good' Metaphilosophy, 34(1–2): 12–28. doi:10.1111/1467-9973.00257

Zangwill, N. (2021) 'Aesthetic Judgment' The Stanford Encyclopedia of Philosophy (Spring 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2021/entries/aesthetic-judgment/>. (Accessed: 03/12/22)

Chapter 5

Ayer, A. J. (1986) Voltaire. New York: Random House

Baggini, J. (2004). 'Making Sense: Philosophy Behind the Headlines' Oxford University Press. pp. 181–182. ISBN 978-0-19-280506-5.

Bastani A. (2019). 'Fully Automated Luxury Communism: A Manifesto.' Verso

Bate, J. (1991) 'Romantic ecology: Wordsworth and the environmental tradition' London: Routledge.

Belis, M. (2019) 'Inventions and Inventors of the 18th Century' ThoughtCo. https://www.thoughtco.com/18th-century-timeline-1992474 (Accessed: 03/12/22)

Bertram, C., (2020) 'Jean Jacques Rousseau' The Stanford Encyclopedia of Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/rousseau/>. (Accessed: 03/12/22)

Betz, G. (2012) 'The Detailed Structure of the Sub-debates In: Ethical Aspects of Climate Engineering'. Karlsruhe: KIT Scientific Publishing, 2012 <http://books.openedition.org/ksp/1789>. ISBN: 9782821874343. (Accessed: 03/12/22).

Bossi, M., and Poggi, S. (1994) 'Romanticism in Science: Science in Europe' 1790–1840. Kluwer: Boston

Boyle, M (2019) 'The Way Home: Tales from a life without technology' Oneworld Publications. ISBN 978-1-78607-600-7.

Brennan, A. and Y.-S. Lo, (2021) 'Environmental Ethics', The Stanford Encyclopedia of Philosophy (Winter 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2020/entries/ethics-environmental/>.(Accessed: 03/12/22).

Bristow, W. (2017) 'Enlightenment' The Stanford Encyclopedia of Philosophy (Fall 2017 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2017/entries/enlightenment/>. (Accessed: 03/12/22)

Burns, W. (2003) 'Science in the Enlightenment: An Encyclopædia' entry: 7,103

Cadwalla, C. (2013) 'Stewart Brand and the Whole Earth Catalog, the book that changed the world' The Guardian Online https://www.theguardian.com/books/2013/may/05/stewart-brand-whole-earth-catalog (Accessed: 03/12/22)

Cunningham, A. & Jardine, N. (1990) 'Romanticism and the Sciences' Cambridge University Press.

Curtice, J., & Bryson, C. (2001) 'The measurement of socio-political orientations' In European Social Survey Core Questionnaire Development (pp. 233-257). City University, London: European Social Survey.

Dahlberg, L. (2017) Cyberlibertarianism. Oxford Research Encyclopedia of Communication. https://oxfordre.com/communication/view/10.1093/acrefore/9780190228613.001.0001/acrefore-9780190228613-e-70. (Accessed: 03/12/22)

Eisenbud, M. (1972) 'Natural versus the unnatural' (CONF-720805--P2). Gesell, T.F. (Ed.).

Evnine, S. J., (2016) 'Making Objects and Events: A Hylomorphic Theory of Artifacts, Actions, and Organisms' Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780198779674.001.0001

Glendinning, C. (1994). 'My name is Chellis & I'm in recovery from Western civilization' Boston: Shambhala.

Gorodeisky, K. (2016) '19th Century Romantic Aesthetics' The Stanford Encyclopedia of Philosophy (Fall 2016 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2016/entries/aesthetics-19th-romantic/>. (Accessed: 03/12/22)

Hamilton, A. (2020) 'Conservatism' The Stanford Encyclopedia of Philosophy (Spring 2020 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2020/entries/conservatism/>. (Accessed: 03/12/22)

Heidelberger, M. (1998) 'Schelling and the Naturphilosophen' Naturphilosophie doi:10.4324/9780415249126-DC092-1. Routledge Encyclopedia of Philosophy, Taylor and Francis,https://www.rep.routledge.com/articles/thematic/naturphilosophie/v-1/sections/schelling-and-the-naturphilosophen. (Accessed: 03/12/22)

Hepburn, B. and Hanne A. (2021) 'Scientific Method' The Stanford Encyclopedia of Philosophy (Summer 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2021/entries/scientific-method/>.(Accessed: 03/12/22)

Heywood, A. (2017) 'Political Ideologies An Introduction' Red Globe Press (Bloomsbury UK) ISBN: 9781137606044, 1137606045 Edition: 6th

Hilpinen, R. (1995) 'Belief Systems as Artifacts' The Monist, 78(2): 136–155. doi:10.5840/monist19957828

IEEE (2017) '10 Engineering Quotes' Transmitter IEEE https://transmitter.ieee.org/10-quotes-spark-engineering-inspiration/ (Accessed: 03/12/22)

Inglehart, R. (1977) 'The Silent Revolution: Changing Values and Political Styles Among Western Publics' Princeton, New Jersey: Princeton University Press. ISBN 978-0-691-10038-8.

