Science, Evaluation, and Morality

Thesis

Science, Evaluation, and Morality

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Abstract

There is considerable dispute over the nature of the relationship between ethics and the natural sciences. This thesis argues that ethics is substantially independent of the natural sciences because the appeals to the natural sciences fail to adequately justify moral judgements about human beings. Specifically, I argue that if appeals to the natural sciences are not adequate to justify the normative assessment of living organisms, then they are not adequate to justify moral judgements about human beings. I consider the following appeals to justify the normative assessment of living organisms. These include the appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; (5) functions; (6) development; (7) species; and (8) the experience of pleasure and pain. I claim that these appeals are inadequate for one or more of the following reasons. One, some versions of the appeals are incompatible with the natural sciences. Two, the appeals justify implausible and counterintuitive moral judgements. Three, the appeals fail to adequately determine what should occur in contrast to what occurs. Four, there are many different appeals which justify contrary moral judgements and no objective means within the natural sciences to privilege one appeal over another. Finally, five, for some appeals there are various parameters which determine what is justified, but there are no objective means within the natural sciences to justify any particular set of parameters over and against alternatives.

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Introduction

At the time of writing in the United Kingdom there is considerable debate over the creation and use of human-animal embryos.[1] The focus of the debate is over plans to update the Human Fertilization and Embryology Act 1990 to permit the creation of these embryos for the purpose of scientific research.

It ought not to be surprising that opponents of these plans, such as the Catholic Church, are those who believe that human embryos are sacred. For example, in his Easter Sunday 2008 homily, Cardinal Keith O'Brien, the Roman Catholic Bishop of St. Andrews and Edinburgh claimed,

> ... I believe that a greater challenge than that even faces us – the possibility now facing our country is that animal – human embryos be produced with the excuse that perhaps certain diseases might find a cure from these resulting embryos.
>
> What I am speaking of is the process whereby scientists create an embryo containing a mixture of animal and human genetic material. If I were preaching this homily in France, Germany, Italy, Canada or Australia I would be commending the government for rightly banning such grotesque procedures.
>
> However here in Great Britain I am forced to condemn our government for not only permitting but encouraging such hideous practices.
>
> Our Prime Minister, Gordon Brown has given the Government's support to the Human Fertilisation and Embryology Bill. It is difficult to imagine a single piece of legislation which, more comprehensively, attacks the sanctity and dignity of human life than this particular Bill. ...
>
> This Bill represents a monstrous attack on human rights, human dignity and human life.[2]

However, religious opinions on this matter are far from monolithic. There are religious proponents of creating human-animal embryos as a means of alleviating human sickness

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[1] Human-animal embryos share DNA, cell components, or cells from different sources. For example, recently, a human-animal embryo was created by inserting a human nucleus (taken from a human skin cell) into a de-nucleated cow cytoplasm (taken from a cow egg cell). See: Fergus Walsh. " UK's first hybrid embryos created." [Webpage]. In: BBC News Website. Available at http://news.bbc.co.uk/1/hi/health/7323298.stm. Accessed: 24 April 2008.

[2] Cited from a copy of the Cardinal's sermon reproduced on the Times Online website. See: Ruth Gledhill. "Cardinal: stop this 'Frankenstein' evil." [Webpage]. In: Times Online. Available at http://timescolumns.typepad.com/gledhill/2008/03/cardinal-stop-t.html. Accessed: 24 April 2008.

and suffering. For instance, Ruth Gledhill and David Lister, writing in the TimesOnline note,

> At least one other senior religious leader also backed the bill. Dr Jonathan Romain, Rabbi of Maidenhead Synagogue, said Judaism was just as concerned at the sanctity of human life as Catholicism but did not condemn the creation of human-animal hybrid embryos for medical research. Instead, it was to be "welcomed as a life-saving development that uses our God-given skills in the noblest of causes."[3]

Nor ought it be surprising that proponents of creating these embryos and of updating the Act are often those with a stake in this medical and scientific research, such as scientists.[4] The embryos are very useful in studies of various diseases including Parkinson's Disease and Alzheimer's Disease. For instance, they are a source of cell-lines, including stem-cell lines.

Proponents of creating these embryos and of updating the Act have responded vigorously to the Roman Catholic Church's view. For instance, the Nobel Laureate Professor Sir Martin Evans said it was not acceptable because using these embryos was needed to develop lifesaving treatments.[5] Labour peer Lord Winston said statements made by Cardinal Keith O'Brien were discrediting the Church, and that his statements were inaccurate.[6] Finally, Professor Chris Shaw of Kings College, London, remarks,

> We think there is nothing illegal, immoral or unethical about this. While we understand the concerns, we think they are largely founded on misinformation. People think we are generating some sort of hybrid

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[3] Ruth Gledhill and David Lister. "Cardinal Keith O'Brien attacks 'monstrous' human embryo Bill." [Webpage]. In: Times Online. Available at http://www.timesonline.co.uk/tol/comment/faith/article3597851.ece?token=null&offset=12. Accessed: 24 April 2008.

[4] Interestingly, the Human Embryology and Fertilization Authority authorized the creation of one type of chimaeric embryos prior to the passing of this update of the Act. See: Walsh. " UK's first hybrid embryos created."

[5] Pallab Ghosh. "Stem cell pioneer backs embryo research." [Webpage]. In: BBC News Website. Available at http://news.bbc.co.uk/1/hi/health/7338706.stm. Accessed: 24 April 2008.

[6] "Peer and Church clash on embryos " [Webpage]. In: BBC News Website. Available at http://news.bbc.co.uk/1/hi/uk_politics/7310918.stm. Accessed: 24 April 2008.

> animal. This is just cells, just for science. No animal is ever going to be created.[7]

Clearly, the two views are deadlocked. So how could they be reconciled or resolved? Ought we create and use human-animal embryos? Are those scientists who create and use them guilty of committing a monstrous act?

The purpose of this project is to look at the role, if any, the natural sciences have in answering such ethical questions.[8] More specifically, its goal is to ascertain the extent to which ethics depends upon the natural sciences.[9] My conclusion is that ethics is substantially but not completely independent of the natural sciences.

Of course, such a conclusion is not novel. However, I believe my rationale for holding it is. Specifically, it does not draw upon the standard lines of argument within the philosophical literature which would also support this conclusion. Rather my argument adopts the metaphysical assumptions of my naturalistic opponents who do believe the natural sciences can and do adequately justify moral judgments about human beings.[10] For instance, I assume, for the sake of argument, the premises of this form of ethical naturalism, that: (1) ethical terms are definable in non-ethical, natural terms; (2) ethical conclusions are derivable from non-ethical premises; (3) ethical properties are natural

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[7] "Bioethics: Human-animal hybrid embryos." [Webpage]. In: BBC News Website. Available at http://www.bbc.co.uk/religion/ethics/animals/using/hybridembryos_2.shtml. Accessed: 24 April 2008.

[8] What I mean by the natural sciences are: "**1.** the sciences collectively that are involved in the study of the physical world and its phenomena, including biology, physics, chemistry, and geology, but excluding social sciences, abstract or theoretical sciences such as mathematics, and applied sciences. **2.** any one of these sciences." See: "natural science," in *Collins English Dictionary* (Glasgow, 1991).

[9] What I mean by ethics is: "...the philosophical study of the moral value of human conduct and of the ruiles and principles that ought to govern it; moral philosophy." See: "ethics," in *Collins English Dictionary* (Glasgow, 1991).

[10] I should stress at the outset that I do not have any quarrel with either a broadly construed naturalism or ethical naturalism. That is, I do not have problems with a naturalism or ethical naturalism which accepts there are facts which may be investigated and understood outside the natural sciences. However, I do take issue with these doctrines when they hold that facts must be investigated and understood solely within the natural sciences. In other words, I take issue with these doctrines where they hold that natural or objective phenomena must be conceived, investigated, and understood purely in terms of the natural sciences. For instance, I object to the claim that ultimately ethics can be reduced to biology, chemistry, and physics.

properties—where a natural term or property is one that can be employed or referred to in natural scientific explanations.[11] In other words, I assume, for the sake of argument, that ethics is dependent upon the natural sciences. I then argue that this kind of project fails because the appeals made to the natural sciences to justify moral judgements about human beings are not adequate.

Together the conclusion and rationale form what I call the central claim of the thesis. This is:

> Ethics is substantially independent of the natural sciences because appeals made to the natural sciences are not adequate to justify moral judgements about human beings.[12]

However, at the outset, I ought to be clear about the kind of appeals I consider. I take it that the adequate justification of moral judgements consists of sufficiently privileging particular occurrences, to which the judgements refer, over and against the possible alternatives. That is, I believe that to adequately justify the claim "*X* ought to occur," one must sufficiently privilege the occurrence of *X* over and against its alternatives *Y*, *Z*, *A*, ... etc. This involves providing some basis for privileging the occurrence of X over and against its alternatives. So for example, to adequately justify the claim that "One ought to tell the truth," one must sufficiently privilege the occurrence of 'telling the truth' over and against 'telling lies'. This involves some basis for privileging 'telling the truth' over and against 'telling lies'. In this case, Kant would argue that Reason provides the basis for privileging telling the truth over and against telling lies. The appeals I consider and examine are appeals to the natural sciences which attempt to *objectively* privilege particular occurrences over and against the alternatives. That is, they are appeals to some objective aspect or feature of the causal order or to some state of affairs which supervenes

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[11] Roger Crisp, "naturalism, ethical," in *The Oxford Companion to Philosophy*, ed. Ted Honderich (Oxford; New York, 1995).

[12] Henceforth, I shall generally refer to this proposition as the Central Claim.

upon it. It is these aspects or features which distinguishes between what ought to occur and what does occur. (They are objective precisely in the sense they do not rely upon any kind of [subjective] agency to distinguish between what ought to occur and what does occur.) One example is the appeal to typicality. This tries to privilege particular occurrences on the basis of its regularity within the causal order.

I also ought to note that the appeals I consider come from both the scientific and philosophical literature. In the latter case, I look at the work of Larry Arnhart, William Casebeer, and Philippa Foot. However, in the former case, the appeals are not made to justify moral judgements of human beings. Rather they are made to justify normative assessments of living organisms which occur in the literature on organisms' character traits, health, and welfare.

I look at these appeals for four reasons. The first is that the natural sciences generally do not consider moral judgements of human beings but they do consider normative assessments of living organisms. The second is that I believe that the moral judgement of human beings is a special case of the normative assessment of living organisms. In other words, I take it that the moral judgement of human beings is a kind of normative assessment of living organisms.[13] Consequently, if the appeals are not adequate in the general case they are not adequate in the specific case. The third reason is that the normative assessment of living organisms avoids the complications of human agency and rationality. Finally, the general case has the advantage of broader applicability.

I then argue that these appeals are not adequate to justify normative assessments because one or more of the following reasons apply: (1) they fail to sufficiently privilege

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[13] Even if this proposition is incorrect, it is a very natural proposition for my opponents to hold.

what should occur over and against alternatives; (2) they justify normative assessments which are strongly counter-intuitive; or (3) some appeals, or versions of some appeals are not compatible with the natural sciences.

I ought to stress that the sense of 'should' I use here is evaluative. One must not confuse this use with the descriptive and predictive senses of should, which is easily done. Take for example, the claim "Human beings should be born with two eyes." The 'should' here could equally be descriptive, predictive, or evaluative.

These different senses of 'should' refer to different kinds of norm which are respectively descriptive, predictive and evaluative. Descriptive norms refer to various states of affairs which may be distinguished from alternatives. For instance, what is typical or what is functional can delineate descriptive norms. In our example, it is *typical* that human beings are born with two eyes. Predictive norms refer to what we have good reason to expect *ceteris paribus*. And in our example, all other things being equal, human beings will be born with two eyes rather than one. Finally evaluative norms refer to various states of affairs which should occur (for some reason) in contrast to alternatives. In our example, there is some reason why human beings should be born with two eyes rather than one, such as the occurrences are good, valuable, or appropriate. The different kinds of norm may also be distinguished by what we would say where they fail to obtain. In the case of descriptive norms we would say something like that it is *unusual*. While in the case of predictive norms we would say something like it is *surprising*. And in the case of evaluative norms we would say something like it is *defective*.

The confusion between the evaluative sense of should and the other senses of 'should' generally occurs where descriptive or predictive senses of should are understood

evaluatively. In other words, claims concerning what typically occurs, or will occur *ceteris paribus*, are understood as evaluative norms, such that something is defective if it is atypical or unanticipated. Of course, one could argue that something is defective if it is atypical or unanticipated. But this needs some argument to back it up, and, if I am correct, the arguments fail.

So to be clear, I distinguish the evaluative sense of should from other senses by the use of a subscript e. That is, the evaluative sense of should is denoted by $should_e$. The descriptive and predictive senses of should are respectively denoted by $should_d$ and $should_p$.

The thesis is divided into eight further chapters. Chapter 1 lays the foundation for my defence of the Central Claim of the thesis. It begins by describing what I take the claim of substantial independence to entail. It then distinguishes my argument from the standard arguments within the philosophical literature and introduces it. Finally, I consider three philosophers, Larry Arnhart, William Casebeer, and Philippa Foot, whose work can be viewed as a challenge to the Central Claim because they provide an account of moral judgement grounded within the natural sciences. However, criticism of their work is deferred to Chapter 7 so that the arguments of this thesis can be bought to bear.

Chapter 2 provides an account of the normative assessment of living organisms using the example of domesticated pigs. It also characterizes the appeals used within the natural sciences to justify normative assessments of living organisms. These include appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; (5) the experience of pleasure and pain; (6) functions; (7) development; and (8) species.

I claim that these appeals to justify normative assessments of living organisms are not adequate. Chapters 3-6 present my case. Chapter 3 examines the appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; and the experience of pleasure and pain. Chapters 4-6 respectively scrutinizes the appeals to function, development, and species.

Chapter 7 then applies the arguments of Chapters 3-6 to the work of Larry Arnhart, William Casebeer, and Philippa Foot discussed in Chapter 1. These authors make use of one or more of the above appeals in justifying moral judgements of human beings.

Finally, in the Conclusion I look at the implications of my argument.

Chapter 1: Ethics and the Natural Sciences

1. Introduction

The purpose of this chapter is to lay the foundation for my defence of the central claim of this thesis. This is:

> Ethics is substantially independent of the natural sciences because the appeals made to the natural sciences are not adequate to justify moral judgements about human beings.[1]

This foundation will involve four elements. The first consists of spelling out what I mean by ethics being 'substantially independent' of the natural sciences. I do this by exploring the kinds of contribution the natural sciences could conceivably make to ethics. This is explained in terms of six different hypotheses concerning the extent of the connection between ethics and the natural sciences. I then specify what the claim that ethics is substantially independent of the natural sciences means with respect to these kinds of contribution.

The second element consists of distinguishing my argument for the Central Claim from the standard arguments, doctrines and traditions within the philosophical literature which would also support it. For example, it is thought that the natural sciences have no role in ethics—let alone a role in justifying moral judgements—because logically one cannot directly move from matters of fact to matters of value. In contrast to this, like my opponents, I believe that this argument is not decisive. My argument does not draw upon these. Rather I engage with opponents of the Central Claim on their own ground not on grounds sympathetic to my position.

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[1] Henceforth, I shall generally refer to this proposition as the Central Claim.

The third element involves introducing my argument for the Central Claim. This connects moral judgments concerning human beings with the normative assessments of living organisms. Specifically, I claim that if the natural sciences are not adequate to justify normative assessments of living organisms, then they are not adequate to justify moral judgements about human beings.[2] I argue that the natural sciences are not adequate to justify normative assessments of living organisms. Therefore, the natural sciences are not adequate to justify moral judgements about human beings.

The Central Claim will follow given that the justification of moral judgements is a core task of ethics. Consequently, if the natural sciences do not justify moral judgements about human beings then they fail to make a foundational contribution to ethics, which means that ethics must be substantially independent of them.

It emerges that the contentious premiss of my argument for the Central Claim is the claim that the natural sciences are not adequate to justify normative assessments of living organisms. It is for this reason that the remainder of the thesis focuses upon demonstrating that this is the case.

Finally, I end the chapter by considering some views that run counter to my own. Specifically, I examine the work of three philosophers: Larry Arnhart, William Casebeer, and Philippa Foot. These authors apparently hold that the natural sciences are sufficient to justify moral judgements about human. Consequently, their views present a challenge to my Central Claim.

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[2] Clearly, moral judgements about human beings are a kind of normative assessments of living organisms. However, if this point is not clear I will make it so in section 4.1.

2. Ethics is substantially independent of the natural sciences

2.1 The relationship between ethics and the natural sciences

William Rottschaefer remarks that the sciences might make six different and increasingly controversial kinds of contribution to ethics.[3] These are expressed in terms of hypotheses concerning the degree to which the natural sciences and ethics could be connected.[4] I adopt his descriptions because I believe they provide an excellent characterization of the different kinds of contributions the natural sciences might make to ethics. The first of his six hypotheses proposes the minimal connection between the two domains, while the last hypothesis proposes the maximal connection between them. The others range in strength between these lower and upper limits.

The first hypothesis is called the Informational Connection Hypothesis.[5] It asserts that factual information of the kind provided by the natural sciences is important in both ethical decision-making and understanding.[6] For instance, human normative theories may state that human beings have an obligation to feed the hungry. But in order to properly discharge this obligation human beings need to know the facts with respect to human nutrition. Presumably, the best source of these facts is the sciences of biology.[7] And as Rottschaefer notes, this minimal connection between the two domains is acknowledged even by those who maintain that ethics and the natural sciences are substantially separate.[8]

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[3] William A. Rottschaefer, *The Biology and Psychology of Moral Agency* (Cambridge, 1998), 21.
[4] Rottschaefer cashes out the continuum in terms of moral agency, which is the focus of his work. However, I believe it is evident that what he says concerning the relationship between the sciences and moral agency applies directly to the relationship between the sciences and ethics.
[5] Rottschaefer, *The Biology and Psychology of Moral Agency*, 21.
[6] Rottschaefer, *The Biology and Psychology of Moral Agency*, 21.
[7] I believe they are not the only source for such facts *pace* certain kinds of eliminativists.
[8] Rottschaefer, *The Biology and Psychology of Moral Agency*, 21.

The second hypothesis is called the Explanatory Connection Hypothesis.[9] It claims that human moral capacities have various biological components and that the biological and psychological sciences provide descriptive, explanatory, and predictive information concerning these capacities.[10] (Broadly speaking, human moral capacities are those capacities required for human beings to act morally.) Rottschaefer uses the example of human developmental psychology which provides an explanation of the origin and development of empathy in human children. This connection is obvious given that empathy is an important, if not essential component of moral character and agency. For example, those without empathy typically have little regard for others because they cannot understand how they think and feel. Again, those who hold that ethics and the natural sciences are substantially separate do not object to this hypothesis.

The third hypothesis is called the Critical Connection Hypothesis.[11] This contends that the sciences may properly critique the claims of morality and ethics.[12] For instance, it holds that the sciences of biology and psychology may appraise common sense or philosophical views of human moral capacities and the nature and function of morality and determine that they are wrong or in error. Take for example, the common sense and philosophical view that human beings can genuinely be altruistic.[13] The Critical Connection Hypothesis would maintain that if biologists demonstrated that all apparently altruistic action was ultimately 'selfish', that is, all 'altruistic' actions were ultimately undertaken for the benefit of the agent rather than the beneficiary, then the biologists could rightly claim that the view human beings ought to be altruistic is wrong. On this hypothesis, separatists may demur.

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[9] Rottschaefer, *The Biology and Psychology of Moral Agency*, 22.
[10] Rottschaefer, *The Biology and Psychology of Moral Agency*, 22.
[11] Rottschaefer, *The Biology and Psychology of Moral Agency*, 22-23.
[12] Rottschaefer, *The Biology and Psychology of Moral Agency*, 22-23.
[13] The example is adapted from Rottschaefer.

The fourth hypothesis is called the Normative Connection Hypothesis.[14] This maintains that, general *prima facie* normative principles can be derived concerning what is good for human beings to do morally and what is morally permissible and impermissible from biological knowledge in conjunction with knowledge from other sources.[15]

The generation of normative principles concerning what is good for human beings to do morally and what is morally permissible and impermissible is at the heart of ethics. Arguably, it is one of the central tasks of any system of ethics which by definition is concerned with the actions and character of moral agents. Consequently, the Normative Connection Hypothesis is the most divisive. Rottschaefer notes, it is controversial because it asserts that the so-called fact-value gap may be bridged.[16]

The fifth hypothesis is called the Metaethical Connection Hypothesis.[17] This hypothesis claims that if the explanatory hypothesis is established, then it may be concluded that the (biological) capacities human beings have for morality, such as our capacity for moral agency, provide us with relatively reliable means for achieving moral ends.[18] Consequently, we can appeal to these capacities in attempting to understand the nature and function of morality, and in attempts to justify particular aspects of morality such as moral beliefs, motivations, and actions.[19] Rottschaefer uses the case of evolutionary biology which has apparently established that morality plays a significant role in contributing to biological fitness, and thus to the probability of survival and reproduction. In effect, if the hypothesis is true, the sciences of biology can identify what is morally valuable, and thus what actions are morally forbidden, required, or permissible.

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[14] Rottschaefer, *The Biology and Psychology of Moral Agency*, 23.
[15] Rottschaefer, *The Biology and Psychology of Moral Agency*, 23.
[16] Rottschaefer, *The Biology and Psychology of Moral Agency*, 23.
[17] Rottschaefer, *The Biology and Psychology of Moral Agency*, 24.
[18] Rottschaefer, *The Biology and Psychology of Moral Agency*, 24.
[19] Rottschaefer, *The Biology and Psychology of Moral Agency*, 24.