Kania, A. (2017) 'The Philosophy of Music' The Stanford Encyclopedia of Philosophy (Fall 2017 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2017/entries/music/>. (Accessed: 03/12/22)

Kaplan, D. (2017) 'Philosophy, Technology, and the Environment' MIT Press, 2017, ix + 255 pp., ISBN 9780262533164

Kukla, R., Wayne, K. (2018) 'Pregnancy, Birth, and Medicine', The Stanford Encyclopedia of Philosophy (Spring 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2018/entries/ethics-pregnancy/>. (Accessed: 03/12/22)

Lee, K. (1999) 'The natural and the artefactual: The implications of deep science and deep technology for environmental philosophy' Lanham, Md: Lexington Books.

Leftwich, A.(2015) 'What is politics? : the activity and its study' Polity Press. ISBN 978-0-7456-9852-6.

Lovejoy, A. (1960) 'Essays in the History of Ideas' New York: Capricorn.

Lovelock, J. (2006) 'The revenge of Gaia: Earth's climate in crisis and the fate of humanity' New York: Basic Books.

McKusick, J. C. (2009) 'Green writing: Romanticism and ecology' New York: St. Martin's Press.

Moore, G. E. (1922). 'Principia Ethica' Cambridge: Cambridge University Press.

Oakeshott, M. (1991) 'Rationalism in Politics and Other Essays' Indianapolis: Liberty Press.

Pamplany, A. (2020) 'The Ethical Desirability of Geoengineering: Challenges to Justice' In Bioethics in Medicine and Society, edited by Thomas Heston, Sujoy Ray. London: IntechOpen, 2020. 10.5772/intechopen.94889

Parfit, D. (1984) 'Reasons and Persons' Oxford University Press

Pepper, D (1994). 'Ecosocialism: From Deep Ecology to Social Justice' OCLC 27727607.

Pinker, S. (2019) 'Enlightenment Now' Penguin Books.

Pivetti, M. (2007) 'Natural and unnatural: activists' representations of animal biotechnology' New Genetics and Society, 26:2, 137-157, DOI: 10.1080/14636770701466840

Porter, R. (2001) 'Enlightenment: Britain and the Creation of the Modern World', Allen Lane History (p. 3).

Preskey, N. (2019) 'Why Are Natural Births Still So Popular?' VICE Online https://www.vice.com/en/article/439mvm/this-is-why-the-natural-birth-movement-isnt-slowing-down (Accessed: 03/12/22)

Preston, C.J. (2015) 'De-extinction: A Tale of Two Visions' Center for Humans and Nature. ttps://humansandnature.org/de-extinction-a-tale-of-two-visions/ (Accessed: 03/12/22)

Preston, C.J. (2018) 'The synthetic age: Outdesigning evolution, resurrecting species, and reengineering our world' https://mitpress.mit.edu/books/synthetic-age. (Accessed: 03/12/22)

Preston, C.J. (2021) 'De-extinction and Gene Drives: The Engineering of Anthropocene Organisms' In: Bovenkerk, B., Keulartz, J. (eds) Animals in Our Midst: The Challenges of Co-existing with Animals in the Anthropocene. The International Library of Environmental, Agricultural and Food Ethics, vol 33. Springer, Cham. https://doi.org/10.1007/978-3-030-63523-7_27). https://link.springer.com/chapter/10.1007/978-3-030-63523-7_27 (Accessed: 03/12/22)

Shelley, M. (1818) 'Frankenstein: Or, The Modern Prometheus' Lackington, Hughes, Harding, Mavor, & Jones. https://literature.org/authors/shelley-mary/frankenstein/index.html (Accessed: 03/12/22)

Sider, T.R. (1991) 'Might theory X be a theory of diminishing marginal value?' Analysis, Volume 51, Issue 4, October 1991, Pages 265–271, https://doi.org/10.1093/analys/51.4.265

Sleat, M. (2016) 'What is a Political Value? Political Philosophy and Fidelity to Reality' Social Philosophy and Policy, 33 (1-2). pp. 252-272. ISSN 0265-0525 https://doi.org/10.1017/S0265052516000285

Srnicek, N., & Williams, A. (2015). 'Inventing the future: Postcapitalism and a world without work'

The Washington Post (1997) Unabomber Special Report: Industrial Society and Its Future by Theodore Kaczynski
https://www.washingtonpost.com/wp-srv/national/longterm/unabomber/manifesto.text.htm (Accessed: 03/12/22).

Thoreau, H. D. (1908). 'Walden, or, Life in the woods' London: J.M. Dent.

Turner, R. (2014) 'Programming Languages as Technical Artefacts' Philosophy and Technology, 27(3): 377–397; first published online 2013. doi:10.1007/s13347–012–0098-z

Wagner, G. (2021) Geoengineering. 1st edn. Wiley. Available at:
https://www.perlego.com/book/2906425/geoengineering-pdf (Accessed: 03/12/22).

Wall, S. (2021) 'Perfectionism in Moral and Political Philosophy' The Stanford Encyclopedia of Philosophy (Fall 2021 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/fall2021/entries/perfectionism-moral/>. (Accessed: 03/12/22)

Walshe, G. (2014). 'Green libertarianism' Ethical Theory and Moral Practice. Springer 17 (5): 955–970. doi:10.1007/s10677-014-9499-7. Baggini, J. (2004). 'Making Sense: Philosophy Behind the Headlines' Oxford University Press. pp. 181–182. ISBN 978-0-19-280506-5.

Bastani A. (2019). 'Fully Automated Luxury Communism: A Manifesto.' Verso

Betz, G. (2012) 'The Detailed Structure of the Sub-debates In: Ethical Aspects of Climate Engineering'. Karlsruhe: KIT Scientific Publishing, 2012
<http://books.openedition.org/ksp/1789>. ISBN: 9782821874343. (Accessed: 03/12/22).

Boyle, M (2019) 'The Way Home: Tales from a life without technology' Oneworld Publications. ISBN 978-1-78607-600-7.

Brennan, A. and Y.-S. Lo, (2021) 'Environmental Ethics', The Stanford Encyclopedia of Philosophy (Winter 2021 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/win2020/entries/ethics-environmental/>.(Accessed: 03/12/22).

Cadwalla, C. (2013) 'Stewart Brand and the Whole Earth Catalog, the book that changed the world' The Guardian Online
https://www.theguardian.com/books/2013/may/05/stewart-brand-whole-earth-catalog (Accessed: 03/12/22)

Curtice, J., & Bryson, C. (2001) 'The measurement of socio-political orientations' In European Social Survey Core Questionnaire Development (pp. 233-257). City University, London: European Social Survey.

Dahlberg, L. (2017) Cyberlibertarianism. Oxford Research Encyclopedia of Communication. https://oxfordre.com/communication/view/10.1093/acrefore/9780190228613.001.0001/acrefore-9780190228613-e-70. (Accessed: 03/12/22)

Eisenbud, M. (1972) 'Natural versus the unnatural' (CONF-720805--P2). Gesell, T.F. (Ed.).

Glendinning, C. (1994). 'My name is Chellis & I'm in recovery from Western civilization' Boston: Shambhala.

Hepburn, B. and Hanne A. (2021) 'Scientific Method' The Stanford Encyclopedia of Philosophy (Summer 2021 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2021/entries/scientific-method/>.(Accessed: 03/12/22)

Heywood, A. (2017) 'Political Ideologies An Introduction' Red Globe Press (Bloomsbury UK) ISBN: 9781137606044, 1137606045 Edition: 6th

IEEE (2017) '10 Engineering Quotes' Transmitter IEEE https://transmitter.ieee.org/10-quotes-spark-engineering-inspiration/ (Accessed: 03/12/22)

Inglehart, R. (1977) 'The Silent Revolution: Changing Values and Political Styles Among Western Publics' Princeton, New Jersey: Princeton University Press. ISBN 978-0-691-10038-8.

Kaplan, D. (2017) 'Philosophy, Technology, and the Environment' MIT Press, 2017, ix + 255 pp., ISBN 9780262533164

Kukla, R., Wayne, K. (2018) 'Pregnancy, Birth, and Medicine', The Stanford Encyclopedia of Philosophy (Spring 2018 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2018/entries/ethics-pregnancy/>. (Accessed: 03/12/22)

Leftwich, A.(2015) 'What is politics? : the activity and its study' Polity Press. ISBN 978-0-7456-9852-6.

Lovelock, J. (2006) 'The revenge of Gaia: Earth's climate in crisis and the fate of humanity' New York: Basic Books.

Moore, G. E. (1922). 'Principia Ethica' Cambridge: Cambridge University Press.

Oakeshott, M. (1991) 'Rationalism in Politics and Other Essays' Indianapolis: Liberty Press.

Pamplany, A. (2020) 'The Ethical Desirability of Geoengineering: Challenges to Justice' In Bioethics in Medicine and Society, edited by Thomas Heston, Sujoy Ray. London: IntechOpen, 2020. 10.5772/intechopen.94889

Parfit, D. (1984) 'Reasons and Persons' Oxford University Press

Pepper, D (1994). 'Ecosocialism: From Deep Ecology to Social Justice' OCLC 27727607.
Pivetti, M. (2007) 'Natural and unnatural: activists' representations of animal biotechnology' New Genetics and Society, 26:2, 137-157, DOI: 10.1080/14636770701466840

Preskey, N. (2019) 'Why Are Natural Births Still So Popular?' VICE Online https://www.vice.com/en/article/439mvm/this-is-why-the-natural-birth-movement-isnt-slowing-down (Accessed: 03/12/22)

Preston, C.J. (2015) 'De-extinction: A Tale of Two Visions' Center for Humans and Nature. ttps://humansandnature.org/de-extinction-a-tale-of-two-visions/ (Accessed: 03/12/22)