For example, if the Metaethical Connection Hypothesis is true, biological fitness is either intrinsically or instrumentally morally valuable. Therefore, Rottschaefer says one could justify actions promoting biological fitness as being morally required or permissible.[20] So if the Metaethical Connection Hypothesis is true, one can make the move 'good', 'bad', 'correct', 'wrong' etc., *biologically* speaking to 'good', 'bad', 'correct', 'wrong' etc., *morally* speaking. In other words, the metaethical hypothesis implies the normative hypothesis.

The final hypothesis is called the Meaningful Hypothesis. This contends that accounts of morality and ethics derived from the sciences of biology can make an important contribution to the conception of a meaningful human life.[21] However, in Rottschaefer's formulation of the hypothesis, other conceptions of ethics and morality are not eliminated, unlike other views at this end of the continuum like E. O. Wilson's.[22] This is because he is a self-described integrationalist with respect to the relationship between the natural sciences and ethics.[23] So on Rottschaefer's view, other conceptions of ethics and morality are not eliminated because instead the natural sciences are integrated with them.

I am not convinced that Rottschaefer's Meaningful Connection Hypothesis represents a greater degree of connection than the Metaethical Connection Hypothesis. This is because his description of the Meaningful Connection Hypothesis seems to be entailed by accepting the Metaethical Connection Hypothesis. Nevertheless, I include it for the sake of completeness.

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[20] Rottschaefer, *The Biology and Psychology of Moral Agency*, 24.
[21] Rottschaefer, *The Biology and Psychology of Moral Agency*, 24-25.
[22] See Michael Ruse and O. Wilson Edward, "Moral Philosophy as Applied Science," *Philosophy* 61 (1986), Edward O. Wilson, *Consilience: The Unity of Knowledge* (London, 1998), Edward O. Wilson, *On Human Nature* (London, 1995).
[23] The integrationalist claims that both biology and psychology have the resources to contribute to the delineation and refinement of these visions [of a meaningful human life] and thus to making the life of moral agency meaningful. See: Rottschaefer, *The Biology and Psychology of Moral Agency*, 24.

I take it that acceptance of any particular hypothesis entails acceptance of the prior hypotheses. For instance, acceptance of the Critical Connection Hypothesis entail acceptance of the Explanatory and Information Connection Hypotheses. And acceptance of the Meaningful Connection Hypothesis entails acceptance of the Metaethical, Normative, Critical, Explanatory, and Informational Connection Hypotheses. This is because the prior hypotheses (if any) are pre-requisites for the later ones. For example sustaining the Normative Connection Hypothesis requires that the natural sciences make informational, explanatory, and critical contributions to ethics. One could not claim that the natural sciences can help to determine what should$_e$ occur in contrast to what actually does occur, if the natural sciences could not provide information relevant to ethical decisions or if we could not use the natural sciences to criticise ethical claims.

So having described a scale for the possible relationships of dependence between ethics and the natural sciences, I now need to spell out what the claim of substantial independence means. Essentially, the claim of substantial independence makes two assertions. The first is that the Critical Connection Hypothesis is true, although this assertion is made with a caveat I shall come to. The second is that the Normative Connection Hypothesis is false.

2.2 The Critical Connection Hypothesis is true

I argue that the Critical Connection Hypothesis is true is because I believe the maxim, "Ought implies can," is true. That is, I believe it must be possible for a human being to be or do X, if we are to rightly claim that they ought to be or do X. For instance, the claim, "Human beings ought to refrain from murder," assumes that human beings have the capacity to refrain from murder. And I take it that it is correct to criticize the moral theories

or some pertinent piece of moral discourse if the natural sciences can demonstrate that it is true that human beings lack some moral capacity that moral theory and moral discourse claim they have. For instance, it would be untenable for some moral theory to claim that human beings are morally responsible if the natural sciences demonstrate that human behaviour is hard-wired by sequences of DNA such that the hard-wiring does not permit meaningful choices.

Yet this acceptance of the Hypothesis is made with the following caveat in mind: any criticisms of common moral intuitions or ethical theories made by the natural sciences must be tentative. This is because scientific explanations are not necessarily true, and may well be false. Indeed, the natural sciences are littered with explanations of phenomena that were once believed to be true, but ultimately have been shown to be false. Furthermore, on one view of the natural sciences, the natural sciences do not present true propositions. Rather they present propositions which have not yet been falsified.[24]

2.3 The Normative Connection Hypothesis is false

I argue that the Normative Connection Hypothesis is false. That is, I maintain that the natural sciences do not objectively sustain adequate general *prima facie* normative principles about what is good for human beings to do morally, and what is morally permissible and impermissible. I maintain this because I believe I can demonstrate that the appeals made to the natural sciences are not adequate to justify moral judgements about human beings. Specifically, I argue that the appeals fail to sufficiently privilege particular outcomes. As a result they fail to effectively sustain the difference between what should$_e$ occur and what actually does.

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[24] This is the doctrine of falsificationalism which was advocated and made popular by the philosopher of science Karl Popper. For an overview of falsificationism see: Alain Chalmers, *What is This Thing Called Science?*, 3rd ed. (Buckingham, 1999), esp. Chapters 5-7, pp 59-103

I call this difference the Normative Distinction. Take for example, the moral judgement "Beatrice the burglar is bad because she steals." Justifying this claim involves adequately privileging one possible causal outcome: Beatrice's not stealing in contrast to the fact that Beatrice does in fact steal. My argument is that I can demonstrate that the appeals made to the natural sciences fail to do this sufficiently or adequately.

Now if the Normative Distinction is not adequately sustained by the natural sciences then the Normative Connection Hypothesis is false. Adequate *prima facie* normative principles concerning what is morally permissible and impermissible requires that the difference between what should$_e$ occur in contrast to what actually does occur ought to be adequately sustained. So if I am correct that the natural sciences do not adequately sustain this difference, then they cannot derive adequate *prima facie* normative principles, and the Normative Connection Hypothesis is false.

The claim that ethics is substantially but not completely independent of the natural sciences follows from the claim that the Critical Connection Hypothesis is true and the Normative Connection Hypothesis is false. Specifically, I hold that ethics is substantially rather than completely independent of the natural sciences because accepting the Critical Connection Hypothesis entails that I accept the natural sciences make a contribution to the characterization, explanation, and criticism of ethics. I take it that this entails that there is a degree of dependence between them. However, the claim that the Normative Connection Hypothesis is false entails that the natural sciences cannot support the crux of ethics. That is, if the hypothesis cannot be sustained then the natural sciences cannot properly formulate general *prima facie* principles about what it is good for human beings to do morally, and therefore what is morally permissible and impermissible. But to formulate these principles

and permissions is the *raison d'être* of ethics. Consequently, ethics is substantially independent of the natural sciences.

3. A distinctive approach

The claim that the natural sciences are not adequate to justify moral judgements about human beings is not new to moral philosophy. Indeed, there are long standing normative theories within moral philosophy, which either directly or indirectly maintain that this is the case. Take for instance the following examples.

Anti-naturalistic normative theories such as Divine Command Theory argue that the natural sciences are irrelevant to the issue of justifying moral judgements about human beings because it is God who justifies them.[25] So to take our burglar Beatrice for example, the reason why Beatrice should$_e$ not steal in contrast to the fact that she does steal is because God decrees that stealing is wrong.[26]

The doctrine of non-cognitivism holds that moral statements, such as moral judgements are not propositions. That is, they hold that moral judgements such as, "It is wrong to murder," is not a statement which is either true or false since it has no truth conditions. Yet the natural sciences are concerned with propositions—with statements which have truth conditions.[27] Consequently, the natural sciences are largely orthogonal to the justification

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[25] The point assumes that the Divine Command Theorist holds that what is good and right is that which God commands rather than God commanding what is good and right. If God commands what is good and right then it is possible that the natural sciences slip in the back-door if they can discover what is good and right. However, in this case, God is somewhat superfluous and consequently *Divine* Command theory collapses into something else.

[26] The fact that God may burn her for eternity in to punish her for not doing what she was told to do may also give her a reason to obey, although it is not this fact which technically justifies the claim according to Divine Command Theory.

[27] That is, according to orthodox accounts of the natural sciences the natural sciences are concerned with propositions. There are alternative accounts of the natural sciences, which hold otherwise, such as those which claim that the natural sciences are socially constructed.

of moral judgements if non-cognitivism and the orthodox account of the natural sciences are correct.

Finally there are long standing arguments against the use of the natural sciences to justify moral judgements. These assert that the appeal to the natural sciences involves an invalid form of argument. Specifically, they maintain that their use involves the Naturalistic Fallacy or a failure to recognise Hume's law.

My approach, however, is different and distinctive. It does not draw upon ethical or metaethical theories sympathetic to my claim. Neither does it involve arguments based upon the Naturalistic Fallacy or an appeal to Hume's Law. Yet ultimately I reach the same conclusion that would be entailed if the ethical traditions and doctrines sympathetic to my claim were true, or if the Naturalistic Fallacy or an appeal to Hume's Law applied to all uses of the natural sciences to justify moral judgements.

However, before I go on to describe my argument for the Central Claim, I believe it is worthwhile to discuss why I do not wish to avail myself of arguments based upon the Naturalistic Fallacy or Hume's Law since these have be been the mainstays of objections to the idea that the natural sciences can be used to justify moral judgements about human beings. I do not discuss them in detail because my argument for the Central Claim is independent argument: its success does not depend on either the success or the failure of these other approaches.

3.1 Not *an appeal to the Naturalistic Fallacy*

What the naturalistic fallacy is supposed to be, and what it encompasses when invoked in the literature varies somewhat. The term is used to refer to appeals to: (1) Hume's Law; (2) G. E. Moore's open question argument; (3) G. E. Moore's argument from the addition of

meaning; (4) the genetic fallacy; or (5) various combinations of the above.[28] However, the term properly ought to refer to appeals to Moore's open question argument and the argument from the addition of meaning since these are the arguments Moore appealed to in his *Principia Ethica* to contend that naturalistic theories are guilty of a naturalistic fallacy.

So given that it is more accurate to distinguish between appeals to Hume's Law and Moore's arguments rather than conflate them, I shall examine these different arguments separately.

Roughly, the Naturalistic Fallacy refers to the conflation of some naturalistic property with the property of goodness. [29] This is an error, or so Moore contends, because it will always be an open question whether the naturalistic property in question is indeed *good.* The open question argument is a formalization of this position. However, this error can also be highlighted by the argument from the addition of meaning.[30] This is the argument that because statements such as, "What is pleasurable is good," provide extra information concerning what is good, we cannot reduce the good to the pleasurable or indeed to any naturalistic property. In this case if 'good' meant pleasurable, then to say, "What is pleasurable is good," would not add any information, since 'pleasurable' would be identical to 'good'. However, Moore asserts that it does.

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[28] William F. Rottschaefer claims that there are three forms of the naturalistic fallacy: (1) the genetic—which is the genetic fallacy in another guise; (2) the deductive—which is Hume's Law under another name; and (3) the open question form—which is Moore's open question argument. See [28] William A. Rottschaefer, "Evolutionary Ethics: An Irresistible Temptation: Some Reflections on Paul Farber's The Temptation of Evolutionary Ethics," *Biology and Philosophy* 12 (1997). Given its minor role in the literature I do not consider the genetic form of the fallacy.

[29] G. E. Moore, *Principia Ethica* (Cambridge, 1903).

[30] William D. Casebeer includes the open-question argument and the argument from the addition of meaning in his discussion of the naturalistic fallacy *qua* Moore. See William D. Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition* (London, 2003).

I take it that the open question argument and the argument from the addition of meaning fail because they mistakenly hold that claims concerning what is good are analytic statements rather than synthetic statements.[31] In other words, they mistakenly hold that such propositions are definitions rather than being contestable matters which are contingent upon the nature of the world. The open question argument and the argument from the addition of meaning fail because they hold that propositions such as "what is pleasurable is good" is not true in virtue of the meaning of the words. Rather the truth of such propositions is something that we need to discover.

So one of the main reasons I do not employ the Naturalistic Fallacy objection to argue against appealing to the natural sciences to justify moral judgements about human beings is that it largely misses the point. It would apply if the applicable moral propositions were definitions, but they are mostly contestable matters contingent upon the nature of the world.

3.2 Not *an appeal to Hume's Law*

Hume's law claims that it is impossible to derive an 'ought' (or normative proposition) from an 'is' (or descriptive proposition).[32] In other words, it asserts that there is a logical gulf between fact and norm, which cannot be bridged.

The 'law' is derived from a passing discussion in Hume's *A Treatise of Human Nature*. Almost as an afterthought he notes,

> I cannot forbear adding to these reasonings an observation, which may, perhaps, be of some importance. In every system of morality, which I have hitherto met with, I have always remark'd, that the author proceeds for some time in the ordinary way of reasoning, and establishes the being of a God, or makes observations concerning human affairs; when of a sudden I am surpriz'd to find, that instead of the usual copulations of propositions, *is*, and *is not*, I meet with no proposition that is not

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[31] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 20-21.
[32] Simon Blackburn, "Hume's Law," in *The Oxford Dictionary of Philosophy* (Oxford, 1994).

> connected with an *ought*, or an *ought not*. This change is imperceptible; but is, however, of the last consequence. For as this *ought*, or *ought not*, expresses some new relation or affirmation, 'tis necessary that it shou'd be observ'd and explain'd; and at the same time that a reason should be given, for what seems altogether inconceivable, how this relation can be a deduction from the others, which are entirely different from it. But as authors do not commonly use this precaution, I shall presume to recommend it to the readers; and am persuaded, that this small attention wou'd subvert all the vulgar systems of morality, and let us see, that the distinction of vice and virtue is not founded merely on the relation of objects, nor is perceiv'd by reason. [Italics in original][33]

The following is an example taken from Rottschaefer.[34]

(I.) 1. Evolution has shaped humans to pursue the communal good.

2. Therefore, the communal good is morally valuable.

In this example there is a move from purely factual premises to a normative conclusion.

The reason such arguments are fallacious is because the conclusion is not contained in the premises. However, as Rottschaefer (among others) has noted, this argument can be made valid by adding another premise.[35] For example,

(II.) 1. Evolution has shaped humans to pursue the communal good.

2. What is morally valuable is what evolution has shaped human beings to pursue

3. Therefore, the communal good is morally valuable.

(II) is a logically valid argument, though perhaps not a convincing one. However, this is a significant point. As long as there is a bridging premise Hume's Law does not apply notwithstanding we move from a factual premise to a normative conclusion.

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[33] L. A. and Nidditch Selby-Bigge, P. H., ed., *Hume's Treatise of Human Nature*, 2nd ed. (Oxford, 1978), 469.

[34] Rottschaefer, "Evolutionary Ethics: An Irresistible Temptation: Some Reflections on Paul Farber's The Temptation of Evolutionary Ethics," 372.

[35] Rottschaefer, "Evolutionary Ethics: An Irresistible Temptation: Some Reflections on Paul Farber's The Temptation of Evolutionary Ethics," 372.

Moreover, the bridging premises are empirical or synthetic propositions which come under the rubric of the natural sciences. For instance, the claim, "What is morally valuable is what evolution has shaped human beings to pursue," is a proposition which the natural sciences could, at least in principle, address.

In contrast, what I shall argue is that where such propositions are used in moral judgements of human beings, say as norms, they are not adequately justified by appeals to the natural sciences. Take for example, the premise above, "Evolution has shaped humans to pursue the communal good." If this is to be used in the moral judgement of human beings, human beings should$_e$ pursue the communal good. Otherwise, we cannot say of human beings who do not pursue it that they are bad or defective (or some other negative evaluative term). Likewise, we cannot say of human beings who do pursue it that they are good. My contention is that we cannot appeal to evolution to justify this as a norm because such an appeal is either implausible—it justifies counterintuitive moral judgements—or it does not adequately sustain the Normative Distinction. In other words, I reject such appeals because they are implausible or they do not sufficiently determine what should$_e$ occur in contrast with the alternatives. In other words, my objection is *not* that one cannot move from is to ought in an argument. With bridging premises one can. Rather my objection is that the bridging premises are such that the resulting argument is either indeterminate about what should$_e$ occur, or that the determination is clearly mistaken.

Of course, one could argue that bridging premises are open to the objections provided by the open question argument and the argument from the addition of meaning. However, they would only succeed if such premises were analytic propositions rather than synthetic ones. And as I argued above, such propositions might be synthetic rather than analytic.

So in summary, I agree that Hume's Law constitutes an objection to using the natural sciences to justify the moral judgement of human beings *where there are no bridging premises*. However, bridging premises in principle can be supplied. In contrast, my objection is that one or more premises in such arguments are used in moral judgements, they not justified by the natural sciences because the appeal to them does not in fact sustain the Normative Distinction.

4. My argument for the Central Claim

In this section I explain how I shall argue for the Central Claim of the thesis. Namely:

> Ethics is substantially independent of the natural sciences because appeals made to the natural sciences are not adequate to justify moral judgements about human beings.

It consists of the following premises and conclusion:

Premiss 1: If the appeals made to the natural sciences to justify normative assessments of living organisms are not adequate, then the appeals made to the natural sciences to justify moral judgements about human beings are not adequate;

Premiss 2: The appeals made to the natural sciences to justify normative assessments of living organisms are not adequate;

Intermediate conclusion:

The appeals made to the natural sciences to justify moral judgements about human beings are not adequate. (From 1 and 2)

Premiss 3: If the appeals made to the natural sciences to justify moral judgements about human beings are not adequate, then ethics is substantially independent of the natural sciences.

Conclusion: Therefore, ethics is substantially independent of the natural sciences. (From intermediate conclusion and 3)

At the outset, I concede that this strategy for defending the Central Claim is indirect. Yet I contend it has two significant advantages. The first is that the normative assessment of living organisms is a more general category compared to the moral judgement of human

beings. The second is that it avoids the complications raised by human rationality and agency. For instance, non-human living organisms which do not reproduce are clearly defective. Yet the same cannot be said of human beings who do not reproduce because of some rational choice. Indeed, arguably, such a choice is a good one.[36]

4.2 The connection between moral judgements and normative assessments

The first premiss claims there is a deep connection between moral judgements about human beings and normative assessments such that if the natural sciences are not adequate to justify normative assessments of living organisms they are not adequate to justify moral judgements about human beings.

Underlying this claim is the thought that moral judgements about human beings are a subset of the normative assessment of living organisms. That is, the latter encompasses the former. What drives this thought are two facts. The first is that human beings are a kind of living organism. The second is that moral judgements are a kind of normative assessment. That is moral judgements make normative claims. Specifically, they claim that *morally* something should$_e$ be the case in contrast to what is or may be the case. Furthermore, all moral claims are normative claims but not all normative claims are moral claims. Consequently, I take it that any failure of the natural sciences to justify normative assessments of living organisms equally applies to moral judgements about human beings.

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[36] In saying this, I do not mean to imply that the differences between human rationality and agency and other living organisms obviates the connection between the moral judgement of human beings and the normative assessment of living organisms. If recent scientific research is true, the difference between human rationality and agency and the rationality and agency of other living organisms, such as dolphins and apes, is not as great as commonly supposed. For a discussion of this topic see: John Dupré, *Humans and Other Animals* (Oxford, 2002), esp. pp. 217-256, Alasdair MacIntyre, *Dependent Rational Animals : Why Human Beings Need the Virtues* (London, 1999), esp. 11-61. Furthermore, as I shall discuss later, Philippa Foot, in her *Natural Goodness* argues that the evaluation of non-human organisms can serve as a template for the moral judgement of human beings. See: Philippa Foot, *Natural Goodness* (Oxford, 2001), esp. pp. 25-51.

I take it that the first premiss is not controversial. Consequently, the crux of my argument is establishing the second premiss; that appeals to the natural sciences to justify normative assessments of living organisms are not adequate. However, before I do this, I believe it is important to clarify what sustaining the Normative Distinction entails.

4.3 Sustaining the Normative Distinction

For all normative claims, there is an assertion that some occurrence *X* is privileged in contrast to alternatives *Y*, *Z*, *A*. For example, take the moral claim, "Human beings should$_e$ be honest." This asserts that honesty is privileged in contrast to dishonesty. Or take the normative claim, "Porky the piglet should$_e$ be born with two eyes, two ears, and a curly tail." This asserts that being born with two eyes, two ears, and a curly tail is privileged in contrast to the alternatives characteristics piglets could be born with. It is privileged in the sense that it is being picked out as the state of affairs that should$_e$ occur, as opposed to some alternative.

Of course, the alternatives *Y*, *Z*, *A* …, do not necessarily preclude *X*. For example, the normative claim "Human beings should$_e$ be honest," does not preclude human beings being brave, kind or wise. Neither does the normative claim "Porky the piglet should$_e$ be born with two eyes, two ears, and a curly tail," preclude Porky being born with four limbs, a snout, and a bristly coat. Yet some do. For instance, the normative claim "Porky the piglet should$_e$ be born with two eyes, two ears, and a curly tail," does preclude her being born with one eye, one ear and no curly tail.

Sustaining the Normative Distinction then is establishing the privileging of *X* in contrast to the alternatives *Y*, *Z*, *A*. For example, sustaining the Normative Distinction in the claim "Human beings should$_e$ be honest" involves privileging of honesty over dishonesty. Or sustaining the Normative Distinction in the claim "Porky the piglet should$_e$

be born with two eyes, ears and a curly tail" involves privileging of being born with these characteristics in contrast to the alternatives.