Preston, C.J. (2018) 'The synthetic age: Outdesigning evolution, resurrecting species, and reengineering our world' https://mitpress.mit.edu/books/synthetic-age. (Accessed: 03/12/22)

Preston, C.J. (2021) 'De-extinction and Gene Drives: The Engineering of Anthropocene Organisms' In: Bovenkerk, B., Keulartz, J. (eds) Animals in Our Midst: The Challenges of Co-existing with Animals in the Anthropocene. The International Library of Environmental, Agricultural and Food Ethics, vol 33. Springer, Cham. https://doi.org/10.1007/978-3-030-63523-7_27). https://link.springer.com/chapter/10.1007/978-3-030-63523-7_27 (Accessed: 03/12/22)

Sider, T.R. (1991) 'Might theory X be a theory of diminishing marginal value?' Analysis, Volume 51, Issue 4, October 1991, Pages 265–271, https://doi.org/10.1093/analys/51.4.265

Sleat, M. (2016) 'What is a Political Value? Political Philosophy and Fidelity to Reality' Social Philosophy and Policy, 33 (1-2). pp. 252-272. ISSN 0265-0525 https://doi.org/10.1017/S0265052516000285

Srnicek, N., & Williams, A. (2015). 'Inventing the future: Postcapitalism and a world without work'

The Washington Post (1997) Unabomber Special Report: Industrial Society and Its Future by Theodore Kaczynski https://www.washingtonpost.com/wp-srv/national/longterm/unabomber/manifesto.text.htm (Accessed: 03/12/22).

Thoreau, H. D. (1908). 'Walden, or, Life in the woods' London: J.M. Dent.

Wagner, G. (2021) Geoengineering. 1st edn. Wiley. Available at:
https://www.perlego.com/book/2906425/geoengineering-pdf (Accessed: 03/12/22).

Wall, S. (2021) 'Perfectionism in Moral and Political Philosophy' The Stanford Encyclopedia of
Philosophy (Fall 2021 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/fall2021/entries/perfectionism-moral/>. (Accessed:
03/12/22)

Walshe, G. (2014). 'Green libertarianism' Ethical Theory and Moral Practice. Springer 17 (5):
955–970. doi:10.1007/s10677-014-9499-7.

Lee, K. (1999) 'The natural and the artefactual: The implications of deep science and deep
technology for environmental philosophy' Lanham, Md: Lexington Books.

Chapter 6

Allen, C. and Trestman, M. (2020) 'Animal Consciousness' The Stanford Encyclopedia of
Philosophy (Winter 2020 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/win2020/entries/consciousness-animal/>. (Accessed:
03/12/22)

Beauvoir, S. (1989) 'The Second Sex' New York: Vintage Books, Print.MLA (7th ed.)

Chalmers, D. J. (1996) 'The Conscious Mind: In Search of a Fundamental Theory' New York
and Oxford: Oxford University Press.

Ereshefsky, M. (2022) 'Species' The Stanford Encyclopedia of Philosophy (Summer 2022
Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/sum2022/entries/species/>. (Accessed: 03/12/22)

Odenbaugh, J. and Griffiths, P. (2020) 'Philosophy of Biology' The Stanford Encyclopedia of
Philosophy (Summer 2020 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/sum2020/entries/biology-philosophy/>. (Accessed:
03/12/22)

Chapter 7

Andrianantoandro, E., Basu, S., Karig, D. K., and Weiss, R. (2006) 'Synthetic biology: New
engineering rules for an emerging discipline' Molecular Systems Biology 2 (1):E1–E14.

Annas, G., Andrews, L., & Isasi, R. (2002) 'Protecting the Endangered Human: Toward an
International Treaty Prohibiting Cloning and Inheritable Alterations' American Journal of Law &
Medicine, 28(2-3), 151-178. doi:10.1017/S009885880001162X

Bedau, M. and Larson, B. (2013) 'Lessons from Environmental Ethics about the Intrinsic Value of Synthetic Life' In Synthetic Biology and Morality: Artificial Life and the Bounds of Nature, edited by G. E. Kaebnick (Cumberland, RI: MIT Press)

Boldt J. (2013) 'Creating Life: Synthetic Biology and Ethics' In Synthetic Biology and Morality: Artificial Life and the Bounds of Nature, edited by G. E. Kaebnick (Cumberland, RI: MIT Press) (p. 35).

Bostrom, N. (2003) 'Human Genetic Enhancements: A Transhumanist Perspective' The Journal of Value Inquiry, 37(4): 493–506.

Buchanan, A., Brock, D., Wikler, D., and Daniels, N. (2000) 'From Chance to Choice: Genetics and Justice' Cambridge and New York: Cambridge University Press.

Caplan, A. (2010) 'Now ain't that special? The implications of creating the first synthetic bacteria' Scientific American online Guest Blog, May 20. http://blogs.scientificamerican.com/guest-blog/2010/05/20/now-aint-that-special-the-implications-of-creating-the-first-synthetic-bacteria/. (Accessed: 03/12/22)

Coady C.A.J. (2009) 'Playing God, in Human Enhancement Ethics: The State of the Debate' Nick Bostrom and Julian Savulescu. 2009 "Human Enhancement - Hardcover - Julian Savulescu; Nick Bostrom - Oxford University Press". global.oup.com. (Accessed: 03/12/22)

Coleman, J. (1995) 'Playing God or playing scientist: a constitutional analysis of state laws banning embryological procedures.' Pac. LJ 27 (1995): 1331.

Deech, R. (2006) 'Playing God: Who Should Regulate Embryo Research.' Brook. J. Int'l L. 32 (2006): 321.

Farman, Abou (2020) 'On Not Dying: Secular Immortality in the Age of Technoscience' University of Minnesota Press, 2020, https://doi.org/10.5749/j.ctv10rrc6z.

Fukuyama, F. (2002) 'Our Posthuman Future' New York: Farrar, Straus and Giroux

Glover, J. (2006) 'Choosing children: The ethical dilemmas of genetic intervention' New York: Oxford University Press

Groll, D. and Lott, M. (2015) Is There a Role for 'Human Nature' in Debates About Human Enhancement? doi:10.1017/S0031819115000376 The Royal Institute of Philosophy, 2015

Gutmann, A (2011) 'The ethics of synthetic biology: guiding principles for emerging technologies'. Hastings Center Report. 41 (4): 17–22. doi:10.1002/j.1552-146x.2011.tb00118.x. PMID 21845917. S2CID 20662786.

Harrington, M. (2022) 'Peter Thiel on the dangers of progress: The tech billionaire discusses Silicon Valley, Christianity and apocalypse' Unheard, 2022. Accessed at https://unherd.com/2022/07/peter-thiel-on-the-dangers-of-progress/ (Accessed: 03/12/22)

Harris, J. (2009) 'Enhancements are a Moral Obligation', in Julian Savulescu and Nick Bostrom (eds), Human Enhancement, Oxford: Oxford University Press, 2009, 134.

Hartman, L. (2017) 'Climate Engineering and the Playing God Critique' Ethics & International Affairs, 31(3), 313-333. doi:10.1017/S0892679417000223

Hofmann, S. (2017) BMC Medical Ethics 18:56 DOI 10.1186/s12910-017-0215-8

Juengst, E. (1998) 'What does enhancement mean?' in E. Parens, ed., Enhancing Human Traits: Ethical and Social Implications. Washington, D.C.: Georgetown University Press, 1998, pp. 29-47.

Juengst, E. and Moseley, D. (2019) 'Human Enhancement' The Stanford Encyclopedia of Philosophy (Summer 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2019/entries/enhancement/>.(Accessed: 03/12/22)

Kaebnick, G.E. (2013). 'Engineered Microbes in Industry and Science: A New Human Relationship to Nature?' Synthetic Biology and Morality (Basic Bioethics) (p. 51). MIT Press. Kindle Edition.

Kamm, F. (2009) 'What Is and Is Not Wrong With Enhancement?', in Julian Savulescu and Nick Bostrom (eds), Human Enhancement, Oxford: Oxford University Press, 2009, n.13, 103.

Kass, L. (1998) 'The Wisdom of Repugnance: Why We Should Ban the Cloning of Humans' 32 Val. U. L. Rev. 679 Available at: https://scholar.valpo.edu/vulr/vol32/iss2/12 (Accessed: 03/12/22)

Kass, L. (2003) "Beyond Therapy: Biotechnology and the Pursuit of Human Improvement." Paper prepared for the President's Council on Bioethics, Washington, D.C.

Kelley, J. (1993) 'Moral Reasoning and Political Conflict: The Abortion Controversy' The British Journal of Sociology, vol. 44, no. 4, [Wiley, London School of Economics and Political Science, London School of Economics], 1993, pp. 589–612, https://doi.org/10.2307/591412.

Lee, N. (2019). 'The Transhumanism Handbook' Springer Verlag.

Liao M.,Sandberg, A., and Roache, R. (2012) 'Human engineering and climate change', Ethics, Policy & Environment 15.2 (2012), 206–221.

Lustig, A. (2013) 'Appeals to Nature and the Natural in Debates about Synthetic Biology' Synthetic Biology and Morality (Basic Bioethics) (p. 15). MIT Press. Kindle Edition.

Mandle, Jon (2013) 'Synthetic Biology and Public Reason' In Synthetic Biology and Morality: Artificial Life and the Bounds of Nature, edited by G. E. Kaebnick (Cumberland, RI: MIT Press) (p. 131).

McConnell, T. (2010) Journal of Medicine and Philosophy, 35: 415–428, 2010 doi:10.1093/jmp/jhq034 Advance Access publication on July 16, 2010

McKenny, G. (2009) 'Nature as given, nature as guide, nature as natural kinds: Return to nature in the ethics of human biotechnology' In Without Nature? A New Condition for Theology, ed. David Albertson and Cabell King, 152–177. New York: Fordham University Press.