Now the natural sciences could make a number of appeals to sustain the Normative Distinction. For instance, to use the example of Porky above, they could appeal to the fact that piglets such as Porky are typically born with two eyes, two ears, and a curly tail. In this case, what privileges Porky being born with two eyes, ears, and a curly tail rather than one eye, ear, and no curly tail is the fact that the former is typical whereas the latter is not.

So what I argue for in this thesis is that the appeals made to the natural sciences, such as the appeal to typicality, do not adequately justify the normative assessment of living organisms. Specifically, they are not adequate to justify normative assessments for one or more of the following reasons. The first is that some versions of the appeals cannot be understood purely in terms of the natural sciences. For instance, some versions of the appeals are incompatible with the purported ontology of the natural sciences, such as a version of the appeal to functions which ostensibly draws upon an incompatible teleology.[37] I should also note that the appeals I discuss have versions which are compatible with the ontology of the natural sciences, but vulnerable to one or more of the remaining objections so this objection plays only a minor role in my argument.

The second reason is that some of the appeals justify counter-intuitive normative assessments. For example, the appeal to development justifies the normative assessment "Porky the piglet is *not* defective [being born with three legs, one eye, and no ears or curly tail]" when this outcome is specified in Porky's genome. Of course, this reason assumes

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[37] I ought to note that this reason assumes that the natural sciences have a single ontology, but this assumption is subject to significant challenge, most notably in John Dupré's *The Disorder of Things*. See: John Dupré, *The Disorder of Things: Metaphysical Foundations of the Disunity of Science* (Cambridge, Massachusetts; London, England, 1995), 1.

that our intuitions are reliable, and in this example at least, it appears that they are. On the other hand, the natural sciences are known for demonstrating in other spheres, that human intuitions with respect to nature are not reliable. Take for instance, the intuition that the earth is flat.

So the obvious response to this objection is to ask why should we trust human intuitions instead of the natural sciences? After all, the track record of the natural sciences is much better than human intuitions when it comes to understanding the natural world. My reply is that our intuitions are the means by which we evaluate whether any kind of appeal justifies normative assessments or moral judgements. For example, in ethics we evaluate whether normative theories justify moral judgements via our intuitions. This is despite of the fact our intuitions often vary and even contradict each other presently and over time.[38] While this is problematic, there seems to be no better way to evaluate whether any kind of appeal to the natural sciences to justify normative assessments or moral judgements succeeds or fails. Moreover, given the long-standing entrenchment of this system, the burden of proof is upon any alternative to show why we should prefer it without begging the question in its favour.

The third and final reason I argue these appeals are not adequate is that they fail to sufficiently and rightly privilege particular occurrences over and against the alternatives. That is, they do not satisfactorily determine what should occur over and against alternatives. This is necessary because both moral judgements and normative assessments are making some implicit or explicit claims concerning what should occur. For instance, to justify the moral judgement "Scientists who create human-animal embryos are bad," it is

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[38] I minimize the impact of this issue by only drawing upon intuitions which I believe would be shared by every rational agent.

necessary to establish that human-animal embryos *should not* be created. On the other hand, if human-animal embryos *should* be created then this moral judgement is untenable.[39]

These reasons are recurring motifs throughout the thesis. Moreover, the third reason occurs in at least three different guises. That is, there are three different reasons why appeals to the natural sciences fail to satisfactorily determine what should occur over and against alternatives. The first of these is that the appeal itself is not normative. That is, it makes no distinction between what should occur and alternatives. For example, one conception of the appeal to functions is not normative. The second reason is that some appeals embed unjustified assumptions which effectively beg the question concerning which normative assessments are justified. (Different assumptions would justify different even contradictory normative assessments.) Take for instance, the normative assessment *X*, which is justified by an appeal to *Y*. If *Y* embeds unjustified assumptions where alternative assumptions justify not-*X*, then the question is begged concerning which normative assessment (say *X* or not-*X*) is justified by an appeal to *Y*. For example, one version of the appeal to functions embeds unjustified assumptions concerning the timeframe for the contribution to fitness which delineates what the function is. Another way to put this is that some appeals have parameters, such as the timeframe in the case above, which need to be specified in order to ascertain what should occur, yet the specification of these parameters cannot be rightly justified. The third reason is that there are many different versions of some of the appeals yet no single version of the appeal can be justified over and against the alternatives. Given that different versions can justify different and even contradictory normative assessments the appeal does not satisfactorily determine what should occur. This

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[39] Unless there is something specifically wrong with *scientists* creating them rather other kinds of agent.

is because if the different versions are given equal credence then contradictory normative assessments would be equally justified.

However, before I begin my argument proper, I believe it is worthwhile to examine the work of three philosophers—Larry Arnhart, William Casebeer, and Philippa Foot—who can be interpreted as arguing for the view that the natural sciences justify moral judgements about human beings. If any of their views are correct, then clearly the appeals used by the natural sciences to justify moral judgements are adequate, which contradicts my Central Claim. The aim is give some idea of the different ways in which philosophers have appealed to the natural sciences to justify moral judgements.

5. *Au Contraire*

Arnhart, Casebeer, and Foot either explicitly or implicitly use an account of the good or end for human beings drawn from the natural sciences to make a claim concerning what should$_e$ occur for human beings. For example, Arnhart uses the notion of the desirable for human life and makes extensive use of the natural sciences to specify what the desirable for human life is. Casebeer uses the notion of human functions, which he takes to be grounded in the natural sciences. And finally, Foot uses the notion of the human life form and fleshes out this notion drawing upon the natural sciences. Consequently, at least a *prima facie* case can be made that each of authors provides a challenge to the Central Claim of the thesis because they implicitly or explicitly contradict the second premiss of my argument for it.

However, before I begin my discussion of these authors I ought to note that my aim in the next section is not to criticize their arguments. Rather, my purpose is to set the scene so that I may criticize them in Chapter 7.

5.1 Larry Arnhart

The philosopher Larry Arnhart's work *Darwinian Natural Right: The Biological Ethics of Human Nature*, provides an account of the notion of Darwinian natural right.[40] He says it is a combination of ideas from the classic texts of Aristotle, Hume, and Darwin, as well as the work and writings of contemporary political theorists like Roger Masters, Robert McShea, James Q. Wilson, and the biologist E. O. Wilson.[41] Arnhart claims that this notion can be stated in ten propositions, which he then defends in the book.[42]

However, for my purposes, the book is significant for two reasons. The first is that the notion of Darwinian natural right is directly concerned with moral judgements about human beings. For example, Arnhart claims,

> We can judge divergent ways of life by how well they nurture the natural desires and cognitive capacities of human beings in different circumstances ...[43]

The second is that he uses the natural sciences, especially the sciences of biology, in his account of moral judgements about human beings. For instance he uses them in his moral judgement of the practice of female genital mutilation.

For the uninitiated, female genital mutilation encompasses a range of practices which encompass the light 'nicking' of the clitoris, to its complete removal (clitoridectomy). Clitoridectomy is often accompanied by the sewing together of the vulva, only leaving a small hole for the flow or urine and menstrual blood (infibulation). It is practiced in Africa, the Middle East and Asia, or in those communities from these places that have emigrated.

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[40] Larry Arnhart, *Darwinian Natural Right* (New York, 1998).
[41] Arnhart, *Darwinian Natural Right*, 6.
[42] Arnhart, *Darwinian Natural Right*, 6-7.
[43] Arnhart, *Darwinian Natural Right*, 6.

There are various justifications given for the practice, which include custom, religion, guarding virginity, and preventing infidelity.

The moral judgment that Arnhart makes about female genital mutilation is based on a notion of universal human nature. The justification of moral judgements involves an appeal to this notion. For instance, he says,

> Some feminists would seem to say that in the conflicts between men and women and between different cultural groups, there is no common ground of shared interests. If that is so, then there can be no resolutions of such conflicts except through force or fraud in which one side exploits the other. I would argue, however, that even in the absence of a universal sympathy, there is a universal human nature—a universal pattern of human desires—to which all human beings can appeal in searching for shared interests to settle their disputes.[44]

Indeed, his notion of universal human nature forms the heart of his account of moral judgement.

Arnhart's account of universal human nature begins with a defence of the claim that the good [for human beings] is the desirable [for human beings].[45] He identifies the desirable—the good for human beings—by identifying the universal desires of the human species. This is done through a variety of sources. These encompass ancient philosophical literature, but they particularly focus upon research drawn from the natural sciences, especially the sciences of biology. And in this case, Arnhart draws deeply upon the science of sociobiology (or evolutionary psychology as it is now known).[46]

For example he says,

> The twenty desires that I identify as natural and universal is based on various kinds of evidence. Donald Brown, in his *Human Universals* (1991), and Irenäus Eibl-Eibesfeldt, in his *Human Ethology* (1989), have surveyed the anthropological and biological research showing that there

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[44] Arnhart, *Darwinian Natural Right*, 149.
[45] Arnhart, *Darwinian Natural Right*, 17.
[46] I should also note that he also seems to use the natural sciences to bolster and perhaps justify his normative framework via their evident virtues, especially their epistemic virtues.

> are hundreds of human universals, which include the twenty desires on my list. Anthropologists such as Carol and Melvin Ember (1993) and sociologists such as Joseph Loperato (1984) confirm the universality of the twenty desires. Psychologists who study the psychology of motivation would recognize these twenty desires as manifesting the basic motives for human action (McClelland 1985). When Aristotle, in the *Nicomachean Ethics* and the *Rhetoric*, reviews the common opinions of human beings about what is desirable in life, he includes the twenty desires on my list. When an Aristotelian scholar like Martha Nussbaum (1992) describes "the basic human functions" that support universal norms of moral judgement, she includes the desires on my list. ... Thus, some contemporary social scientific research and some classic texts of philosophy and literature confirm the universality of these twenty desires as rooted in human nature.[47]

The human desires on his list include the desire for: (1) a complete life; (2) parental care; (3) sexual identity; (4) sexual mating; (5) familial bonding; (6) friendship; (7) social ranking; (8) justice as reciprocity; (9) political rule; (10) war; (11) health; (12) beauty; (13) wealth; (14) speech; (15) practical habituation; (16) practical reasoning; (17) practical arts; (18) aesthetic pleasure; (19) religious understanding; (20) intellectual understanding.[48]

For Arnhart the role of the natural sciences, particularly, the sciences of biology, is to give flesh (or content) to his account of human nature. That is, the natural sciences are largely employed to describe what these universal desires of the species are, such that the desirable, and thus the good, can be ascertained. On Arnhart's account, the properties of human nature are derived from some statistical aggregation of the properties of the human species over a particular period of time.

Of course, the significant point about Arnhart's account is that he takes the justification of moral judgements to rely upon a number of appeals to the natural sciences. These include appeals to typicality, what is natural, natural selection, and species. For example, Arnhart's justification of his moral judgement of the practice of female genital mutilation,

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[47] Arnhart, *Darwinian Natural Right*, 29-30.
[48] Arnhart, *Darwinian Natural Right*, 31-36.

and the human beings who engage in it, involves appealing to the natural and universal desires of *Homo sapiens*.[49] Specifically, he appeals to such desires which are frustrated by female genital mutilation, like the desire for sexual pleasure and bodily health.[50] But as we shall see, these appeals to typicality (Chapter 3), what is natural (Chapter 3), natural selection (Chapter 3), and species (Chapter 6) are not adequate to justify normative assessments of living organisms and thus moral judgements of human beings. However, how my objections to these appeals apply to Arnhart will be discussed in Chapter 7.

5.2 William Casebeer

In *Natural Ethical Facts*: *Evolution, Connectionism, and Moral Cognition*, William Casebeer attempts to provide and defend a naturalized ethic in terms of the natural sciences.[51] Like Foot's and Arnhart's account, this account effectively defends the claim that the sciences of biology do justify moral judgements about human beings. On Rottschaefer's scale there is little doubt that he would hold to The Normative Connection Hypothesis. For instance, early on in *Natural Ethical Facts* Casebeer discusses an analogous scale coined by Philip Kitcher which postulates four possibilities for biologicizing ethics.[52] The most radical of these possibilities is the possibility that,

> ... Evolutionary theory can lead us to revise our system of ethical principles, not simply by leading us to accept new derivative statements ... but by teaching us new fundamental normative principles. In short, evolutionary biology is not just a source of facts but a source of norms.[53]

Whereupon he subsequently explicitly claims that collectively the natural sciences can fulfil all four possibilities, including the most radical.[54] Consequently, clearly he holds that the Normative Connection Hypothesis is true. Therefore, his account provides a direct challenge to the Central Claim of the thesis.

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[49] Arnhart, *Darwinian Natural Right*, 149-157.
[50] Arnhart, *Darwinian Natural Right*, 155.
[51] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 1-2.
[52] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 14.
[53] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 14.
[54] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 14.

Casebeer characterizes his project as an attempt to reconcile the sciences of cognition with a fully naturalized notion of morality.[55] He argues that one can better understand the nature of moral theory and its role in moral judgement(s) if we properly understood what morality is.[56]

Casebeer is not unaware that his project faces significant objections. He notes that such attempts to naturalize ethics have been beset by difficulties, and points to three historical reasons why this is so.[57] The first, he suggests, were theoretical arguments based on the claims that naturalistic theories of ethics commit the (so-called) naturalistic fallacy, which purportedly showed that it was impossible to reduce the normative domain to the natural domain. The second were claims that the domain of human morality was too complex for empirical explanation by the natural sciences. The final reason, he suggests, is that the previous attempts to construct a scientifically informed moral theory have been too simple. Perhaps to this reason we could add that some attempts to construct a scientifically informed moral theory have provided bad, if not egregious, moral theories.

Casebeer therefore, focuses upon addressing the first two objections to his project of a scientifically naturalized ethic in conjunction with articulating his own position. In summary, he attempts to show that the modern natural sciences *are* up to the task of providing an explanation of human morality by offering an account of human morality. And he offers a number of arguments to defuse the objections raised by: (1) Hume's Law; (2) the open question argument; (3) the argument from the addition of meaning; and (4) Mackie's error-theory regarding the meaning of moral terms. He then provides an account

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[55] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 3.
[56] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 3.
[57] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 2.

of how one can move from non-normative premises to normative conclusions through a recent-history theory of functions. [58]

For example, he claims that, "Moral claims should be reduced to functional claims technically construed ..."[59] And that,

> Such functional claims should be treated as they are in biology and the life sciences, with a suitably modified Wright-style telenomic analysis: a Godfrey-Smith flavoured "modern-history" theory of functions.[60]

The reason Casebeer uses this notion of function is because it provides a completely naturalistic and science-based grounding for normativity. And it is at this point I depart from Casebeer, although for reasons rather different to those typically offered.

For instance, I agree with Casebeer that the objections based on the Hume's Law, the open question argument, and the argument from the addition of meaning are either inadequate or can be addressed. I also agree that *a priori* the natural sciences *are* capable of explaining or providing an account of human morality including the phenomenon of the moral judgement(s) of human beings.

Where I depart from Casebeer where he claims that moral claims ought to be reduced to functional claims of the recent-history kind. I do so because I believe that appeals to recent-history functions do not adequately sustain the Normative Distinction, and thus they cannot justify moral judgements about human beings. Furthermore, if I can show that his use of the concept of functions does not adequately sustain the Normative Distinction then moral claims cannot be so-reduced to functional claims so technically construed. However, my argument for these claims remains for Chapter 4, where I explicitly deal with the

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[58] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 3-4.
[59] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 4.
[60] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 4.

appeal to functions to justify normative assessments of living organisms. And how they apply to Casebeer will be discussed in Chapter 7.

5.3 Philippa Foot

An explicit aim of philosopher Philippa Foot's work *Natural Goodness* is to give a naturalistic account of moral judgement(s). She claims that it diverges wildly from most contemporary accounts of moral judgement(s). For example, in the beginning of chapter one, she summarizes her project as follows and claims,

> For better or worse—and many will say worse—I have in this book the overt aim of setting out a view of moral judgement very different from that of most moral philosophers writing today. For I believe that evaluations of human will and action share a conceptual structure with evaluations of characteristics and operations of other living things, and can only be understood in these terms. I want to show moral evil as 'a kind of natural defect'. *Life* will be at the centre of my discussion, and the fact that a human action or disposition is good of its kind will be taken to be simply a fact about a given feature of a certain kind of living thing. [Italics in original][61]

Her account of moral judgement is of interest because it makes use of the natural sciences. Consequently, there is at least *prima facie* evidence to suggest that her account of moral judgement challenges the Central Claim.

Foot begins her account of the moral judgement of human beings by contrasting it with the accounts of theorists whom she takes to be her primary opposition. She identifies these as proponents of non-cognitivist theories of ethics and followers of the anti-naturalist G. E. Moore.[62] In short, Foot claims that her opponents have made a mistake.[63] For instance, she claims that it is a mistake for non-cognitive theorists to give conditions of use for 'moral'

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[61] Foot, *Natural Goodness*, 5.
[62] Foot, *Natural Goodness*, 5.
[63] Foot, *Natural Goodness*, 8.

statements (such as evaluations) in terms of something which must be true of the speaker—her feelings, attitudes or commitments to act.[64]

In contrast to her opponents, Foot seeks to establish that there are 'natural norms' for organisms, including human beings, derived from the fact that they are living. These 'natural norms' refer to what Foot calls the 'natural goodness' of living things.[65] This is only attributable to living things, their parts, characteristics, and operations—in other words, to their intrinsic or autonomous goodness.[66]

In characterizing the natural goodness of living things Foot makes use of the concept of species, which at least gives a *prima facie* reason to suppose she is using the natural sciences to justify moral judgements about human beings. However, her usage of the term is drawn directly from the work of the philosopher Michael Thompson in his paper 'The Representation of Life'.[67] For instance she remarks,

> For help I shall turn to a paper published by Michael Thompson: a paper I admire very much.
>
> Michael Thompson's subject in this paper, which is called 'The Representation of Life', is the description of living things. His thesis is that to understand certain distinctive ways in which we describe individual living organisms, we must recognize the logical dependence of these descriptions on the nature of the species to which the individual belongs. Species-dependence is leitmotif. For this reason he concerns himself with propositions of the form 'S's are F' or 'The S is F', where 'S' holds a place for the name of a species (or 'life form' as he is ready to say for the sake of those who want to give 'species' a technical definition) and 'F' a place for a predicate; ...[68]

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[64] Foot, *Natural Goodness*, 9.
[65] Foot, *Natural Goodness*, 26-27.
[66] Foot, *Natural Goodness*, 27.
[67] Foot, *Natural Goodness*, 27. is where Foot acknowledges her debt to Thompson and his paper 'The Representation of Life'. See: Michael Thompson, "The Representation of Life," in *Virtues and Reasons: Philippa Foot and Moral Theory*, ed. Rosalind Hursthouse, Gavin Lawrence, and Warren Quinn (Oxford, 1995).
[68] Foot, *Natural Goodness*, 27-28.

A representative proposition would include, "Dogs are carnivores." They also use the form '*S*'s do *V*' (where *V* refers to some verb.) A representative proposition would include, "Dogs eat meat." (Foot uses rabbits.[69])

Propositions of this form are logically unquantifiable.[70] In other words, they do not speak of an individual dog, although they can; nor do they predicate something that is true of every dog. For instance, "Dogs have tails," but Fang, the Doberman, does not have a tail (because it was docked). Foot claims that in order to understand what such propositions assert or claim one needs to look at the context, or in Thompson's terms, "... the natural-history account of the *life form* or species: of how creatures of this kind live."[71] For instance, we cannot understand what 'reproduction' or 'growth' (or any element of a species/*life form*) *is*, unless we know something of its natural history. As Foot notes, mitosis in amoebae and human beings is given the same description in textbooks, whereas in the former it is the reproduction of the individual organisms, whereas in the latter case it is not.[72] Or more broadly, such natural history sentences speak of the life cycle of individuals of a given species.[73] These 'natural history sentences' are also called Aristotelian categoricals.[74]

Foot emphasizes that these normative 'Aristotelian categoricals' are *not* statistical propositions. That is, they do not apply to a particular species because the predicate in question predominates in the species. So the norms that they describe are *not* norms because they predominate in species. Rather, she suggests they are normative because they are part of teleology of the species described by the *life form*.

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[69] Foot, *Natural Goodness*, 28.
[70] Foot, *Natural Goodness*, 28.
[71] Foot, *Natural Goodness*, 28.
[72] Foot, *Natural Goodness*, 28-29.
[73] Foot, *Natural Goodness*, 28-29.
[74] Foot, *Natural Goodness*, 28-29.

She also points out that Aristotelian categoricals are context sensitive, and asserts that what counts as excellence or defect is relative to the 'natural' habitat of the species.[75]

Foot connects her concept of species or life form to the normative evaluation of living organisms in the following way,

> Let us now ask how all this is relevant to the normative judgements that we make about plants and animals when we say, for instance, that a plant in our garden is diseased, or not growing properly, or that a certain lioness is a neglectful parent, or a particular rabbit not as reproductive as a rabbit should be. Thompson suggests that the relation between the Aristotelian categorical and the evaluative assessment is very close indeed. In fact, he says that if we have a true natural-history proposition to the effect that *S*'s are *F*, then if a certain individual *S*—the individual here and now or then and there—is not *F* it is therefore not as it should be, but rather weak, diseased, or in some other way defective. [76]

And it is her contention that this form of evaluation is also applicable to moral judgements about human beings. The fundamental issue for the human case, as Foot notes, is, "...whether characteristics of humans can be evaluated in relation to the part they play in human life, according to the schema of natural normativity that we found in the case of plants and animals."[77] That is, the schema discussed above.