Persson, I. and Savulescu, L. (2012) 'Unfit for the future: The need for moral enhancement' New York: Oxford University Press, 2012,

President's Council on Bioethics (2003) 'Beyond therapy: Biotechnology and the pursuit of happiness' New York: Regan Books.

Preston C. J. (2013) Synthetic Bacteria, Natural Processes, and Intrinsic Value In Synthetic Biology and Morality: Artificial Life and the Bounds of Nature, edited by G. E. Kaebnick (Cumberland, RI: MIT Press) (p. 107).

Preston, C. J. 'Synthetic Biology: Drawing a Line in Darwin's Sand' Environmental Values 17, no.1, (2008): 23-29. www.environmentandsociety.org/node/6022 (Accessed: 03/12/22)

Regis, E. (2008) What Is Life? New York: Farrar, Straus, and Giroux.

Sandel, M. J. (2004) 'The case against perfection: What's wrong with designer children, bionic athletes, and genetic engineering' Atlantic Monthly, April, 51–62.

Schummer, J. (2009) 'The creation of life in cultural context: From spontaneous generation to synthetic biology' In The Ethics of Protocells: Moral and Social Implications of Creating Life in the Laboratory, ed. M. A. Bedau and E. C. Parke, 125–142. Cambridge, MA: MIT Press.

Sikela, J. M. (2006) 'The Jewels of Our Genome: The Search for the Genomic Changes Underlying the Evolutionarily Unique Capacities of the Human Brain' PLoS Genetics, 2(5): e80, doi:10.1371/journal.pgen.0020080 [Available online] (Accessed: 03/12/22)

Streiffer, R. (2019) 'Human/Non-Human Chimeras' The Stanford Encyclopedia of Philosophy (Summer 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2019/entries/chimeras/>. (Accessed: 03/12/22)

Thompson, P. (2003) 'Crossing Species Boundaries Is Even more Controversial than You Think' The American Journal of Bioethics, 3(3): 14–15.

Tolleneer, J., Sterckx, S. and Bonte, P. (2013) 'Athletic Enhancement, Human Nature and Ethics: Threats and Opportunities of Doping Technologies' New York: Springer.

Walker, A. T. (2017) 'God and the Transgender Debate: What does the Bible actually say about gender identity?' The Good Book Company.

Wasserman, D., Asch, A., Blustein, J., and Putnam, D, (2016) 'Disability: Definitions, Models, Experience' The Stanford Encyclopedia of Philosophy (Summer 2016 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/sum2016/entries/disability/>. (Accessed: 03/12/22)

Whitehouse, P. J., Juengst, E., Mehlman, M., and Murray, T. H. (1997) 'Enhancing Cognition in the Intellectually Intact' The Hastings Center Report, 27(3): 14–22.

Chapter 9

Achen, Christopher H. and Bartels, Larry M. (2017) Democracy for Realists: Why Elections Do Not Produce Responsive Government, Princeton: Princeton University Press, 2017. https://doi.org/10.1515/9781400888740

Albrecht, D., Bultena, G, Hoiberg, E. & Nowak, P. (1982) 'Measuring Environmental Concern: The New Environmental Paradigm Scale' The Journal of Environmental Education, 13:3, 39-43, DOI: 10.1080/00958964.1982.9942647

Bai H. (2022) 'The Multiple-Matching Perspective on Value Versus Identity: Investigating How Political Ideology and Party Identity Contribute to Citizens' Support for Political Candidates' Pers Soc Psychol Bull. 2022 Sep 13:1461672221121381. doi: 10.1177/01461672221121381. Epub ahead of print. PMID: 36113113.

Bandalos, D. L. (2017) 'Measurement Theory and Applications for the Social Sciences' The Guilford Press.

Berlin, I. (1958) 'Two Concepts of Liberty', Oxford: Clarendon Press

Bernstein, J. & Szuster, B. (2019) 'The new environmental paradigm scale: Reassessing the operationalization of contemporary environmentalism', The Journal of Environmental Education, 50:2, 73-83, DOI: 10.1080/00958964.2018.1512946
Boateng, G.O. et al. (2018) 'Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer.' Frontiers in public health vol. 6 149. 11 Jun. 2018, doi:10.3389/fpubh.2018.00149

Bogner, F. (2018) 'Environmental Values (2-MEV) and Appreciation of Nature' Sustainability. 10. 350. 10.3390/su10020350.

Bogner, F. X., & Wilhelm, M. G. (1996a) 'Environmental perception of pupils: Development of an attitude and behavior scale' Environmentalist, 16, 95-110.

Bogner, F. X., & Wiseman, M. (1996b) 'Environmental perception of Danish and Bavarian pupils: Towards a methodological framework' Scandinavian Journal of Educational Research, 41, 53-71.

Bogner, F. X., & Wiseman, M. (1997) 'Environmental perception of rural and urban pupils' Journal of Environmental Psychology, 17, 111-122.

Bogner, F. X., & Wiseman, M. (1998) 'Environmental perception of Swiss and Bavarian pupils' Swiss Journal of Sociology, 24, 547-566.