Of course, Foot admits that there are important differences between the evaluation of plants and (non-human) animals and moral judgements about human beings.[78] Yet she maintains that despite these differences the conceptual and formal structure of the evaluation of plants and (non-human) animals and of moral judgements about human beings is the same. She also admits that as a result of the differences, the human case is

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[75] Foot, *Natural Goodness*, 34.
[76] Foot, *Natural Goodness*, 29-30.
[77] Foot, *Natural Goodness*, 40.
[78] Foot, *Natural Goodness*, 39.

deeply problematic.[79] Yet, she believes that it can be addressed through considering what the human good is and how human beings live—in other words, the problems can be addressed through considering what kind of living thing human beings are and how they conduct their lives.[80]

Clearly, the central issue of Foot's account for this thesis concerns whether her account objectively uses the natural sciences to adequately justify moral judgements about human beings. In concrete terms, the central issue is whether her account appeals to the natural sciences to justify the moral judgement, "Human beings ought to refrain from murder," and if so whether this use is adequate to justify it.

I argue that the answer to this issue is unclear. That is, a case could be made that she *does* and *does not* use the natural sciences to justify moral judgements about human beings. The negative case is supported by the fact she explicitly distances herself from the technical or scientific use of the term 'species'.[81] Obviously, Foot would not be appealing to the natural sciences if her account owes very little to that.

Moreover, the concept of species *qua* Foot's life form and the concept of species *qua* particular evolutionary lineage are inconsistent. (The latter is the predominant account of species in the scientific literature, although, as we shall see, in a subsequent chapter, it is by no means the only one.) In essence, they are inconsistent because form is only incidental on the 'lineage' species concept. One is not a member of a lineage in virtue of sharing characteristics in common, but in virtue of sharing a particular ancestor in

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[79] Foot, *Natural Goodness*, 43.
[80] Foot, *Natural Goodness*, 51.
[81] For instance see, Foot, *Natural Goodness*, 27-28, Thompson, "Virtue and Reasons," 276-277.

common.[82] Consequently, on the latter species concept, no matter how divergent characteristics are between individuals, they are members of the same species if they share the relevant ancestor in common. In contrast, on the 'life form' species concept, if the characteristics of an individual are divergent enough they are either a defective member, or a member of a different species. For example, Foot argues that a wolf belonging to the species Wolf *qua* life form who hunts selfishly rather than cooperatively is defective.[83] In contrast, a wolf belonging to the species Wolf *qua* sharing a common ancestor who hunts selfishly rather than cooperatively is not. She just is a member notwithstanding she is statistically abnormal. Furthermore, on Foot's account, if hunting selfishly quickly became pervasive for wolves sharing a common ancestor; those wolves would still be defective *qua* Wolf life form.

The positive case for the claim that Foot makes use of the natural sciences to justify moral judgements is supported by the fact that there are concepts of the species from the natural sciences which are compatible with Foot's concept of the species *qua* life form. (A point I will explore in Chapter 6.) So while species *qua* evolutionary lineages is the predominant species concept, it is not the only one. There is no reason why her account could not use a compatible species concept.

So if the notion of a species *qua* life form is compatible with the natural sciences, it looks like this might give us a way to sustain the Normative Distinction. For instance, it could be sustained by the relationship between the life form (which is constituted scientifically) and the individual being morally judged.[84] What should$_e$ occur in the

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[82] Although, sharing characteristics in common is used to infer that an individual is a member of a particular lineage. As Darwin observed long ago, offspring resemble their parents, and families typically share characteristics in common.
[83] Foot, *Natural Goodness*, 16.
[84] For human beings we could name the life form 'Human Beings' and the individual a 'human being'.

individual being morally judged is determined by the life form to which the individual belongs, which is cashed-out in terms of the natural sciences.

It is for this reason that Foot's account *prima facie* could present a direct challenge to the Central Claim of the thesis. There are two matters to determine: (1) whether Foot conceives species *qua* life form in terms compatible with the natural sciences; (2) if she does, whether this concept of species can be employed to adequately justify the normative assessment of living organisms. I contend that whether Foot conceives species *qua* life form is not clear. One could make a case for either view. However, the compatible species concept *qua* life form cannot be employed to adequately justify the normative assessment of living organisms.

6. Conclusion

The purpose of this chapter was to lay the foundation for my defence of the Central Claim. Namely,

> Ethics is substantially independent of the natural sciences because the appeals made to the natural sciences are not adequate to justify moral judgements about human beings. [85]

It consisted of four elements. First I spelt out what I mean by ethics being 'substantially independent' by exploring the kinds of contribution the natural sciences *could* potentially make to ethics. I characterized this relationship of 'substantial dependence' by locating it on a scale drawn from the work of William Rottschaefer, which described in terms of six hypotheses the extent the natural sciences could contribute to ethics. On this scale I accepted the Critical Connection Hypothesis as being true and claimed that the Normative

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[85] Henceforth, I shall generally refer to this proposition as the Central Claim.

Connection Hypothesis is false. I then argued that this entailed that ethics is substantially independent of the natural sciences.

Secondly, I distinguished my argument for the Central Claim from the standard arguments, doctrines and traditions within the philosophical literature which would also support it. The motivation was to make my case on my opponents' grounds rather than in terms sympathetic to my thesis. Specifically, I do not use a metaethical framework sympathetic to my claim but a metaethical framework sympathetic to my opponents' position. For instance, I assume naturalism and cognitivism. Neither do I draw upon the Naturalistic Fallacy or Hume's Law.

In the third element I introduced my argument for the Central Claim. Namely,

Premiss 1: If the appeals made to the natural sciences to justify normative assessments of living organisms are not adequate, then the appeals made to the natural sciences to justify moral judgements about human beings are not adequate;

Premiss 2: The appeals made to the natural sciences to justify normative assessments of living organisms are not adequate;

Intermediate conclusion:

The appeals made to the natural sciences to justify moral judgements about human beings are not adequate. (From 1 and 2)

Premiss 3: If the appeals made to the natural sciences to justify moral judgements about human beings are not adequate, then ethics is substantially independent of the natural sciences.

Conclusion: Therefore, ethics is substantially independent of the natural sciences. (From intermediate conclusion and 3)

I acknowledged that this was an indirect argument but suggested that it offered the advantages of greater generality and avoiding the complications of human rationality. I also connected this argument back to the Central Claim.

Finally, in the fourth element, I examined three authors who provide at least *prima facie* objections to my argument because they either implicitly or explicitly claim that the natural sciences justify moral judgements about human beings. These authors included the philosophers Larry Arnhart, William Casebeer, and Philippa Foot. My final response to these authors is found in Chapter 7.

Now, with this foundation in place, I turn to the issue of the natural sciences and the normative assessment of living organisms.

Chapter 2: The natural sciences and the normative assessment of living organisms

1. Introduction

In the previous chapter I argued that the Central Claim:

> Ethics is substantially independent of the natural sciences because the appeals made to the natural sciences are not adequate to justify moral judgements about human beings

could be defended via the following argument:

Premiss 1: If the appeals made to the natural sciences to justify normative assessments of living organisms are not adequate, then the appeals made to the natural sciences to justify moral judgements about human beings are not adequate;

Premiss 2: The appeals made to the natural sciences to justify normative assessments of living organisms are not adequate;

Intermediate conclusion:

> The appeals made to the natural sciences to justify moral judgements about human beings are not adequate. (From 1 and 2)

Premiss 3: If the appeals made to the natural sciences to justify moral judgements about human beings are not adequate, then ethics is substantially independent of the natural sciences.

Conclusion: Therefore, ethics is substantially independent of the natural sciences. (From intermediate conclusion and 3)

In the course of the discussion, it emerged that the linch-pin of the argument was the second premiss because the other premises were either clearly true, or they followed from the preceding argument.

Consequently, the remainder of the thesis consists of presenting the case for the proposition that the appeals made to the natural sciences to justify normative assessments of living organisms are not adequate. However, in order to understand my argument for this claim we first need to understand the normative assessment of living organisms and to characterize the appeals made to the natural sciences to justify them.

The goals of this chapter therefore are twofold. The first is to provide an account of the normative assessment of living organisms. This is illustrated using the example of domesticated pigs taken from within the scientific literature. The second is to characterize the appeals used within the natural sciences to justify normative assessments.

2. An account of the normative assessment of living organisms

I begin my account of the normative assessment of living organisms with a broad characterization of what assessment is, which I assume to be uncontroversial. I take it that assessments are reports of some kind of comparison with respect to a norm or norms. For instance, the normative assessment, "Porky the piglet is defective [because she is blind]," is a report of some kind of comparison between a pig and the norm that pigs should$_e$ be able to see.

This characterization of assessment has three elements which I shall now discuss. The first is norms. The second is a comparison with respect to these norms. And the third is the use of evaluative terms.

2.1 Norms

Norms refer to actual or hypothetical occurrences or states of affairs. For example, the norm in the normative assessment of Porky is being able to see.

Norms are either descriptive or evaluative. Broadly speaking, norms which are descriptive *describe* what typically occurs or presumably will occur. In other words, norms of this kind are statistical. They are based on particular statistical aggregations for some population over some timeframe. Often the population is defined by some abstraction—for

populations of living organisms most commonly this is the species. In contrast, norms which are evaluative assert what should$_e$ occur in contrast to what occurs or will occur. In other words, norms which are evaluative maintain the Normative Distinction whereas norms which are descriptive do not. However, one complication arises where evaluative norms are based upon an appeal to typicality. In this case what should$_e$ occur is that which typically occurs, and therefore the descriptive norm and the evaluative norm coincide.

Yet in most instances, the main difference between norms which are descriptive and norms which are evaluative is that the latter are independent of what typically occurs. Take for example, the norm for sight for the type 'piglet'. As things stand, the evaluative and the descriptive norm coincide. In other words, as things stand, things are as they should$_e$ be. However, if it became typical for piglets to be born blind piglets should$_d$ be blind. But, on most evaluative norms, it would still be the case that they should$_e$ be sighted—at least in the short term. (I doubt one would maintain that pigs should$_e$ be able to see if they have not seen for millions of years.)

Different accounts of norms can give rise to conflicting norms. That is, in any given situation, it is possible in the same situation to have conflicting claims about what should$_e$ happen. This occurs because there are differences in what is being appealed to in order to justify the claim about what should$_e$ occur. Take for example, the behaviour of domesticated sows that are confined to farrowing crates for giving birth. Sows so confined show various signs of distress which include chewing or gnawing upon the bars of the crate, and elevated levels of stress hormones in the blood (compared to sows that are not confined). A normative assessment based on an evaluative norm that appeals to what is typical would imply that the behaviour is 'normal' because it is typical. That is, it is atypical for sows *not* to show signs of behavioural and physiological stress, but typical for

them to do so in this context. In contrast, a normative assessment based on an evaluative norm that appeals to what is natural to ground and justify it would imply that the behaviour is 'abnormal', notwithstanding it is a 'natural' response to being confined to a farrowing crate. It would imply that the behaviour is 'abnormal' because domesticated sows farmed under natural or semi-natural conditions do not show these signs of behavioural and physiological stress when about to give birth.

2.2 A comparison with respect to norms

The heart of the normative assessment of living organisms is a comparison with respect to a norm or norms. The norms assert what should$_e$ occur; this is compared to what actually does and a report is given. For example, the normative assessment "Porky the piglet is defective [because she is blind]," reports the comparison between Porky and a norm for sight which Porky fails to fulfil. (The norm in this case asserts that piglets should$_e$ see in contrast to the fact that Porky the piglet does not.)

These comparisons are often at different but compatible levels of abstraction. For example, in the case of Porky, the comparison is between a token of a type ('Porky') with the norm for sight for the type ('piglet'). Indeed typically the comparison is between a token of some type and a norm for that type. For instance, another very common comparison is between a token of some species and a norm for that species.

These comparisons are also embodied in the use of evaluative terms such as 'good', 'bad', 'functional', 'dysfunctional', 'malfunctional', 'defective', 'healthy', 'diseased' etc. For example, we say Porky is *defective* because comparing her with the norm shows that what should$_e$ occur did not. Consequently, the use of these evaluative terms in discourse indicates implicit or explicit normative assessments.

2.3 Evaluative terms

A plausible naturalistic account of evaluative terms and their use is suggested by Peter Geach in his paper 'Good and Evil.'[86] In this paper Geach, argues that evaluative terms such as 'good' and 'evil' are always *attributive* adjectives.[87] An *attributive* adjective is an adjective that is *dependent* upon its noun for its content. Take for example the adjective term 'big'. The meaning of 'big' can be only determined in relation to the noun it is connected to. Compare for instance "A 'big' *E. coli*," to "A 'big' giraffe," and "A 'small' Blue whale" to "A 'small' rat." What 'big' or 'small' means in a sentence can only be determined in relation to the objects that are described by the nouns.[88] Otherwise, a simple argument would show that a 'big' *E. coli* was a big organism, and a 'small' Blue whale was a small organism, which is clearly false.

Attributive adjectives may be compared to *predicative* adjectives. A *predicative* adjective is an adjective that is *independent* of its noun for its content. Take for example, the adjective term 'blue'. The meaning of 'blue' is independent of the noun that it is connected to. Compare for instance, "A 'blue' bird," and "A 'blue' fish." What 'blue' means in these sentences is independent of the object being described.

Geach puts the distinction in the following terms:

> I shall say that in a phrase 'an A B' ('A' being an adjective and 'B' being a noun) 'A' is a (logically) predicative adjective if the predication 'is an A B' splits up logically into a pair of predications 'is a B' and 'is A'; otherwise I shall say that 'A' is a (logically) attributive adjective.[89]

If this distinction is correct it implies that the evaluative terms 'good' and 'evil', depend upon the character of the object referred to by the noun , rather than being an

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[86] P. T. Geach, "Good and Evil," in *Theories of Ethics*, ed. Philippa Foot (Oxford, 1967).
[87] Geach, "Good and Evil," 64.
[88] One implication which could be drawn from Geach's argument is that the phrase "big thing" is meaningless. I agree. However, the fact that we typically understand what is referred to by the phrase 'big thing' is the implicit assumption that the thing in question is 'big' relative to the human scale.
[89] Geach, "Good and Evil," 64.

independent property. For example, the *health* of domesticated pigs is something that is relative and deeply connected to the character traits of domesticated pigs. Moreover, it is possible to extend this point to all evaluative terms.

The significant point that follows from this account of evaluative terms is that one cannot give an account of an evaluative term without having an account of the object that is referred to by the noun. So for example, in the normative assessment "Porky is a defective pig," we cannot give an account of 'defect' without having an account of what a pig is. Or in the normative assessment "Porky is a good pig," we cannot give an account of 'good' without having an account of what a pig is.

This is significant because an account of what a pig is *can* be provided by the natural sciences, although they are not the only possible source.[90] Among other practices, the natural sciences set out to describe objects in the world and the sciences of biology set out to describe organisms. Consequently, in principle there could be a scientific account of normative assessments of living organisms. Take for example, the normative assessment noted above, "Porky is a good pig." The natural sciences can and do provide an account of what a pig is. 'Good' is clearly an attributive and an evaluative term, which can be given meaning in terms of the scientific account of what a pig is. Therefore, *prima facie* we have a tenable scientific account of normative assessments of living organisms.

So to fill out this account I shall now examine the normative assessment of domesticated pigs within the scientific literature. There are a number of reasons for this choice of subject and literature. For instance, I chose domesticated pigs as my exemplar

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[90] For instance, there could be a theological account of the pig type.

because I believe they are representative of living organisms. Moreover, their domestication raises a number of interesting and significant issues.

3. The normative assessment of living organisms: the example of domesticated pigs

We can find examples of the normative assessment of living organisms within the scientific literature on domesticated pigs' character traits, health, and welfare. That is, I shall focus upon claims which assert what should$_e$ occur for domesticated pigs that arise within this literature.

3.1 Character trait norms

Domesticated pigs are pigs that have been developed by human beings for human purposes by the process of selective breeding from wild ancestors, who displayed some initial compatibility with human beings. When this started is not known with any precision, although there is archaeological evidence which suggests it began at least 9000 years ago.[91]

The wild boar, *Sus scrofa*, is the ancestor of almost all domesticated pigs. It originated in Europe and Asia. However, there are some exceptions. For example, there is the very specific local domestication of the Sulawesi Warty hog in Indonesia. In addition, Pond and Mersmann note that domesticated pigs also have partly descended from the east Asiatic banded pig, *Sus vittatus*.[92]

The process of domestication has bought about numerous changes from the wild-type ancestor to such an extent that it is possible to deduce whether pig bones found in

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[91] Valerie Porter, *Pigs: A handbook to the breeds of the world* (Robertsbridge, 1993), 13.
[92] Wilson G. Pond and Harry J. Mersmann, "General Characteristics," in *Biology of the Domestic Pig*, ed. Wilson G. Pond and Harry J. Mersmann (Ithaca; London, 2001), 1.

archaeological digs are from the wild-type or domesticated pigs.[93] For example, there have been changes in: (1) the head—it tends to be smaller; (2) legs—they tend to be shorter; (3) body—it tends to be longer; (4) skull shape—a domesticated pig's skull is shorter and broader than the long skull of its wild ancestor; (5) ears—domesticated pig ears may be floppy whereas wild pigs' are erect; (6) tail—domesticated pigs have curly tails, whereas wild pigs' tend to be straight; (7) coat—a wild boar has very coarse bristles and a definite crest whereas domesticated pigs have much finer, less dense bristles, almost to the point of nakedness in some cases; (8) colour—domesticated pigs show 'non-wild' colours.[94]

As noted, modern agricultural pigs are largely descended from the European wild boar through a long process of domestication. Yet despite this long process, domesticated pigs and their various breeds still share many of the characteristics of these pigs. For example, the behaviour of domesticated pigs in semi-natural or wild environments is often very similar to those of wild boar or feral pigs.[95] Take for instance, nest building behaviour in sows about to give birth. Curtis *et al.* claim that

> Under natural or semi-natural conditions, both wild and domestic sows build large, complex nests from whatever suitable material is available in the surroundings ... In agricultural situations, sows use straw if it is provided or, in the absence of any suitable material, perform pawing, nosing, and oral behaviours directed at the floor, penning, and artificial manipulanda (Widowski and Curtis, 1990). ... When this behavior is prevented (e.g. by confinement in a farrowing crate without bedding), they show both behavioural and physiological indications of stress (Widowski and Curtis, 1990; Lawrence et al., 1994).[96]

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[93] Porter, *Pigs: A handbook to the breeds of the world*, 14.
[94] Pond and Mersmann, "General Characteristics," 14, Porter, *Pigs: A handbook to the breeds of the world*, 9.
[95] Stanley E. Curtis, Sandra A. Edwards, and Harold W. Gonyou, "Ethology and Psychology," in *Biology of the Domestic Pig*, ed. Wilson G. Pond and Harry J. Mersmann (Ithaca; London, 2001), 41.
[96] Curtis, Edwards, and Gonyou, "Ethology and Psychology," 57.

However, these norms only apply where domesticated sows are free to act as they will, which is *not* typically the case for many, if not most domesticated sows.[97] Rather, they are usually bound by the particularities of the farming system they are part of. So while it is true that given the opportunity, sows build a nest for farrowing, in many farming systems they are confined to farrowing crates instead.

Sexual behaviour is also similar. The elements of courtship are essentially the same between domesticated pigs and wild boar, although domesticated males show large individual differences and patterns compared to their wild brothers.[98]

So ostensibly a domesticated pig is effectively a wild pig at heart.[99] Indeed, they also share similarities with all other species of wild pig. For example, like their wild relatives, domesticated pigs are opportunistic omnivores, and will eat a wide range of food if given the opportunity, including food from animal origin such as carrion.[100] (Their digestive systems are very similar to other opportunistic omnivores like human beings.[101]) Yet there are some differences between wild and domesticated pigs bought about by the process of domestication and specific adaptations to the agricultural environment domesticated pigs find themselves in.

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[97] Of course, there is also the assumption that there is material to build a nest a food in sufficient proximity for sows feed in a 'group'.
[98] Curtis, Edwards, and Gonyou, "Ethology and Psychology," 58.
[99] I use 'wild pig' here instead of 'wild boar' because it is easy to confuse the different sense of 'wild boar'. 'Wild boar' can mean either "a wild male pig of any species of pig," or "a wild pig of either sex belonging to the species *Sus scrofa*. ('Wild pig' merely has the fault of being unspecific.) I should note that when I use 'wild pig' subsequently I mean a wild pig of either sex belonging to the species *Sus scrofa*, rather than any wild species.
[100] Curtis, Edwards, and Gonyou, "Ethology and Psychology.", Porter, *Pigs: A handbook to the breeds of the world*, 4.. Naturally, this is not to say that different pig species do not have dietary preferences, or a pattern of eating dictated by the environment they are in.
[101] Curtis, Edwards, and Gonyou, "Ethology and Psychology," 25, Porter, *Pigs: A handbook to the breeds of the world*, 4. Interestingly, at one point, early research on infant pigs was focused on the development and evaluation of human infant formulas! Pond and Mersmann, "General Characteristics," 25.

With respect to the former, domesticated pigs do not have the same seasonal breeding pattern as wild pigs. Wild pigs are seasonal breeders, usually conceiving in autumn or sometimes late spring—a pattern that is mainly determined by photoperiod.[102] While domesticated pigs generally breed all through the year, although they can show seasonal infertility. And as noted above, domesticated pigs also differ from wild pigs in a number of bodily characteristics.

With respect to the latter, domesticated sows have adapted to individual feeding systems, while in the semi-wild or wild environment, they typically eat as a group. And as Curtis *et al.* also note, pigs are highly adaptable and show a remarkable capacity to adapt their behaviour to the agricultural setting, notwithstanding that behaviours evolved in the natural habitat may be incompatible with farming practices.[103]

Therefore, domesticated pigs are an intriguing mixture of wild pig, which has been selected, shaped and thus altered significantly for human ends. So it is not surprising that the evaluative norms for domesticated pigs' character traits are a mixture of the wild-type from which domesticated pigs arose, and the consequences of the effects of domestication.

These character norms specify what should$_e$ occur and are embodied within the normative assessment of domesticated pigs. For instance, where individual domesticated pigs meet these norms they are positively evaluated. That is, if Porky in due course instantiated all these character norms we would call her a good pig. And, conversely, if

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[102] Curtis, Edwards, and Gonyou, "Ethology and Psychology," 57.
[103] Curtis, Edwards, and Gonyou, "Ethology and Psychology," 51, 52. Their point raises a number of problems about respect to the relationship between being 'normal' or 'abnormal' and animal welfare, which will be explored in subsequent sections. E.g. great care needs to be taken in inferring animal welfare by comparing the behaviour of domesticated pigs with wild pigs. A typical behaviour in domesticated pigs considered 'abnormal' in wild pigs could either be 'normal' or 'abnormal' for domesticated pigs depending on whether the behaviour is a good adaptation, i.e. it does not cause suffering.

individual domesticated pigs fail to meet these norms they are negatively evaluated. So if Porky in due course fails to instantiate some of these character norms we would call her a bad or defective pig.

3.2 Health norms

The norms for pig health can be gleaned from a number of sources in the scientific literature. For example, the following are various normal or healthy physiological parameters for domesticated pigs drawn from D. J. Taylor's *Pig Diseases*:

> Body temperature: 39^{O}C (102^{O}F)
> Lower critical point 38.4 ^{O}C (101.2 ^{O}F)
> Upper critical point 40 ^{O}C (103.5 ^{O}F)
> Respiratory rate, resting 18 ^{O}C: 20-30 per minute, more in young (up to 50), less in old (to 13-15) in sows
>
> Pulse (resting): 70-80 per minute, more in young (200-280, newborn).

Packed Cell Volume (PCV)	0.42	(0.37-0.46)		1/1
Red Blood Cells (rbc)	7.0	(6.5-8.0)	$X10^{12}$	/1
White Blood Cells (wbc)	18.0	(10.0-23.0	$X10^{9}$	/1
Platelets	400	(250.0-500.0)	$x10^{9}$	/1
Haemoglobin	140	(110-142)		g/l

> For blood levels of ions or plasma enzymes, see appropriate section. All blood parameters may change with age. These are adult figures. [104]

Deviations from these physiological parameters are usually taken as an indication that something has gone awry.

Take for example, a scenario where Porky has a body temperature of 43^{O}C. This, among other possibilities, is indicative of Porky being infected with a virus. (Fever is one response a pigs' body makes to viral infection because higher body temperatures makes viral replication more difficult.) Porky could be infected with *Aphtae epizooticae*—the virus responsible for Foot and Mouth disease—since high fever is one of the signs of

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[104] D. J. Taylor, *Pig Diseases*, 6th ed. (Glasgow, 1995), 7.

infection along with blisters in the mouth and excessive secretion of long stringy salvia.[105] She could also be infected with Swine Vesicular Disease (SVD) because the clinical signs are identical to Foot and Mouth Disease.[106]

The critical point to note about these physiological parameters is that they too specify what should$_e$ happen. Indeed, the physiological parameters of individual domesticated pigs are commonly and frequently compared to the physiological norms for domesticated pigs, and reports of the comparison given. For instance, if Porky has a body temperature of 43^{O}C, the likely normative assessment would be that she is diseased since she should$_e$ have a body temperature of 39^{O}C, and the most likely explanation of the increased temperature is the presence of a viral disease in her body. She could also be assessed as being defective if there are failures in her body's systems which explain why her temperature is 43^{O}C instead of 39^{O}C it should$_e$ be.

3.3 Welfare norms

Claims concerning what should$_e$ occur in contrast to what occurs or may possibly occur concerning the welfare of domesticated pigs can also be gleaned from a number of sources of literature. For instance, the following norms for the welfare of domesticated pigs are drawn from the Department for Environment, Food, and Rural Affairs (DEFRA), who are central source of norms for the welfare of domesticated pigs in the United Kingdom (UK). These norms are significant not only because they are based upon scientific knowledge and practice, but because they also have legal force in the UK. And while their normative

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[105] Food Department for Environment, and Rural Affairs (DEFRA). "Disease Fact Sheet: Foot and Mouth Disease (FMD)." [Website]. (Last Updated: August 3, 2007). In: Department of the Food Environment and Rural Affairs (DEFRA). Available at http://www.defra.gov.uk/animalh/diseases/notifiable/fmd/index.htm. Accessed: 13 August, 2007 2007.

[106] Food Department for Environment, and Rural Affairs (DEFRA). "Disease Fact Sheet: Swine Vesicular Disease (SVD)." [Website]. (Last Updated: August 3, 2007). In: Department of the Food Environment and Rural Affairs (DEFRA). Available at http://www.defra.gov.uk/animalh/diseases/notifiable/svd/index.htm. Accessed: 17 August 2007.

power is due in part to the force of law, the particularities of the norms encompassed by the legislation are due to a normative framework. For example, the *Code of Recommendations for the Welfare of Farm Animals*: Pigs declares,

> The welfare of pigs is considered within a framework that was developed by the Farm Animal Welfare Council and known as the "Five Freedoms". These form a logical basis for assessing animal welfare within any husbandry system, together with the actions necessary to safeguard animal welfare within the limitations of an efficient livestock industry.[107]

These Five Freedoms are:

> **1. FREEDOM FROM HUNGER AND THIRST** - by ready access to fresh water and a diet to maintain full health and vigour.
>
> **2. FREEDOM FROM DISCOMFORT** - by providing an appropriate environment including shelter and a comfortable resting area.
>
> **3. FREEDOM FROM PAIN, INJURY OR DISEASE** - by prevention or rapid diagnosis and treatment.
>
> **4. FREEDOM TO EXPRESS NORMAL BEHAVIOUR** - by providing sufficient space, proper facilities and company of the animal's own kind.
>
> **5. FREEDOM FROM FEAR AND DISTRESS** - by ensuring conditions and treatment which avoid mental suffering.[108]

Each of the Five Freedoms claims something should$_e$ occur in contrast to what does actually occur. That is, specifically pigs *should$_e$* be free from: (1) hunger and thirst; (2) discomfort; (3) injury or disease; and (4) fear and distress. And they should$_e$ have the freedom to express normal behaviour. But of course, domesticated pigs do not always enjoy these freedoms. Unfortunately what sometimes occurs is that domesticated pigs suffer from hunger, thirst, discomfort, pain, injury, disease, fear and distress. Furthermore in some circumstances they do not have the freedom to express normal behaviour. For example, as I noted above, in many farming systems, sows about to give birth are confined

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[107] "The Code of Recommendations for the Welfare of Farm Animals: Pigs." [Website]. In: Department of the Food Environment and Rural Affairs (DEFRA). Available at http://www.defra.gov.uk/animalh/welfare/farmed/pigs/pigcode.pdf. Accessed: 5 July 2004.
[108] "The Five Freedoms." [Website]. In: Farm Animal Welfare Council (FAWC). Available at http://www.fawc.org.uk/freedoms.htm. Accessed: 5 July 2004.

to farrowing crates. In contrast, normal behaviour would be to build a nest—if normal is understood in terms of what is natural, or in terms of what the sow would do if given the opportunity.

The regulations concerning what ought to be done to maintain the Five Freedoms are very clear.[109] For instance, there are regulations which specify norms for how domesticated pigs should$_e$ be handled. They specify that pigs should$_e$ be moved at their own pace and not struck in sensitive places.[110] They also specify that electrical current should$_e$ not be applied for the purposes of immobilization. There are also norms for the contexts in which pigs are handled.[111] For example, there is a regulation that the floors and walkways are well maintained such that they provide a non-slip surface, and that they not be too steeply sloped because this can cause leg problems.[112] More generally, there are regulations which specify norms for: (1) accommodation; (2) feeding and hydration, (3) body modification; (4) regulating fertility; (5) giving birth; (6) treatment of piglets, weaners, sows, boars; and (7) health.

The relationship between the Five Freedoms and the scientific literature on animal welfare is complex because they are intertwined. For example, while the Five Freedoms were drawn (to some extent) from the natural sciences and its literature, the Five Freedoms also inform them.[113] However, the significant point raised by these norms is that they specify that certain things should$_e$ occur, and they are embedded within scientific discourse.

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[109] Interestingly, they begin with the virtues of the 'Stockman', which as they note, is the most significant influence on the welfare of pigs. See: "The Code of Recommendations for the Welfare of Farm Animals: Pigs."
[110]"The Code of Recommendations for the Welfare of Farm Animals: Pigs."
[111]"The Code of Recommendations for the Welfare of Farm Animals: Pigs."
[112]"The Code of Recommendations for the Welfare of Farm Animals: Pigs."
[113] The veterinary scientist Dr. John Webster drew up the Five Freedoms and were there original proponent. He was an original committee member of the Farm Animal Welfare Council (FAWC) and is presently Emeritus Professor of Animal Husbandry at the University of Bristol. See

However, interestingly welfare norms are also used in moral judgements of human beings. For example, if a farmer failed to meet these norms for animal welfare he or she would be morally judged as being 'bad' or even in extreme cases 'evil'. Indeed these welfare norms are typically applied in moral judgements of human beings rather than in normative assessments of living organisms. This is because the target of welfare norms are generally not domesticated pigs but human beings since they are responsible for the welfare of domesticated pigs. For example, we would not say that a domesticated pig is 'bad' or 'defective' if he or she did not meet these norms but we might say that of human beings if they did not.

4. The justification of normative assessments by the natural sciences

As I mention earlier the normative assessment of living organisms involves a report of a comparison between living organisms with a norm for living organisms. So for example, the normative assessment, "Porky the piglet is defective [because she is blind]," reports a comparison between a pig and a norm for sight, where the pig fails to meet the norm in question.

The power of these comparisons depends upon the reason that is given to justify the norm. So in the case of Porky the strength of the assessment comes from the reason that is given for why Porky should$_e$ be born with the ability to see. The nature of these reasons depends on the type of appeal that is being made to the natural sciences to justify the normative assessment. For example, one reason could be that it is typical for piglets to be born being able to see. Another could be that there is some plan or blueprint which specifies that Porky should$_e$ be born with the ability to see.

Now if we examine the norms of character traits, health, and welfare above, we can discern a number of appeals which purport to objectively justify why something should$_e$ occur and thereby ground normative assessments of living organisms. With one exception, they are all appeals to some feature or aspect of the causal order. They include appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; (5) function; (6) ontogeny; (7) species; and (8) pain and suffering. However, I ought to note that my goal in the following sub-sections is to describe the appeals. It is not to criticize them. I reserve my criticisms to chapters 3-6.

4.1 The appeal to typicality

The appeal to typicality to justify normative assessments of living organisms is based upon the fact that some occurrences are typical and some are atypical. That is, what should$_e$ occur is that which typically occurs and that which should$_e$ not occur is that which occurs atypically. So for example, we are justified in claiming that Porky the piglet is defective because it is atypical that piglets are blind (or it is typical that they can see). In other words, Porky the piglet should$_e$ be able to see because it is typical for piglets to be able to see.

The appeal to typicality requires that one ascertain what is typical for the individual or group being normatively assessed. This is done by reference to some broader population or grouping to which the individual or group belongs. What is typical for them is some statistical abstraction from this broader population or grouping. In the case of Porky, the group is new-born members (piglets) of the species Porky belongs to (*Sus scrofa*).

I suggest that underlying this appeal is the intuition, sometimes explicitly expressed, that regularly or typically occurring outcomes signifies the operation of some cause or

system of causes.[114] For example, domesticated pigs will, with great regularity, be born with two ears, two eyes, a curly tail, and be covered with a bristly coat. Consequently, it is not surprising that there is an expectation that domesticated pigs specifically, and living organisms generally, will turn out a particular way, and there is a tendency to note the fact when they do not.

So when we see a group of pigs in a field that are in many respects the same, or very similar, we tend to assume that this is caused by something. And in this case, the intuition is entirely correct. The fact that these pigs are in many respects the same or very similar is due to human action (in conjunction with pig biology).[115] The inference is then drawn (rightly or wrongly) that the effects of the causes should$_e$ occur.

However, the appeal to typicality is *not* to the underlying causal system responsible for typical outcomes. It is the fact of typicality which ostensibly justifies the normative assessments in this case. Of course, we could appeal to the various underlying causal systems responsible for typical outcomes to justify normative assessments. For example, in what follows, I consider the causal system responsible for development in the appeal to development. For Porky it is this causal system which is responsible for the fact that piglets typically are born with eyes. It is also the causal system responsible for whatever characteristics piglets happen to exhibit, and more generally it is the causal system responsible for whatever characteristics living organisms exhibit. Nevertheless, an appeal to this causal system would go beyond an appeal to typicality as such.

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[114] In invoking causes and effects I am not implicitly appealing to any particular account of causation and ontology for cause and effect. My point does not depend upon them.

[115] This is especially pertinent in the case of breeds of domesticated pigs which vary greatly from the wild-type ancestor because without human action the breed would likely revert to some alternative set of similar characteristics.

4.2 The appeal to history

A closely related appeal to justify the normative assessments of living organisms is the appeal to the history of the causal order. Similarly, I suggest that underlying this appeal is the intuition, sometimes explicitly expressed, that the regularity or typicality of the operation of some cause or system of causes over time is significant. For example, some living organisms have shown great constancy in their development over period of thousands and even millions of years. Living fossils are the classic example. For instance, the New Zealand Tuatara (a lizard) is unchanged since the time of the dinosaurs, which was at least 60-odd millions of years ago. Given such past regularity, it is a small leap to suggest that this consistency in causation is and ought to be privileged. That is, the inference is drawn (rightly or wrongly) that the regularity of effects over some period of time should$_e$ occur in contrast to what atypically occurs or may possibly occur.

For instance, at least part of the intuition that domesticated pigs such as Porky should$_e$ turn out a particular way is because for at least 9000 years, they have turned out this way, albeit modified to some degree by human action. So it ought not to be surprising that some have come to the view that what should$_e$ occur in contrast to what actually occurs is what has regularly occurred in the past.

The appeal is also utilized implicitly to some extent in the works of Foot, Arnhart, and Casebeer. For example, in Foot's account of moral judgement and normative assessment, the central normative concept of life forms is a historical as well as a logical construct.[116] So for any individual *x* belonging to life form X the character traits etc. of the life form X should$_e$ occur in *x*. However, what the character traits are for the particular life form X

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[116] I should note that his point is not clearly made in *Natural Goodness*. Rather it is clearly made in 'The Representation of Life' by Michael Thompson. See Thompson, "Virtue and Reasons," esp. pp. 271-279. Foot draws extensively upon Thompson and explicitly acknowledges this in her account of life forms. See Foot, *Natural Goodness*, 27-29.

depends on how the life form has developed over history. For instance, we cannot say which reproductive behaviours of individual domesticated pigs belonging to the life form *Sus scrofa* should$_e$ be, unless we know the history of the reproductive behaviours of the life form.

4.3 The appeal to what is 'natural'

A further appeal that seeks to explain why something should$_e$ occur is the appeal to what is natural. Like the appeal to typicality and history, it seems to be another appeal to the causal order. Specifically it is an appeal to the causal order *absent* causes enacted by human beings. For example, earlier I noted that ultimately the normative assertion that domesticated pigs should$_e$ be free to express 'normal' behaviour is based upon what is natural for the domesticated pig, where "what is natural," is understood (roughly) as what domesticated pigs would do in circumstances outside human control.

Specifically, I discussed the case of the practice of confining sows to farrowing crates prior to giving birth. One reason that might be given for assessing this practice as bad is that it is not natural. That is, it is negatively assessed, among other reasons, because being confined to give birth is not what wild pigs and domesticated pigs living in wild environments do; or what they do given any choice in the matter. Indeed, what they do in the wild and given the opportunity is to build a complex nest.

Furthermore, the appeal to what is natural in this sense, underpins a good deal of the normative assessments and moral judgements issued by some members of the environmental movement. For example, some environmentalists normatively and morally criticize those who interfere with the 'natural' environment—the environment which (hitherto) has been (largely) free from human interference. Indeed, such interference is

represented as one of the biggest environmental sins human beings, especially those within commercial companies or governments, can commit.

4.4 The appeal to natural selection

Evolution by natural selection is a central explanatory motif within the sciences of biology. It is important for a number of reasons, but a central one is that diverse biological phenomena are explained by the process. For instance, it is used to explain the appearance of design in the living world, human sexual behaviour and morality, and speciation. Natural selection is 'natural' in the sense described above; that is, the 'selection' is free from human influence or interference. Indeed, natural selection is contrasted with artificial selection which is selection due to human influence or interference.

In the context of normative assessments, the appeal to natural selection is used to justify normative assessments by the facts that natural selection 'chooses' what should$_e$ occur.[117] So what is distinctive about grounding normative claims with respect to natural selection is the kind of 'choice' that is made by nature. That is, the 'choice' is taken to establish a norm because it is natural.

Moreover, the fact that there are instances where what occurs differs from what should$_e$ occur is not a problem for this kind of appeal. This is because it is widely recognized that natural selection is imperfect. What I mean by this is that something having a higher fitness compared to variations or alternatives does not ensure that it will occur in contrast to the possible alternatives. What higher fitness means is that something has a higher chance of surviving to reproduce under natural selection. It does not mean that it will survive to

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[117] The 'choice' here is without intention.

reproduce under natural selection. The fact of survival to reproduction may be due to other factors, such as luck.

And again this appeal is a kind of appeal to the causal order. Specifically, it is an appeal that builds upon the intuitions about typicality, history, and what is natural. To these it adds a kind of natural 'choice'. Indeed, the remaining appeals are similar in that they build upon the previous appeals and add something to them.

The appeal to natural selection is part of Arnhart's account of moral judgement of human beings. In particular, he holds that the twenty natural desires, to which he appeals to justify moral judgements, were developed and shaped by natural selection. For instance,

> Despite the uncertainty in reconstructing the evolutionary history of human ancestors, there is evidence for believing that this pattern of twenty desires developed in the Paleolithic environment of our hunting-gathering ancestors, the evolutionary environment in which human nature was shaped by natural selection.[118]

In other words, natural selection at least partially established these particular twenty natural desires.

4.5 The appeal to functions

The appeal to functions seeks to explain why something should$_e$ occur in contrast to what does occur. For instance, it seems natural to say that Porky's heart should$_e$ pump blood, in contrast to whatever else it does because this is what hearts are for. That is, pumping blood is the heart's purpose. If Porky's heart does not pump blood we would say Porky is defective, whereas, if her heart did not make certain kinds of noise, we would not, although perhaps we might say that it unusual.

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[118] Arnhart, *Darwinian Natural Right*, 30.

This kind of appeal to justify normative assessments is especially evident in the context of health. For instance, I have already pointed to the function of the heart in the domesticated pig. I could equally point to the functions of the liver, the functions of the pancreas, the functions of the kidney or a whole host of different organs at one level of organization. I could also point to the functions of particular cells at lower levels of organization, or functions of particular systems such as the endocrine system at a higher level of organization. In each case we can say, at the particular level of organization, what that entity is for and therefore what it should$_e$ do in contrast to what it does in fact do.

Moreover, a healthy pig consists of many different parts each performing specific actions at many different levels of organization towards some overall or overarching harmony (which we call health). This goal is such that dysfunction at any particular level of organization could mean disease for the pig as a whole.

Casebeer in particular appeals to functions to justify moral judgements of human beings. However, I will defer comment on how he makes use of this appeal to Chapter 7.

4.6 The appeal to development

The appeal to development is the appeal to what causes the development of an individual from its beginning to end. This appeal is especially evident in normative assessments of congenital defects. For instance, if Porky was born with no eyes, one ear, and two curly tails, she would be normatively assessed as being defective. The intuition is that piglets should$_e$ be born with two eyes, two ears, and one curly tail and typically they are born with these characteristics. So presumably something has gone awry with the process of development in Porky's case.

The basis of this appeal is a particular kind of account of the development of an individual from egg to adult. This holds that the process of development is preformed in some way. Specifically, presently it is claimed that the process of development is preformed in blueprints or programmes encoded in their DNA. Consequently, these kinds of account are known as preformationist accounts of ontogeny.

On such accounts of ontogeny, what should$_e$ occur is specified by the plan or programme encoded in the DNA of the organism. Obviously, in some cases, this plan can be frustrated. For instance, there could be interference due to some mutagen which affects the DNA itself, or some teratogen which interferes with the implementation of the plan.

4.7 The appeal to species

The appeal to species to justify the normative assessment of living organisms is to some kind of type to which the token belongs to, which explains why something with respect to the token should$_e$ occur. For instance, the normative assessment "Porky is a defective pig" appeals to the type 'domesticated pig' to explain why Porky is defective. That is, it is the fact that Porky belongs to the type 'domesticated pig' which explains why Porky should$_e$ be able to see when in fact she cannot.