Bogner, F. X., & Wiseman, M. (1999) 'Towards measuring adolescent environmental perception' European Psychologist, 4, 139-151.

Bogner, F. X., & Wiseman, M. (2002a) 'Environmental perception: Factor profiles of extreme groups'. European Psychologist, 7, 225-237.

Bogner, F. X., & Wiseman, M. (2002b) 'Environmental perception of pupils from France and four European regions' Journal of Psychology of Education, 1(7&1), 3-18.

Bogner, F. X., & Wiseman, M. (2004) 'Outdoor ecology education and pupils' environmental perception in preservation and utilization.' Science Education International, 15(1), 27-48.

Bogner, F. X., & Wiseman, M. (2006) 'Adolescents' attitudes towards nature and environment: Quantifying the 2-MEV model' The Environmentalist, 26, 247-254.

Bogner, F.X.; Brengelmann, J.C.; Wiseman, M. (2000) Risk-taking and environmental perception. Environmentalist 2000, 20, 49–62.

Bryson, C. and Curtice, J. (1998), 'The end of materialism?', in R. Jowell et al (eds.), British – and European – Social Attitudes: the 15th report (Aldershot: Ashgate)

Carson, R. and Lear, L. (1998). Lost woods: the discovered writing of Rachel Carson.

Curtice, J., & Bryson, C. (2001) 'The measurement of socio-political orientations' in European Social Survey Core Questionnaire Development (pp. 233-257). City University, London: European Social Survey.

Evans, G, et al. (1996) 'Measuring Left-Right and Libertarian-Authoritarian Values in the British Electorate.' The British Journal of Sociology vol. 47, no. 1, 1996, pp. 93–112. www.jstor.org/stable/591118. Accessed 27 Aug. 2021.

Evans, G. and Heath, A. (1995) 'The measurement of left-right and libertarianauthoritarian values: a comparison of balanced and unbalanced scales', Quality and Quantity, 29, 191-206.

Eysenck, H.J., & Eysenck, S. (1975). Manual of the Eysenck Personality Questionnaire. Hodder and Stoughton.

Helm, B. (2021) 'Love' The Stanford Encyclopedia of Philosophy (Fall 2021 Edition), Edward N. Zalta (ed.), forthcoming URL = <https://plato.stanford.edu/archives/fall2021/entries/love/>. (Accessed: 03/12/22)

Herve A. (2003) 'Factor Rotations in Factor Analyses' in Lewis-Beck M., Bryman, A., Futing T. (Eds.). Encyclopedia of Social Sciences Research Methods. Thousand Oaks (CA): Sage.

Heywood, A. (2017) 'Political Ideologies: An Introduction (6th ed.)' Basingstoke: Macmillan International Higher Education. pp. 14–17. ISBN 9781137606044. OCLC 988218349.

Hoexter, M. (2016) 'A Pocket Handbook of Soft Climate Denial' New Economic Perspectives. http://neweconomicperspectives.org/2016/10/pocket-handbook-soft-climate-denial.html (Accessed: 03/12/22)

Hoexter, M. (2016) 'Living in the Web of Soft Climate Denial' New Economic Perspectives. URL = http://neweconomicperspectives.org/2016/09/living-web-soft-climate-denial.html (Accessed: 03/12/22)

Inglehart, R., C. Haerpfer, A. Moreno, C. Welzel, K. Kizilova, J. Diez-Medrano, M. Lagos, P. Norris, E. Ponarin & B. Puranen et al. (eds.) (2014) 'World Values Survey: Round Four - Country-Pooled Datafile Version' JD Systems Institute. URL = www.worldvaluessurvey.org/WVSDocumentationWV4.jsp. (Accessed: 03/12/22)

Johnson, B., & Manoli, C. C. (2008). 'Using Bogner and Wiseman's model of ecological values to measure the impact of an earth education program on children's environmental perceptions' Environmental Education Research, 14, 115-127.

Kerlinger, F. N. (1972) 'The Structure and Content of Social Attitude Referents: A

Middendorp, C. P. (1978) 'Progressiveness and Conservatism: The Fundamental Dimensions

Nussbaum, M. (1990) 'Love and the Individual: Romantic Rightness and Platonic Aspiration' in Love's Knowledge: Essays on Philosophy and Literature, Oxford: Oxford University Press, 314–34.

of Ideological Controversy and Their Relationship to Social Class' Hague: Mouton.
Paris, C. (2017) 'Reconciling Democratic Theories and Realities: A Review of Christopher H. Achen and Larry M. Bartels, Democracy for Realists: Why Elections Do Not Produce Responsive Government.' The Good Society, vol. 25, no. 1, 2017, pp. 119–27. https://doi.org/10.5325/goodsociety.25.1.0119.
Preliminary Study' Educational and Psychological Measurement 32:613-30.

Pust, J. (2019) 'Intuition' The Stanford Encyclopedia of Philosophy (Summer 2019 Edition), Edward N. Zalta (ed.), URL =
<https://plato.stanford.edu/archives/sum2019/entries/intuition/>.(Accessed: 03/12/22)

Rokeach, M. (1973) 'The Nature of Human Values 'New York: Free Press.