Another way to characterize the appeal to species is to say it is (in other terms) an appeal to the individual's essential nature. However, in fact, the two are not the same despite how the term 'species' is used in everyday talk. This is because the term 'species' can refer to different kinds and or aspects of a living organism's character traits. Take, for example, our friend Porky. The essential nature of Porky could be characterized as having "two eyes, two ears, a snout, a bristly coat, and a curly tail." And Porky's species is *Sus scrofa*. Yet *Sus scrofa* does not necessarily refer to the class of creatures that have two eyes, two ears, a snout, a bristly coat, and a curly tail. Rather *Sus scrofa* could refer to a

particular lineage of organisms that share a particular common ancestor, which, in fact, probably had substantially different characteristics compared to modern domesticated pigs.

However, often the appeal to species can be short-hand for another appeal which relies upon a further explanation for why something should$_e$ occur. For example, in the case of Porky, the appeal to the type 'domesticated pig' could be short-hand for the appeal to development—i.e. the causes of development. So the reason why Porky the domesticated pig should$_e$ have two eyes, two ears, and one curly tail is because these character traits are pre-programmed in domesticated pigs' DNA.

Moreover, the appeal to species can encompass a number of very different notions. This is because there are many different kinds of species concept including: (1) species as nominal entities; (2) species as real classes; (3) species as individuals; and (4) species as relations. I consider these in detail in Chapter 6.

4.8 The appeal to pain and pleasure

The final appeal that I discuss that seeks to explain why something should$_e$ occur is the appeal to pain and pleasure. Specifically, the claim is either something should$_e$ occur because it promotes or brings about pleasure, or that it should$_e$ not occur because it promotes or brings about pain.

This appeal to justify normative assessments may be based on the idea that pleasure and pain constitute a kind of signalling system for what is truly desirable for living organisms. [119] Indeed, Arnhart indirectly draws on this point in *Darwinian Natural Right*,

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[119] This kind of point is made in: William F. Harms, *Information & Meaning in Evolutionary Processes* (Cambridge, 2004).

where he provides an account of the normative structure of animal movement.[120] He claims that "To live every animal must act, either consciously or unconsciously, to achieve the goals set by its nature."[121] Broadly, biologically this goal is to survive to reproduce and generally speaking what is 'painful' is inimical to survival and what is 'pleasurable' is positive to survival.

No doubt this attempt to justify normative assessments is also informed by human experiences of pain and pleasure and empathy with fellow living organisms. All other things being equal, human beings prefer the experience of pleasure to the experience of pain. Moreover, they see this preference, albeit analogously, in other living organisms too. That is, all other things being equal, fellow living organisms prefer the experience of pleasure to the experience of pain. For instance, animals typically avoid exactly the same stimuli that cause pain in human beings. Moreover, human beings claim that pain should$_e$ not occur when it does and pleasure should$_e$ occur when it does not. So by observation and empathy they infer that this applies to fellow living organisms too, which in turn is used to justify various normative assessments. Indeed, normative assessments justified by this appeal tend to be statements which describe situations where pain occurs when it should$_e$ not, or where pleasure does not occur when it should$_e$.

This appeal is particularly evident in the context of the normative assessment of living organisms' welfare. For instance it apparently underpins every one of five freedoms for animals, which are in the process of being enshrined into U.K. law. In other words the reason why the five freedoms are espoused and enshrined in law is that if they are denied, animals suffer.

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[120] Arnhart, *Darwinian Natural Right*, 21-28.
[121] Arnhart, *Darwinian Natural Right*, 21.

It also differs somewhat from other appeals I consider in that it is not to some objective aspect or feature of the causal order such as its history. Rather it is to something which supervenes upon it. Still it seeks to objectively privilege particular occurrences (pleasurable states) over and against the alternatives (painful states).

5. Conclusion

The goals of this chapter were twofold. The first was to provide an account of normative assessments of living organisms. The second was to characterize how the natural sciences attempt to justify normative assessments of living organisms. This was in order to lay the foundation for my demonstration that the natural sciences are not adequate to objectively justify normative assessments of living organisms.

I characterized the normative assessment of living organisms as the report of a comparison between a living organisms (or living organisms) with a norm which claims that something should$_e$ occur in contrast to what occurs or may occur. This was illustrated using the example of domesticated pigs.

The justifications of these normative assessments were by various appeals which gave reasons why the norm should$_e$ occur. I discussed appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; (5) functions; (6) development; (7) species; and (8) pleasure and pain.

I am going to argue that none of these appeals succeed. However, to be clear, I am *not* arguing that it is a mistake or wrong to use them to justify normative assessments. For instance, I do not claim that it is never permissible to say "X is wrong because it is

dysfunctional." Rather I claim that it is not correct to suppose that claims of this kind can be wholly and unambiguously justified by a plea to the natural sciences. Specifically, I argue that the appeals are inadequate for at least one of four reasons. The first is that some versions of the appeals cannot be understood purely in terms of the natural sciences. The second is that some appeals embed unjustified assumptions which effectively beg the question concerning which normative assessments are justified. The third is that in some cases some appeals justify completely counter-intuitive normative assessments. The fourth and final reason is that they fail to sufficiently privilege particular occurrences over and against alternatives. It is the goal of the following chapters to demonstrate why this is the case.

Chapter 3: Problems with the natural sciences justifying normative assessments of living organisms

1. Introduction

The previous chapter used the example of domestic pigs to explore the different ways in which it would be possible to appeal to the natural sciences to justify normative assessments. These included appeals to: (1) typicality; (2) history; (3) what is natural; (4) natural selection; (5) function; (6) ontogeny; (7) species and (8) pleasure and pain.

I argue that these appeals are inadequate. The purpose of this and subsequent chapters therefore is to provide arguments to support this claim. In particular, this chapter examines the appeals to: (1) the causal order; (3) history; (4) being natural; and (4) natural selection; (5) pain and pleasure. I do not include the appeals to function, ontogeny, and species because, as we shall see, they appear to escape some of the objections made here. Moreover, their complexity warrants separate treatment. Consequently, I deal with them in chapters 4-6 respectively.

2. The failure of the natural sciences to justify adequately normative assessments concerning living organisms

2.1 The appeal to typicality

The appeal to typicality turns on the idea that there is some state of affairs that regularly or typically occurs. Usually this is in some broader population of tokens of some type. Take for instance our oft-used example of Porky the piglet. The idea is that Porky the piglet is defective precisely because she is blind while the ability to see is typical for all populations of piglets.

The appeal to typicality is a natural and obvious one for those within the natural sciences to make. After all, as noted in Chapter 2, regularity of occurrences is (at least) indicative of the operation of some cause or system of causes, and it is an explicit goal of the natural sciences to elucidate them. So for instance, consistency in the characteristics of organisms within a particular lineage suggests there is some underpinning cause or system of causes (which explains the consistency and why they ought to be consistent).

Therefore, it is not surprising there is an expectation that when something regularly occurs that it should$_e$ occur. Nor is it surprising that when the expectation is fulfilled living organisms are assessed as being good (or some other similar positive normative term), or that when it is frustrated living organisms are assessed as being defective (or some other negative normative term).

However, the appeal to typicality has a number of serious problems. The first is that it relies upon some choice of population, which needs to be justified. This is because what is typical for an individual or group is derived from some broader population to which they belong. The reason the choice needs to be justified is because the individual or group may belong to many different populations whose characteristics may differ considerably. For instance, what is typical for Porky is derived from some broader population of piglets. Yet the characteristics of different populations of piglets may vary considerably. For example, it may be typical in some populations that piglets are born blind. Or that they are variously brown, grey, spotted, or pink etc. So clearly the choice of population is critical and requires justification.

So how might one justify the choice of population over and against possible alternatives? Subjective justifications will not do because these easily lead to

contradictions. In other words, justifications which rely solely upon some non-objective aspect or element of a subject, such as their will, will not do, since these easily lead to irresolvable disputes. For example, subject A chooses a population of piglets which typically are blind, and subject B chooses a population of piglets which typically can see. Yet subjectively speaking both choices are equally justified. Yet an objective choice requires some single privileged way to choose populations, but clearly there is none. That is, an objective justification of the choice of population requires that there be one way to carve nature at the joints, but clearly there are many ways to do so. (This is a point I shall take up again in detail in Chapter 6.)

A parallel problem is that the appeal to typicality relies upon the choice and justification of some timeframe. This is necessary because what is typical for some population changes over time, especially over evolutionary time. For example, let us define a population as every the member of the lineage to which Grant D. Vallance belongs. What is typical for this population depends greatly upon the choice and justification of timeframe. Compare for instance, what is typical for this population over the last 10 000 years with what is typical over its entire history. In the latter scenario, Grant D. Vallance is *very* untypical. (This is a problem I come back to in the next section.)

Indeed, *any* parameter of a population which changes over time raises issues for the appeal to typicality. This is because to determine what is typical requires some implicit or explicit specification of the parameter, which in turn requires justification. Otherwise, the specification is open to the charge of being arbitrary. Or if it is chosen without objective justification the appeal to typicality is open to the accusation that it begs the question concerning what should$_e$ occur.

The second problem facing the appeal to typicality is that it relies upon some measure of typicality. Yet the choice of measure also needs to be justified because there are different possible measures of typicality and they can vary significantly. For instance, for some characteristic of some population, the median, mode, mean, and standard distribution could all be employed as a measure of what is typical.

Let us say we have a population P consisting of individual members P_n whose characteristics can be aggregated via a number between 1 and 10. P in this case is [P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}] where there characteristics are respectively [1, 2, 2, 3, 4, 6, 6, 6, 8, 8, 9]. So what is typical for P? The median is 6, which means P_6, P_7, and P_8 are typical. The average is 5, which means no member strictly speaking is typical. The mode is 6, so again P_6, P_7, and P_8 are typical. The standard deviation is 2.76 (3sf), and if we assume that what is typical falls within one standard deviation then P_4, P_5, P_6, P_7, and P_8 are typical. On all measures P_6, P_7, and P_8 are typical, yet on one measure P_4 and P_5 are also typical. Obviously, the question to address is which measure of typicality one ought to use and how to justify the choice of measure.

An obvious issue with the appeal to typicality is that it leads to contradictions concerning what should$_e$ occur. Take Porky again. If it became typical that piglets be born blind then according to this appeal, piglets (and Porky) should$_e$ be born blind. Yet if it became typical (once again) that piglets be born being able to see then according to this appeal, piglets (and Porky) should$_e$ be born being able to see. The appeal in this case equally justifies the claim that X should$_e$ occur and that not-X should$_e$ occur.

Of course the natural retort is to observe that the norms which appeal to regularity or typicality are time sensitive. That is, if it became typical that piglets be born blind at t_1 then

only at t_1 should$_e$ they be born blind. And if it became typical at t_2 then only at t_2 should$_e$ they be born being able to see. Or more generally, whatever is typical at t should$_e$ occur. So while the appeal in this case equally justifies the claim that X should$_e$ occur and the claim that not-X should$_e$ occur; they are at different times so there is no contradiction. Yet because this retort embeds a choice of timeframe—some particular instant—it raises problems concerning the justification of the choice of timeframe noted above.

However, this retort does not save this appeal from the charge that it justifies normative assessments which are strongly counter-intuitive, which raises the third problem with the appeal. For example, let us assume t_1 and t_2 are two generations of piglets where t_2 is the generation following t_1. At t_1 it is typical for piglets to be born blind because of some pandemic disease, whereas at t_2 it is typical for piglets to be born with the ability to see because the pandemic has died out. Appealing to typicality to justify normative assessments would commit one to holding at t_2 that Porky should$_e$ be born blind. Moreover, it would also commit one to holding that Bacon the piglet (who was born being able to see at t_1) should$_e$ be born blind. And if we normatively assessed Bacon we would say appealing to typicality that she is defective.

This point is especially pertinent in the context of moral judgements concerning human beings. For instance, if we held that what regularly occurs should$_e$ occur then it follows that in the past, slavery should$_e$ have occurred. It also follows that inequality between men and women should$_e$ occur. And in some contexts, that genocide should$_e$ occur too. Now these are all nonsensical normative conclusions to draw.

However, notwithstanding this point, we do seem to hold that regularities in some circumstances justify norms, such as the norms that apply to organisms' development. For

instance, the development of piglets typically occurs in a certain way and the minority of piglets who develop in an atypical way are negatively evaluated.

The issue of course is finding a tenable means of ascertaining when regularities in the causal order ought to be regarded as normative (or not) and how the normative status of regularities may change over time. To take the example above, the problem is finding a tenable means of ascertaining the circumstances under which it would be appropriate to claim that pigs should$_e$ be born with one eye, rather than two.

One possible move would be to go beyond typicality *per se* as the justification for normative assessments. Instead we might appeal to the causal system responsible for what typically occurs. In other words, it would not be that which is typical which justifies what should$_e$ occur, but the causal system which explains why particular outcomes are typical. In the case of Porky we might appeal to the causal system responsible for her development. However, this kind of appeal is no longer an appeal to typicality, although I will consider it in Chapter 5, where I examine the appeal to development.

2.2 The appeal to history

The appeal to history is based on the idea that because lineages of living organisms *have* regularly displayed particular characteristics through time, they should$_e$ display these characteristics. So if individuals within the lineage differ from what has occurred over some period in the past, they are 'defective' because they should$_e$ be the same. And conversely, they are 'good' (or some other similar normative term) where they are the same.

Indeed, there seems to be something special about the use of the past in contrast to the present or possible future in justifying normative assessments concerning living organisms.

Perhaps it is the possible 'weight' of expectation that some histories provide which gives rise to this intuition. For instance, some lineages of living organisms have the same form they did *millions* of years ago, and this gives credence to expectation that they should$_e$ be the way they are. At a minimum, the form clearly has stood the test of time.

However, I acknowledge the point that one could argue that the appeals to typicality and history are different facets of the same kind of appeal, which differ only in that appeal to history focuses solely upon the past. Consequently, what has been argued above applies here too. Nevertheless, I distinguish these appeals because the appeal to typicality is often framed in terms of history rather than in terms of what is typical.

Lineages of living organisms have an extensive history of some four billion years. In that time characteristics of some of these lineages have shown considerable change over time, and in different locations and populations. For example, the characteristics of the lineage which includes all *Homo sapiens* have changed over four billion years from being simple single-cell organisms to a complex of billions of cells of a peculiar form. Consequently, like the appeal to typicality, the choice of timeframe and population is critical because they considerably affect what the norms are. Take for example, the normative assessment that "Domesticated pregnant sows about to give birth should$_e$ be allowed to build a nest and they should$_e$ have the requisite materials to do so." The appeal to history to justify this assessment implicitly invokes a norm specifying how some population of sows (say the wild-type species) behaved prior to birth in the past.[122] However, every domesticated pig has a lineage which goes back right to the origin of life on earth. This lineage encompasses archaebacteria, crude multi-cellular organisms,

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[122] A normative assessment is justified when the norm in question is justified by the appeal. In short, this warrants the claim that the norm should occur.

invertebrates, vertebrates, primitive mammals, and finally pigs. So if the history of this lineage is going to be used to justify the normative assessment of domesticated pigs, a period of its history needs to be chosen. Obviously, the choice of timeframe is going to make profound differences to the norm that results. And importantly, without justification, it is difficult to escape the charge that the norm, and thus the assessment, is arbitrary.

There are three obvious choices of timeframe for the lineage of domesticated pigs or any other lineages of living organisms which are intuitively justifiable. The first is to use the whole of history of the lineage. But on this, essentially most contemporary complex multi-cellular organisms are going to be defective because for the vast majority of every lineage has been composed of single-celled and crude multi-celled organisms. Take the case of the way in which domesticated sows give birth. If we appeal to the whole history of the lineage of domesticated pigs to justify our assessment of how domesticated pigs should$_e$ give birth, then the behaviour of all domestic sows will turn out to be defective. This is because on this timeframe how domesticated pigs should$_e$ give birth is by binary fission rather than by the means we see today. Clearly, this is highly counter-intuitive.

The second option is to go back in time to the point where the lineage diverged to produce the organisms akin to the ones being assessed. However, this choice is circular. It is circular because in order to identify this point, we need to appeal to the qualities and characteristics of contemporary organisms of the lineage—either some exemplar, or some statistical construct of some population. This is problematic because it makes unwarranted assumptions concerning what should$_e$ occur in favour of contemporary qualities and characteristics. But why ought (relatively) recent history pre-dominate? Why ought (recently) recent history be regarded as the norm and be regarded as normal? Why not

some other period? Furthermore, this move assumes without independent justification that either the exemplar or the statistical construct is normative.

The third is some recent timeframe, but even here there are difficulties given the evolution of farrowing practices since pigs have been domesticated. For example, the appeal to history would not support the normative assessment above, if 'recent' encompassed the period when the practice of confining sows into farrowing crates predominated in the production of domesticated pigs in the world. On the other hand, even during this period, the appeal to history would support the normative assessment above if the population was limited to domesticated pigs that were produced organically. Moreover, on the *most* recent history of pig production in the world, the prevalence of confining pigs to farrowing crates is declining. So for example, yesterday, in England, the appeal to [most recent] history would once again support the above normative assessment.

Now on top of the problems about justifying a particular historical timeframe there are also problems about justifying a particular population since these vary, sometimes considerably, at any given point in time. The obvious way to justify the choice of population is to use the species concept to delineate it. However, this does not address the problem. As we shall see in Chapter 6, there are both many different species concepts and many different species concepts employed within the natural sciences which delineate different populations. Consequently, any choice of species concept to do this job would need to be justified too.

While more could be said at this point, I shall desist. This is because more will be said in Chapter 4. This focuses on functions as a way to justify normative assessments concerning living organisms, and at least some accounts of functions which could be

employed to justify normative assessments concerning living organisms rely upon the history of organisms and their parts.

2.3 The appeal to what is natural

As noted, the appeal to what is natural to justify normative assessments concerning living organisms is especially evident in the context of animal welfare assessments. That is, such appeals are clearly seen in assessments concerning how human beings ought to treat other living organisms in their care.[123] For instance, in the previous chapter, I discussed at length the example of the normative assessment of confining domesticated sows about to give birth to farrowing crates.

By and large, the normative assessment of this practice within the welfare literature is negative. It is based on appeals to what is 'normal' and 'natural' for domesticated sows, where what is normal is what is natural, and what is 'natural' is what domesticated sows would do if given the opportunity to choose for themselves, and or what the wild-type does outside human interference. In essence the appeal is based on the idea that what is natural should$_e$ occur and what is artificial should$_e$ not occur.

However, there are a number of problems with this appeal. The first is that the distinction between natural (in this sense) and not natural is difficult to sustain within the natural sciences.[124] What occurs or what will occur is the sum of all and every effect and this includes the effects of human actions. In other words, from the perspective of the causal order, there is no interesting distinction between human causes and other causes, except with respect to the fact they are performed by human beings. For example, the

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[123] Apparently, the irony of making this appeal in this context is lost on those who employ it.
[124] Neither is it particularly naturalistic.

significant difference between natural selection and artificial selection is what or who does the selecting, but the remainder of the process, in essence, is exactly the same.

This is not to say that subjects, such as human beings, cannot distinguish between what is natural and not natural in this sense. But it is to say that this distinction is arbitrary from the perspective of the causal order. Consequently, the natural sciences can describe where this distinction is made by human beings, but they can hardly be said to justify it. There is no causal law so far discovered that privileges what is natural over what is not natural in this sense. For instance, Newton's second law, Force = mass x acceleration, does not depend on whether mass is natural or not natural, or whether the acceleration provided is from 'natural' or not 'natural' sources.

The second problem follows from the first. This is the problem of privileging the natural over the non-natural. Clearly, there are no direct objective means to justify such privileging because effects are insensitive to whether the cause or causes are natural or non-natural. That is, if we compare two effects which are the same, where the first is due to a natural cause and the second is due to a non-natural cause, we could not from the character of the effect ascertain whether it was caused naturally or non-naturally. For example, if we compared two pigs from different lineages that have essentially the same character traits, where the traits of the first were caused by natural selection, and the traits of the second were caused by artificial selection, we would not be able to distinguish from the character traits of the pigs alone, which was naturally and which was artificially caused. So we could not tell which pig should$_e$ occur on this basis.

However, we could claim that while there are no direct (first-order) means of objectively justifying the natural over the non-natural, there may be some indirect (second

order) means of objectively justifying the natural over the non-natural. The obvious move would be to say that natural causes are conducive to an organism's good or its flourishing whereas artificial causes are not. Yet there is no such relationship. Moreover, if it were true, the appeal would justify counter-intuitive normative assessments. For example, one would have to negatively evaluate all animal husbandry which is critical to domesticated organisms flourishing because it is artificial.

Indeed, the difficulties of using what is natural to justify normative assessments concerning living organisms is thrown into stark relief by the case of domesticated living organisms like domesticated pigs. Domestic animals were and are specifically developed by the influence of *Homo sapiens*. Both the organisms themselves and the environments they inhabit have been and are deliberately been shaped to fit the purposes of *Homo sapiens*. Consequently, it is difficult to disentangle what is 'natural' from what is not 'natural'.

Furthermore, the idea that the wild-type can serve as the norm for domesticated organisms is problematic. Indeed, the idea that there are natural character traits for domesticated organisms, in the sense the term 'natural' has been employed, is almost nonsensical. By definition, domesticated organisms are not natural in this sense, and there is no way in which they are naturally supposed to be, notwithstanding the similarities between domesticated pigs and their wild-types.

The obvious point is that all domesticated organisms have been caused by human actions. These have determined their characteristics via artificial selection, by both choosing which organisms to breed and by altering their environment—the context in which they live. Admittedly, there are characteristics of all domesticated organisms which

have largely been unaltered by artificial selection. But if organisms are wholes rather than merely a sum of individual components, and they seem to be, then separating out the 'natural' elements from the 'artificial' elements is extremely difficult. This is because elements derive their character from *both* the constitution of the elements themselves *and* the context in which they are placed. So *pace* Porter, domesticated pigs are not simply wild boar at heart, even though they are similar and related.[125]

Take for example the fact that wild-boar, the wild-type of most domesticated pigs, are seasonal breeders, whereas domesticated pigs breed all year around. I take it that it would be hard to plausibly say that domesticated sows should$_e$ breed once a year. Or conversely, it would be counter-intuitive to say that domesticated pigs that breed all through the year were abnormal. Breeding throughout the year seems to be definitive of domesticated pigs as they are presently constituted, and arguably, they would not be domesticated pigs if they did breed seasonally like wild boar. Furthermore, if domesticated pigs did not breed all through the year, they would almost certainly be regarded as abnormal, and probably ill. One would suppose that if either domesticated sows or boars on a farm suddenly showed no inclination to mate, the vet would be called in to identify the cause, which if identified, would be thought of as being pathological.

One response to this point would be to claim that the scope for the appeal to what is natural is limited to a particular population and or timeframe. So the claim would be that what should$_e$ occur is what is natural for the wild-type *Sus scrofa* in the recent past. And what should$_e$ occur (notwithstanding prior human interference) for domesticated *Sus scrofa* is what is natural for them in the recent past—where what is natural is what they would do absent human interference. However, this response is open to the foregoing objections to

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[125] See Chapter 2.

the appeals to regularity and to history. This is because such limitations seem wholly arbitrary.

An appeal to what is natural is also made in another context, where what is natural is coupled to the sorting power of competition between living organisms—that is, natural selection, and it is to this I now turn.

2.4 The appeal to natural selection

The appeal to natural selection to justify normative assessments concerning living organisms is significant for a number of reasons. First, natural selection is the key component of the theory of evolution, which is the central explanatory motif within the sciences of biology. Consequently, given the role of this theory in the explanation of biological phenomena, one would expect that natural selection would play some, if not insignificant part, in justifying normative assessments concerning living organisms. The second is that it also is an important component of some accounts of functions which are compatible with the natural sciences and which are also used as a way to justify normative assessments concerning living organisms. And finally, obviously, the theory provides an objective way to distinguish between what should$_e$ occur and what does occur.

Simply, what should$_e$ occur in this case is that which has the greatest fitness under natural selection in contrast to the alternatives. So for Porky, Porky should$_e$ be born being able to see because this state of affairs has greater fitness in contrast to being blind. However, natural selection is imperfect. Natural selection does not completely determine survival since sometimes this is dependent on other factors such as luck. Moreover sometimes survival is independent of natural selection because natural selection requires variations and competition to operate and sometimes there is none. So the fittest only typically survive and those with less fitness typically do not. This imperfection helps

explain the difference we observe in practice between what should$_e$ occur and what actually does.

However, I argue that this appeal also fails to justify normative assessments concerning living organisms. It fails for a number of reasons. First, the appeal to natural selection fails because it inherits some of the problems of some of the previous appeals. This is because it has various features in common with them. For example, the appeal to natural selection also privileges what is natural. Yet, as I showed in the appeal to what is natural, there are significant problems in objectively privileging natural over artificial causes from the perspective of the natural sciences. Likewise, there are also significant problems in objectively privileging natural choices over human choices from this perspective. Indeed, natural selection cannot be privileged over artificial selection apart from some subjective preference.

The appeal to natural selection also draws to some extent upon privileging typical outcomes as in the appeal to typicality. This is because the fittest only typically survive and those with less fitness typically do not. However, in this case the privileging of typical outcomes is not based upon typicality *per se* but on an appeal to a causal system which explains why particular outcomes are typical. Consequently, it essentially escapes the objections raised to the appeal to typicality.

Nevertheless a parallel point can be made that the appeal to natural selection justifies normative assessments which are strongly counter-intuitive. The problem is that the appeal to natural selection assumes that survival to reproduction is the ultimate good for living organisms. Yet this is disputable at the level of the individual. For example, from the perspective of a male Black Widow spider, it is counter-intuitive to claim that he *qua*

individual with an interest in living should$_e$ mate when this leads to his death. In other words, it is odd to claim that a male Black Widow spider is defective if he avoids mating and his probable demise at the fangs of his mate. But according to the appeal to natural selection he should$_e$ mate because reproduction and the continuance of the lineage is the ultimate good notwithstanding this is likely to terminate his existence.

Of course, the evaluation is not counter-intuitive if we are considering the survival of the species. But to this point I would reply that an argument needs to be made why this communal perspective ought to be privileged over the individual. Furthermore, this reply becomes more compelling in the case of the moral judgement of human beings where it is clear that the communal considerations are not over-riding.

The appeal to natural selection may also be a kind of appeal to history if the appeal is to what has *been* selected. (In this case what should$_e$ occur in the future is that which has been selected for in the past.) Consequently, it also inherits most of the problems of the appeal to history such as the problem of justifying the particular timeframe of natural selection's operation. The choice of timeframe is important because the operation of natural selection has different consequences at different times. The appeal to past natural selection also has the problem of justifying why the past is normative rather than the present or the future.

Of course it need not be a kind of historical appeal—it could also be a kind of appeal to the future—to what will be selected. However, this is problematic because of the indeterminacy of natural selection and consequently what should$_e$ occur is unclear and effectively makes normative assessments untenable because there are no clear norms.

2.5 The appeal to pain and pleasure

As I noted in the previous chapter, the appeal to the experience of pain and pleasure is commonly used to justify normative assessments in the context of animal welfare. According to this appeal, what should$_e$ occur is that which leads to the greatest experience of pleasure for the greatest number of individuals over some timeframe. And what should$_e$ not occur is that which leads to the experience of pain for the greatest number of individuals over some timeframe. This is in contrast to other possible actions with differing consequences for the experience of pain and pleasure for these individuals.

Moreover, I ought to emphasize that the appeal to pleasure and avoidance of pain is *not* plausibly an appeal to them as ultimate ends.[126] Rather, the appeal to pleasure and avoidance of pain is an appeal to what pleasure and pain reliably signal with respect to the good for living organisms.[127] This is because if these were the ultimate end then they ought to be single-mindedly pursued. But the single-minded pursuit of the experience of pleasure and the avoidance of the experience of pain is clearly bad for living organisms. That is, such pursuit causes them harm. Take for instance the respective lives of drug addicts and lepers. Drug addicts achieve a maximal experience of pleasure, but they apparently ruin or destroy their lives. And lepers do not suffer the experience of bodily pain because their nerves have been deadened due to infection by *Mycobacterium leprae*. But they then damage their bodies because they lack the signal (pain) which indicates bodily damage.

I admit that generally the experiences of pleasure and pain have been reasonably reliable and objective signals with respect to the good or goods for living organisms. Yet

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[126] *Pace* unsophisticated hedonistic utilitarians, plausible arguments against pleasure and pain being ultimate ends were made thousands of years ago by the ancient Greeks. For instance, Aristotle plausibly argues against it in *Nicomachean Ethics*. See: Aristotle, *Nicomachean Ethics*, Terence Irwin trans., 2nd ed. (Indianapolis, Cambridge, 1999), 1095a15-1095b23.

[127] If living organisms did not generally obey signals provided by pleasure and pain, they would soon cease to exist.

the appeal to pleasure and pain does not adequately justify normative assessments for a number of reasons. The first is that the experience of pleasure as a good or indicator of good, or pain as a harm or indicator of harm, is equivocal. On one hand, the experience of pleasure can be a good—or indicate a good, and the experience of pain can be a harm or indicate harm. For example, the experience of pleasure one gets from a good meal can indicate good nutritional status. And the experience of pain as hunger pangs can indicate bad nutritional status. But on the other hand, the experience of pain can also be a good—or indicate a good, and the experience of pleasure can be a harm—or indicate a harm. For instance, the experience of pain one gets when crossing a blackberry patch signals the body being injured and safeguarding bodily integrity is a good. And the experience of pleasure can be a harm, especially where the pursuit of the pleasure occurs to the exclusion of all other activities. Consequently, one cannot blithely say one should$_e$ experience pleasure and should$_e$ not experience pain.

The second reason is because there are perceptual variations in experiences of pleasure and pain. That is, for the same stimuli, there are variations in how and whether they are experienced as pleasure or pain depending on the character and context of the subject and their capacity for nuanced experience. This is important because such variability makes appealing to the experience of pleasure or pain to justify normative assessments erratic and potentially contradictory. For example, let us take two subjects *A*, and *B*, who experience the same stimuli S as a consequence of an action T, yet *A* experiences S as pleasure, and *B* experiences S as pain. One plausible scenario is both *A* and *B* being bitten during lovemaking. In this case, appealing to the experience of pleasure or pain would justify the normative assessment that *A* should$_e$ be bitten, and *B* should$_e$ not be bitten, which would justify contradictory assessments with respect to doing T.

On the other hand, one could say *A* and *B* should$_e$ do what is pleasurable for them on this occasion. So *A* should$_e$ *S*, and *B* should$_e$ not *S* with respect to doing *T*. This seems plausible in this example even though the contraction is not resolved. However, there are problems with this move. Specifically, the move would lead to justifying as good actions that intuitively are not good. For instance, it would justify murder in the case of *A*, if *A* experienced pleasure on the occasion of unjustified killing. Then there is the fact it would make the assessment of *T* over any timeframe difficult. At t_1 it could be positively normatively assessed but at t_2 it could be negatively normatively assessed, and so on. Consequently, in order to normatively assess *T* over any timeframe one would also have to justify the choice of agent (or agents) and the timeframe since different agents and timeframes could give very different results.

Moreover, the contradiction could be resolved. For instance, rather than looking at say *A*'s experience of pleasure now, one could look at what is *typically* pleasurable for *A*. But while the contradiction is resolved there are problems with this kind of appeal justifying the normative assessment of living organisms because of problems about ascertaining what should$_e$ occur. For example, as *A* gets older what is typically pleasurable for *A* may well change. The problem is then justifying which timeframe ought to be normative. One could argue for the most recent timeframe but then transitions are going to be difficult. That is during transitions, it will be difficult if not impossible to ascertain what *A* ought to do when what is typical for *A* is in equipoise.

One could also look at what is pleasurable for creatures like *A*. But this has serious problems too. The most obvious is justifying the type classification for *A* when there are multiple possible types *A* may be a token of. The most obvious one is the *species* but as we shall see in Chapter 6 there are deep problems in justifying which particular conception of

species to use, especially since there are multiple incompatible scientific conceptions of species.

Perhaps the final way to resolve the contradiction is to look at what *A* has been selected to take pleasure in. However, this way has problems too. Take the scenario for example where an organism takes pleasure in something that means its life is greatly foreshortened because the something it takes pleasure in means that it has a far greater chance of being eaten by predators. Furthermore, if the behaviour becomes prevalent within the species, the species would rapidly become extinct. From the perspective of the individual, the life, though brief, is happy. From the perspective of the species, the behaviour leads to species death. While one could argue for a communal view over an individualistic one, I do not believe that the individualistic or communal view can be adequately justified over and against the other.

So absent some different over-riding appeal or appeals, which need to be objectively justified, we are left with a problematic pluralism. This is because the appeal to pain and pleasure alone cannot address the contradictions that arise, such as those noted above. And while there are consistent and coherent sets of normative assessments justified by the appeal to pain and pleasure, there are no means within the natural sciences to justify the choice of any particular consistent and coherent set over and against the others in terms of this appeal.

The third reason is that if we adopted the appeal to pleasure and pain to justify normative assessments we would come up with some rather counter-intuitive normative assessments. For example, we would be committed to saying that Porky is doing well when she is doped up insensate to pain feeling high whilst being fattened for slaughter.

I take it that the above evidence together demonstrates why the appeal to pain and pleasure alone is not adequate to justify normative assessments of living organisms. Each piece builds a picture which illustrates that the appeal to pain and pleasure is insufficient. In essence, the problem is that the appeal allows for the justification of contradictory and counter-intuitive normative assessments.

3. Conclusion

The purpose of this chapter was to demonstrate why five different appeals to the natural sciences to justify normative assessments of living organisms are inadequate. These were the appeals to typicality, history, what is natural, natural selection, and pain and suffering.

The appeal to typicality to justify normative assessments fails because it fails to adequately sustain the difference between what should$_e$ occur and the alternatives, or it justifies counter-intuitive normative assessments.

The appeal to history fails because the choice of timeframe and population necessary to sustain the norms cannot be objectively justified. Discussion was abbreviated because the point will be taken up in Chapter 4 where history is an essential component of the appeal to functions.

The appeal to what is natural fails because there is no objective way to privilege natural over artificial causes. Indeed, the whole distinction is somewhat misguided from the perspective of the causal order since this does not distinguish between natural and artificial causes. For example, in the case of applying force, the causal order does not distinguish

between what or who applies it. Of course, this does not preclude subjectively privileging natural over artificial causes.

The appeal to natural selection fails because it inherits both the objections to the appeal to history and to the appeal to what is natural.

Finally, the appeal to pain and pleasure fails because it permits the justification of counter intuitive normative assessments. That is they do not sustain the difference between what should$_e$ occur and what actually does occur.

However, *prima facie* the appeals to function, individual development, and species could sustain this distinction. For instance, the appeal that something should$_e$ have a certain capacity because that is its function is highly intuitive. For example, a knife should$_e$ cut well because the function of a knife is to cut. Secondly, all other things being equal, individual organisms develop similarly to their parents. This is caused by something and presumably it could provide a justification for claiming why they should$_e$ develop similarly to their parents. And finally it might seem evident that living organisms can be classified and therefore be assessed according to the species to which they belong. Yet, I deny that these appeals do the job and in respective chapters I shall show why this is the case.

Chapter 4: The failure of functions to justify the normative assessment of living organisms

1. Introduction

Human beings claim that the parts, traits, and behaviour of living organisms have functions—a claim that is intuitive, ancient and persistent. Broadly, such claims assert that living organisms and their parts have particular purposes, goals or ends—that there is something that they are *for*. Take for example, the claim "The function of hearts in living organisms is to pump blood." This asserts that pumping blood is what hearts are for, it is what they should$_e$ do (and do well) in contrast to the other things that they may do (and do well) such as indicate health status.

Functional claims are generally normative. That is, in most discourses, functional claims make claims about what should$_e$ occur. In other words, functional claims about living organisms are employed as norms for the normative assessment of living organisms. For instance, an organism with a heart that does not pump blood well is typically evaluated as being defective, whereas an organism with a heart which indicates health status poorly is not.[1]

Further, appeals to function are used to justify normative assessments of living organisms. For example, if Porky the pig has a heart that does not pump blood well, one justification for assessing Porky as being defective is that her heart pumps blood poorly. Of

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[1] However, the generalizability of defect in an element of an entity to defect in the entity itself can break down, especially where the capacity which the element underpins is not an essential part of the entity. Take for example the tail of a domesticated sheep. Arguably, whatever the tail does, it is not essential to the sheep, since we do not say that a sheep without a tail is defective. Indeed, domesticated sheep's tails are routinely removed in many places—generally for the benefit of the sheep because it helps prevent fly-strike. This supports my contention that the natural sciences are not sufficient because clearly human interests play a role.

course, the pertinent point is that if the natural sciences ground this claim, then it follows that the natural sciences *do* justify the normative assessment of living organisms.

However, I deny that they do. Specifically, I argue that appeals to functions to justify the normative assessment of living organisms are vulnerable to one or more fatal objections. These are as follows:

Objection #1: The implicit or explicit ontology of the natural sciences is incompatible with the concept of function being appealed to. Consequently, one cannot appeal to such notions of the concept on pain of ontological incoherence.

Objection #2: The concept of function being appealed to is not normative. Therefore, one cannot appeal to such concepts to justify normative assessments of living organisms.[2]

Objection #3: There are many different concepts of function, but no single concept of function can be objectively justified over and against the alternatives. Consequently, there are many different even contradictory normative assessments which are justified by an appeal to the concept of function.

Objection #4: For some concepts of function there are various parameters which require some specification but no specification can be objectively justified over and against alternatives. So there are many different and even

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[2] There are two senses of term 'normative'. The first may be understood as simply as a comparison with respect to a norm. The second may be understood as a comparison with respect to a norm that should$_e$ occur. In the former case the norm is descriptive and in the latter case the norm is evaluative. The focus of the thesis is upon the second sense of the term. However, here, the objection is simply that the appeal to functions does not work because the concept of functions does not produce norms so there can be no comparison.

contradictory normative assessments which are equally justified by an appeal to such concepts of function.

Objection #5: Some concepts of function normatively assess present change as being defective in opposition to intuitions to the contrary.

Objection #6: Some concepts of function are unable to justify prospective normative claims, which make up a significant proportion of all normative claims, without unjustifiably privileging the past over the future.

Together these objections amount to the claim that presently at least there is no tenable appeal to functions which adequately justifies the normative assessment of living organisms.[3]

2. Appealing to the concept of function

Appealing to an entity's function to justify normative assessments of that entity is deeply intuitive. Moreover, such an appeal seemingly escapes the objections made in the previous chapter. In particular, *prima facie*, appealing to functions escapes the objections raised to appeals to: (1) pain and suffering; (2) regularity; (3) history; (4) what is natural; and (5) natural selection. This is because appealing to functions ostensibly is a very different kind of appeal. That is, in essence it is an appeal to what something is *for*—its goal, end, or purpose.

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[3] This is a limitation of my thesis. There may be some account of function that is compatible with a proposed ontology of the natural sciences that is normative and provides a single set of determinate and coherent normative evaluations which has yet to be developed.

This said, I take if the appeal to functions is to be successful, the concept must fulfil at least five criteria. These are:

Criterion #1: The implicit or explicit ontology of the natural sciences must be compatible with the nature of the concept of function being appealed to.

Criterion #2: The concept of function being appealed to must be normative.

Criterion #3: The concept of function being appealed to must be justified over and against alternatives.

Criterion #4: The values for any parameters of the concept of function being appealed to, which helps to determine it, must be justified over and against possible alternative values.

Criterion #5: The concept of function being appealed to ought to plausibly normatively assess contemporary change.

Criterion #6: The concept of function being appealed to ought to cope with prospective normative claims which make up a significant proportion of all normative claims.

Obviously, these criteria are the obverse of my objections. So in effect my objection to appeals to the concept of function justifying the normative assessment of living organisms is that they do not meet all these criteria. Indeed, I agree that criteria #1 and #2 are met by some accounts of the concept of function. But I argue that they do not meet criteria #3, #4, #5, and #6.

However, I first need to survey all the various accounts of the concept of function in order to show that no account fulfils all the criteria. Therefore, it is to this task I now turn.

3. Accounts of the concept of function

The following accounts of the concept of function are drawn from the philosophical literature. This is for two reasons. The first is that it would be difficult to include every version of the concept that has ever featured in discussions of living organisms. Such accounts are numerous and subject to great variations in interpretation and re-interpretation. The second reason is that it has been philosophers rather than anyone else who have been motivated to provide explicit accounts of the concept.

The different accounts of the concept of function in the philosophical literature may be classified into one of four kinds. It is a very rough and ready classification, and some accounts arguably could be placed in different divisions because they are hybrids and share one or more of the essential elements of my proposed divisions. Nevertheless it ought to suffice.

The first kind of account I discuss I call *value-centred* or *teleological accounts*. They are called this because the accounts are united by an appeal to values and or teleology. However, they largely stand outside the mainstream philosophical literature on the concept of function. This is because the mainstream philosophical literature is dominated by accounts deeply influenced by the natural sciences, and value and or teleological considerations have long been anathema to the natural sciences. In particular, I discuss Mark Bedau's work, which effectively provides a value-based teleological account of the concept of function.[4] Yet, as I shall explain, the question whether his account is

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[4] . This is because while the relevant work does not explicitly discuss functions, he is interpreted as providing and account of the concept. See Christopher Boorse, "A Rebuttal on Functions," in *Functions: New Essays in*

incompatible with the natural sciences is not clear cut as some would make it. Of course, if Bedau's account or value-based accounts were compatible, then they would escape the first objection. But as I shall explain presently, as it stands, there is a fundamental gap in Bedau's account and value-based accounts in general, which means that appeals to such accounts to justify normative assessments presently do not succeed.

The second kind of account I call *capacity accounts* since they conceive functions as causal contributions to some broader or more general capacity. Specifically, on this kind of account, what constitutes a function (*F*) is based on some causal contribution of entities, or element(s) of entities (*E*), respectively to some broader capacity of a system *S* under analysis.

However, generally, capacity accounts do not provide a concept of function which is normative. Therefore they are generally subject to my second objection. Of course, there are exceptions, which I shall discuss. In particular I discuss the account of the concept of function provided by Christopher Boorse.

The third kind of account I call a *propensity* account of the concept of function. In other words, on such accounts, the explanation is based upon the future propensity of trait *T* to contribute to the fitness of descendents of *O* by producing effect *E*, and hence the propensity of *T* to be selected for over alternative traits. In particular, I discuss Bigelow and Pargetter, who present a propensity account.[5]

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the Philosophy of Psychology and Biology, ed. André Ariew, Robert Cummins, and Mark Perlman (Oxford, 2002), 67-68.