Scruton, R. (2012) 'Green philosophy: How to think seriously about the planet' London: Atlantic Books.

Shrestha, N. (2021) 'Factor Analysis as a Tool for Survey Analysis' *American Journal of Applied Mathematics and Statistics, 2021, Vol. 9, No. 1, 4-11*

Todosijevic, B. (2013) 'Structure of Political Attitudes A Literature Review.' in Political Attitudes and Mentalities. Eastern European Political Cultures: Modeling Studies. (pp.23-52) ArsDocendi-Bucharest University Press

Weiner, S., & Tatum, D. S. (2021) 'Rethinking Identity in Political Science' Political Studies Review, 19(3), 464–481. https://doi.org/10.1177/1478929920919360

Wiseman, M.; Bogner, F.X. (2003) 'A higher-order model of ecological values and its relationship to personality' Personal. Individ. Differ. 2003, 34, 783–794.

Wiseman, M.; Wilson, G.; Bogner, F.X. (2012) 'Environmental Values and Authoritarianism' Psychol. Res. 2012, 2, 25–31.

Chapter 10

Aberbach, J.D., Putnam R.D. , and Rockman, B.A. (1981) 'Bureaucrats and Politicians in Western Democracies' Harvard University Press, 1981.

Cohen, J. (1988) 'Statistical power analysis for the behavioral sciences' (2nd ed.) New York Routledge.

Harvey, W. S. (2011) 'Strategies for conducting elite interviews.' Qualitative research 11, no. 4 (2011): 431-441.

Morris, Z.S. (2009) 'The truth about interviewing elites.' Politics 29, no. 3 (2009): 209-217

Mosley, L. (2013) 'Interview Research in Political Science' Cornell University Press

Putnam, R. D. (1973) 'The political attitudes of senior civil servants in Western Europe: A preliminary report.' British Journal of Political Science 3, no. 3 (1973): 257-290.

Annex A - Chapter 10 Interview Script

[For all participants] Administrative notes:
This is a study for my PhD. The purpose of the study is to better understand policymaker attitudes to nature and technology.

Answers will be anonymous. Your job title will be described in a way you are comfortable with. It should take 15-20mins. If you permit me to record our interview, it will be for my own note-taking purposes only. It will not be released, distributed, or used by anyone not directly involved with this project.

[For primed group] Primer:
Political scientists try to understand the underlying forces that drive political decision-making. The key forces I am interested in are political values. You will no doubt be familiar with the idea that there is a political spectrum spanning left-wing to right-wing.

Now, arguably this isn't the only political spectrum; and some more recent political scientists have claimed that there is in fact a new spectrum that is relevant to politics, and this is about nature and technology.

Some people place great importance on preserving nature, whether that be about preserving ecology and wildlife from human interference, preserving the naturalness of human bodies from biotechnology, or preserving a natural way of life. Meanwhile, some people place great importance on technological progress, on inventing new artifacts that can push the boundaries and limits of what is possible in nature, and again, whether that be in matters of plants and animals, the built environment, the human body, or in our general way of life.

Now, when it comes to policymaking in the real world, we are guided by pragmatic and practical concerns as well as core values. You might be interested in solving climate change, not because you care particularly about the natural environment, but because you care about climate-driven poverty. But the purpose of this survey is to try and pick out your core feelings about nature and technology.

I've got 11 questions, I'm going to ask you, I'd like your thoughts for a minute or two on each. There are no wrong answers so please answer honestly. Thank you.

Annex B - Chapter 10 Participant Job Titles and Departments

Senior Policy Advisor, Science, Research and Innovation, BEIS
Senior Policy Advisor, Science, Research and Innovation   , BEIS
Senior Analyst, Science and Innovation, BEIS
Policy Advisor Natural Environment Resources, DEFRA
Policy Lead, Environmental UK Aid Fund, DEFRA
Analyst, Science and Technology, BEIS
Policy Advisor, Science, Research and Innovation, BEIS
Analyst, Science and Technology, BEIS
Research Finance Advisor, BEIS
Senior Social Researcher, Science and Technology, BEIS
Senior Policy Advisor, R&D Investment, BEIS
Innovation and Science Finance Manager, BEIS
Natural Environment Programme Manager, DEFRA
EU Exit Environmental Policy, DEFRA
Senior Policy Advisor - Energy and Climate Change, BEIS
Nuclear Infrastructure Analyst, BEIS
Science policy advisor, BEIS
R&D policy Advisor, BEIS
Senior Net Zero Policy Advisor,   BEIS
Climate Trade Negotiator, DEFRA
Senior Policy Advisor - Business Innovation, BEIS
Senior Policy advisor for a public science and research agency, BEIS
Senior Policy advisor for a public science and research agency, BEIS
Policy Advisor, Science, Innovation and Growth, BEIS
Senior Policy Advisor - Net Zero, BEIS
Policy Advisor - Net Zero, BEIS