[5] Arguably, Bigelow and Pargetter's account is *not* an aetiological account because propensities are not causes, but a disposition to particular outcome within the causal order. I include them in the aetiological section because they share many features in common with aetiological accounts.

The fourth kind of account I call *aetiological accounts* of the concept of function. On this kind of account, what constitutes a function is based on some kind of explanation of why the function is present in the entity. So the function *F* of trait *T*, which produces an effect of type *E*, in some entity *A*, is an explanation of why the trait *T* is there in a token of *A*.[6] Or more specifically for functions in biology, the function *F* of trait *T* in an organism is an explanation of why the trait *T* is there in the token organism.[7]

In comparison, propensity accounts of function bear many similarities to aetiological accounts. They differ in what designates a trait *T* function is its propensity to contribute to fitness, rather than the contribution which explains why under natural selection the trait *T* is present.

I discuss two examples of aetiological accounts of the concept of function, which represent the two main kinds of aetiological theory. The first is from Karen Neander. She is a representative of the ancient-history account of the concept of function. The second example is from Peter Godfrey Smith. He is a representative of the recent-history account of the concept of functions.

So given this introduction to the four kinds of account of the concept of function it is time to discuss them in more detail.

3.1 Value-based/Teleological Accounts

There is a close connection between the concept of function and teleology, although there is considerable disagreement concerning the precise nature of the relationship between

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[6] The schema is adapted from Buller. See: David J. Buller, "Etiological Theories of Function: A Geographical Survey," *Biology and Philosophy* 13 (1998).

[7] The organism is the typical level at which functions are attributed in the biology. Of course, potentially, there are other levels too.

them. This is illustrated in the disagreement over the nature of the relationship between teleological and functional explanations.[8] For instance, on one hand, André Ariew asks us to

> Consider Woodfield's influential remark that teleological explanations are part of the domain of purposive behaviour while functional explanations are part of the larger domain of system analysis (Woodfield 1976).[9]

This clearly articulates the view that they may be distinguished. But then Ariew immediately notes that

> The distinction [between functional and teleological explanations] has no clear support, however, in the writings of Aristotle from which the modern concept of 'functional explanation' takes root. According to Aristotle's schema, functional explorations are a *subset* of teleological ones. [Italics in original][10]

The crux of the disagreement is over whether functional explanations really can be separated from teleological explanations, which fell into disrepute for a number of reasons. First, they over-proliferated such that virtually every event or object was vested with some cosmic function or inner directed force. Second, an implication of such teleological explanations was a form of 'reverse causation' where the purpose or goal in effect caused itself to be. Finally, they seemed incompatible with the new materialistic, mechanistic sciences of the Enlightenment. Indeed, part of the project of the Enlightenment and the new kind of natural science it proposed, was a sustained effort to purge science of functional/teleological explanations and other Aristotelian influences, notwithstanding that such explanations had clear utility, especially in the sciences of biology.[11]

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[8] André Ariew, "Platonic and Aristotelian Roots of Teleological Arguments," in *Functions: New Essays in the Philosophy of Psychology and Biology*, ed. André Ariew, Robert Cummins, and Mark Perlman (Oxford, 2002), 8.
[9] Ariew, "Platonic and Aristotelian Roots of Teleological Arguments," 8.
[10] Ariew, "Platonic and Aristotelian Roots of Teleological Arguments," 8.
[11] André Ariew and Mark Perlman, "Introduction," in *Functions: New Essays in the Philosophy of Psychology and Biology*, ed. André Ariew, Robert Cummins, and Mark Perlman (Oxford, 2002), 1.

Consequently, if teleological and functional explanations are inseparable, then this explains, at least in part, why value-based or teleological concepts of function are thought to be incompatible with the natural sciences, and therefore subject to my first objection. That is, if the ontology of the natural sciences is incompatible with value-based/teleological accounts of function, then one cannot use such accounts in appeals to the natural sciences to justify normative assessments of living organisms.

However, I do not believe there is any *a priori* reason to suggest that value-based/ teleological accounts of the concept of function are incompatible with the natural sciences. Consequently, this is not a criticism I make of them. Nevertheless, I believe that currently appeals to such accounts of the concept of function do not justify the normative assessment of living organisms. I argue this is because there is a necessary part of such accounts which is presently missing. So while these accounts could potentially work, until we have details of the missing part, we cannot say whether they do work (or not).

CONTEMPORARY TELEOLOGY: MARK BEDAU

The leading value-centred account of the concept of function comes from Mark Bedau, and is developed by him in a number of papers written between 1990 and 1993.[12] The motivation for his account comes from dissatisfaction with two kinds of attempt to "naturalize teleology," via either cybernetics or natural selection, which can be seen in accounts of the concept of function by authors such as Nagel and Millikan respectively.[13] Specifically, he was dissatisfied with the commonly held belief (at the time of writing and now) that a biological teleology consistent with naturalism is not normative.[14]

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[12] Boorse, "A Rebuttal on Functions," 67.
[13] Mark A. Bedau, "Can Biological Teleology be Naturalized?," *The Journal of Philosophy* 88 (1991): 647.
[14] Bedau, "Can Biological Teleology be Naturalized?," 647.

Indeed, one of the aims of Bedau's project is to undermine the attempts to 'narrowly' conceive naturalism—that is, to conceive it in terms of naturalism-cum-descriptivism, which is explicitly not normative.[15] In other words, he attempts to challenge notions of naturalism which are purely descriptive and make no recourse to values. He says,

> Contemporary analyses of teleological explanation generally attempt to "sanitize" it, usually by trying to assimilate it to some uncontroversial descriptive form of explanation. This trend is misguided. Teleological explanations are controversial, especially when applied in biology, because value plays an essential role in them. If a reference to value is largely what makes teleological explanations problematic, then it seems only natural to try to vindicate the use of teleological explanations by eliminating or at least neutralizing this offensive reference to value. This has been the predominant trend in recent writings on teleology, in which teleology is usually given some purely descriptive form of causal analysis. Over against this, my project here is to defend a causal analysis that is value-centred.[16]

The bulk of Bedau's positive account of a value-centred teleology is contained in his paper 'Where is the Good in Teleology?'[17] He admits at the outset that many will be unconvinced by his defence of a value-based teleology, but notwithstanding this scepticism, he begins his position with an account of teleological statements. Bedau calls them *in order to statements*, and he claims the following forms are equivalent: (1) *A Bs in order to C*; or (2) *A Bs for the sake of Cing* because they can be given a similar analysis.[18] He then makes the case that value plays some ineliminable role in the analysis of teleology and goes on to examine the role that value has. In doing so he claims that it is necessary to distinguish three grades of teleology. These grades differ in the extent to which the attribution of a function implies the attribution of value.[19]

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[15] Bedau, "Can Biological Teleology be Naturalized?," 647.
[16] Mark A. Bedau, "Where's the Good in Teleology," *Philosophy and Phenomenological Research* 52 (1992): 781.
[17] Bedau himself notes notes this in: Bedau, "Can Biological Teleology be Naturalized?," 647, Footnote #5.
[18] Bedau, "Where's the Good in Teleology," 782.
[19] Bedau, "Where's the Good in Teleology," 787.

Bedau calls the first grade teleology the *good-consequences* approach to value, which he notes most contemporary critics focus upon.[20] The form of this approach is:

> [G1] A Bs in order to C *iff* A Bs and A's Bing contributes to Cing and Cing is good for A.[21]

The basic idea underpinning this approach is that things—natural or artificial—that contribute to 'good' consequences occur in order to bring about these 'good' consequences.[22] However, he remarks there is an obvious problem with the good consequences approach. To illustrate the problem he uses the example of Ralph the swimmer. Swimming 500-1000m keeps Ralph fit, which is clearly a good for him, so he meets the condition above. But as it happens, Ralph does not swim this distance *in order* to maintain fitness and health. Rather he swims because he likes the sensation of swimming since he finds it pleasurable.

The point is that the action is not done for the sake of the good, but for something else. Moreover, the point does not depend on agency. For instance, he notes that the human heart makes a beating sound when pumping which is useful in medical diagnosis, yet the heart does not pump in order to facilitate medical diagnosis. Rather it pumps in order to circulate blood and thereby oxygenate the tissues of the body in order to support various metabolic processes.

Bedau observes there are at least two different kinds of explanatory role good consequences can play which are useful to distinguish and which also provide the two remaining grades of teleology. On the first, the good consequences explain what occurs, although this explanation does not depend on their being good: this provides the second grade of teleology. It has the following form:

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[20] Bedau, "Where's the Good in Teleology," 787.
[21] Bedau, "Where's the Good in Teleology," 787.
[22] Bedau, "Where's the Good in Teleology," 787.

[G2] A Bs in order to C *iff* [A Bs because A's Bing contributes to Cing] and Cing is good.[23]

In this case, the explanatory 'because' has a narrow scope, which merely requires that the consequences happen to be good.[24] However, this does not rule out accidental or incidental benefits. For example, this formulation does not rule out the accidental benefit of avoiding sunburn for sensitive animals that live in burrows in order to avoid day-time predators. One could say that such animals hide in a burrow in order to escape predators [such animals hide because hiding contributes to escaping from predators] and escaping from predators is good. Yet one could also that such animals hide in burrows also contributes to them avoiding sunburn and avoiding sunburn is good (because sunburn is painful and skin damage can lead to skin-cancer). But the animals do not hide in burrows in order to escape sunburn. To rule out accidental or incidental benefits requires that the goodness of the consequences plays some role in explaining why A does B. This gives the third and final grade of teleology. This has the following form:

[G3] A Bs in order to C *iff* A Bs because [A's Bing contributes to Cing and Cing is good.][25]

As Bedau notes this "... requires that the good consequences and their goodness both figure in the explanation; that is neither the consequence(s) nor the benefit provided can be accidental."[26] He is also clear that these grades of teleology do not permit a weaker dispositional or capacity-based interpretation. He says specifically for instance that "... the statement that Cing is good for A does *not* mean merely that Cing tends to cause A to obtain or persist, or that Cing is instrumental to the maintenance of some disposition of capacity of A." [Italics in original][27] Indeed, Bedau remarks that if it did, it would open his

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[23] Bedau, "Where's the Good in Teleology," 789.
[24] Bedau, "Where's the Good in Teleology," 789.
[25] Bedau, "Where's the Good in Teleology," 790.
[26] Bedau, "Where's the Good in Teleology," 790.
[27] Bedau, "Where's the Good in Teleology," 791.

account up to problematic counterexamples.[28] The counterexample he has in mind concerns a stick floating down a stream which brushes against a rock and becomes pinned against it by the backwash it creates. (He discusses it earlier in "Where is the Good in Teleology" where he raises it as an objection to etiological approaches to functions, specifically Larry Wright's version.[29]) It is a counterexample because the backwash causes the stick to obtain or persist behind the rock yet intuitively this is not a system which has functions. Specifically, he says

> Failure to respect this constraint would reopen the door to the stick-on-the-rock counterexample, for the stick creates the backwash because doing so contributes to keeping itself pinned on the rocked and because remaining pinned is instrumental to the maintenance of the stick's disposition to create the backwash. Thus, although Cing might be merely an instrumental good for A, it must nevertheless be a means to some genuine good for A. Creating a backwash is not a genuine good for the stick. In fact, it would seem that sticks, like stones and specks of dust, are simply not the kind of thing for which *anything* could be good (or bad); they do not have interests that can be promoted (or thwarted).[30]

In any case, I believe that the main problem with Bedau's account is that he does not propose a theory of value.[31] The absence of an account of value means there is a mysterious black-box at the heart of the account, which one has to trust works for it to be tenable. Until we have such a theory of value, one cannot evaluate appeals to function which use the concept of function which he has articulated.

Consequently, if we are going to appeal to the notion of function that he has described, we will need a theory of value. Specifically, what is required is a theory of value that is: (1) compatible with the natural sciences as they are conceived[32]; (2) determines what values

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[28] Bedau, "Where's the Good in Teleology," 792.
[29] Bedau's 'etiological' approaches to functions are essentially the same as the 'aetiological' approaches to functions I discuss later. The main difference is that I discuss more narrowly conceived versions. See: Bedau, "Where's the Good in Teleology," 785-786.
[30] Bedau, "Where's the Good in Teleology," 792.
[31] Bedau, "Where's the Good in Teleology," 789.
[32] Some conceptions of the natural sciences rule out values having any part in science, which would preclude believers in such conceptions of science from appealing to Bedau or Bedau-style accounts.

are; (3) establishes which is and is not a value; and (4) explains how values are instantiated—i.e. why certain states of affairs are valuable. For instance, it must be able to say what 'good' is and why, establish that 'good' is a value, and explain for example why a life without pain is good. Yet fulfilling these requirements in terms of the natural sciences would involve at least one of the appeals already discussed (or to be discussed) which would open up such an account to my objections.

Moreover, Bedau himself is sceptical of a naturalistic account of functions where naturalism is the doctrine that "... everything real is at least in principle within the scope of a purely scientific account of the world."[33] For example, he says that

> Elsewhere [in 'Goal Directed Systems and the Good'[34]] I have argued that the cybernetic approach to naturalizing biological teleology fails because of its inability to account for an evaluative component in teleology. Here [in 'Can Teleology Be Naturalized'] I shall sketch a parallel argument concerning the attempt to naturalize teleology by appeal to natural selection.[35]

So clearly Bedau does not think that one could appeal to the natural sciences to justify the normative assessment of living organisms using his account.

Consequently, given these problems I am inclined to leave value-based accounts of functions to one side as a means for the natural sciences to adequately justify the normative assessment of living organisms.

3.2 Capacity Accounts

Broadly, capacity accounts hold that what constitutes a function (*F*) is based on some causal contribution of entities (*E*), to some broader capacity of a system *S*. On such accounts *any* causal contribution to a broader capacity of the system under analysis is a

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[33] Bedau, "Can Biological Teleology be Naturalized?," 647.
[34] Mark A. Bedau, "Goal Directed Systems and the Good," *Monist* 75 (1992).
[35] Bedau, "Can Biological Teleology be Naturalized?," 647-648.

function. For example, under this account of the concept function, the function of hearts is whatever contribution the heart makes to some broader capacity in the system under analysis. So the function of the heart is to pump blood because this is a causal contribution the heart makes to the circulatory system. But equally on this account, the function of the heart is to indicate health because this is a causal contribution hearts make to the broader capacity for indicating health. Or hypothetically, on this account, the function of the heart could be to promote social cohesion, where the sacrifice of still-beating hearts makes a causal contribution to the social cohesion of the system.

Furthermore, functional attribution is further complicated in at least two ways. The first is that there may be a variety of possible analyses of the broader capacities of the system in question. This may depend on a number of things, including the type of system in question, and how the system itself is specified. For instance, an organism's body is capable of many different analyses, even within the domain of the sciences of biology. For instance, there are molecular analyses which are very different to ecological analyses.

The second complication is that even within a single kind of analysis there may be multiple broader capacities to which the capacity C in question may contribute. For example, another broader capacity of this system S, the heart, is cellular communication. Systems of multi-cellular organisms, such as human beings, require coordination between cells via some form of inter-cellular communication. And in this system there are a variety of means of inter-cellular communication such as through nerve impulses or various chemical messengers like hormones (which the heart facilitates). So the function of the human heart with respect to cellular communication is the distribution of various chemical messengers, because this is what "the pumping of blood" does to support inter-cellular communication.

The situation is even worse in the case of entities with multiple functions where these complications are magnified. For instance, the liver has storage functions (storing iron, copper, vitamin B12, and glucose in the form of glycogen), regulatory functions (it helps regulate blood sugar levels by releasing glycogen when the blood gets too low is glucose), detoxification functions (such as detoxifying alcohol), synthesis functions (such as synthesizing glucose from amino acids, lactate, and glycerol, and synthesizing bile, cholesterol and blood clotting factors).

So the attribution of functions according to the capacity account is relative to: (1) the system under consideration; (2) the systemic capacity to be explained; and (3) the kind of analysis employed.[36] Clearly this is a very permissive account of functions. The problem with this permissiveness is that it is problematic to ascertain what should$_e$ occur in contrast to what does or could occur. For example, if we accept that whatever contribution *C* an entity *E* makes to some broader system *S* is its function and it should$_e$ occur, then we would be committed to holding that rain-clouds should$_e$ irrigate Farmer Brown's crops because rain makes a contribution to a system for growing crops.[37] We would also be committed to holding that the rain-cloud should$_e$ also drop its rain on the catchment for a river (as a contribution to the river's ecosystem), and so on. So what should$_e$ occur in the case of rain-clouds where the contributions they could make are mutually exclusive? For instance, if the rain-cloud could either water Farmer Brown's field or contribute its rain to a river's ecosystem?

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[36] The points are derived from Davies. See Paul Sheldon Davies, *Norms of Nature: Naturalism and the Nature of Functions* (London, 2003), 25. The point is also made in Cummins. See: Robert Cummins, "Functional Analysis," *Journal of Philosophy* 72 (1975): esp. pp. 762-764.

[37] The example is drawn from Andrew Woodfield. See: Andrew Woodfield, *Teleology* (Cambridge, 1976), 109.

The main response to this problem has been to look for a way to put some restrictions on the attribution of functions. This has been done via a number of different strategies. The first is to limit the kind of contribution an entity makes which counts as a function. The predominant way this has been done is to limit the contribution which explains the presence of an entity. For example, in living organisms this is largely the contribution which has been selected by natural selection. In other words, it is the contribution that makes the predominant input to fitness. (This is the strategy adopted by many aetiological accounts of function which I shall discuss later on in the chapter.) The second strategy is to appeal to the analytical schemas and explanatory interests of particular scientific disciplines. This move is made by Valery Gray Hardcastle.[38] The third and final strategy is to limit functional attribution only to those systems that are organized hierarchically. This strategy is adopted by Paul Sheldon Davies.[39]

So does this strategy of delimiting functional attribution succeed in terms of adequately justifying what should$_e$ occur? I argue that it does not because despite such constraints there are still ambiguities or conflicts over what should$_e$ occur. In the case of the aetiological approach, I'll defer my argument that it does not succeed to later on in this chapter. In the case of Hardcastle's approach I argue that it hardly delimits functional attribution to any significant extent, thus the problem remains. This is because: (1) the analytical schemas and explanatory interests of particular scientific disciplines internally can be extremely diverse; and (2) the same phenomena can rightly be studied by a variety of scientific disciplines. The consequence is that within scientific disciplines functional attribution *may* be constrained (depending on the nature of the discipline), but given the variety of different scientific disciplines, overall functional attribution is still very diverse.

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[38] See Valerie Gray Hardcastle, "On the Normativity of Functions," in *Functions: New Essays in the Philosophy of Psychology and Biology*, ed. André Ariew, Robert Cummins, and Mark Perlman (Oxford, 2002), 150-153.

[39] See Davies, *Norms of Nature: Naturalism and the Nature of Functions*, esp. Chapter 4 pp. 73-106.

Take for example the study of human nature. This phenomenon can be studied by both biochemistry and psychology and these disciplines have very different analytical schemas and explanatory interests. (Indeed, psychology internally embraces a wide variety of analytical schemas ranging from molecules to concepts like the *id* and *ego*.) Consequentially, functional attribution is still very broad.[40] And finally, in the case of Davies' approach it is not clear whether it could constrain functional attribution sufficiently. Certainly, it constrains functional attribution, but whether this means that it eliminates the ambiguities or conflicts over what should$_e$ occur is not obvious. My view is that it does not especially where an element participates in multiple sub-systems. In particular, ascertaining what should$_e$ occur becomes problematic where changes in the function of an element in a particular sub-system conflict with the function of the element in another subsystem. Take the liver for example. It is responsible (among other things) for the production of bile to aid digestion and the production of clotting factors for the blood. I take it that it is not clear on this account of function what should$_e$ occur if the liver started producing more efficient bile (say due to a mutation) but that this more efficient bile interfered with the production of the clotting factors. Within the digestion system a function of the liver on this account clearly is producing bile to aid digestion since it makes that kind of contribution. And within the clotting system a function of the liver clearly is producing clotting factors.

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[40] My argument fails if scientific disciplines are reducible. That is, if psychology is reducible to biology, biology is reducible to chemistry, and chemistry is reducible to physics. The apparent diversity in functional attribution is thereby illusory because the attribution of function is ultimately due to the analytical schemas and explanatory interests of physics/mathematics. However, I believe that they are not reducible and I follow Dupré's argument for why not. See: Dupré, *The Disorder of Things*.

In such a case it is unclear what should$_e$ occur unless one can objectively privilege one of the two contributions the element makes to its respective sub-system over the other. Now the sub-systems of digestion and blood-clotting are equally important since in organisms which have them, significant malfunction is lethal. So we cannot objectively privilege either contribution the liver makes to each sub-system.[41]

Another response to the problem of permissiveness of functional attribution is to embrace it. That is, it is to insist that whatever contribution *C* and entity *E* makes to some broader system *S* should$_e$ occur. The obvious problem with this response is that it does not address the issue. Consequently, we are left with either ambiguities or conflicts over what should$_e$ occur, especially where a particular element in a system makes multiple contributions to different sub-systems and these conflict, such as in the case of the liver.

Indeed, some capacity theorists explicitly deny that the failure of an entity or element of an entity to make a causal contribution to some broader capacity of the system should be regarded as being dysfunctional. Davies is one example. He remarks that,

> Much in the systematic capacity approach is fundamentally sound. Nevertheless, the theory has come under criticism for being promiscuous in the functions it attributes and for its inability to account for the possibility of malfunctions. I shall argue, however, that the theory can be developed in ways that diminish the force of both objections. The charge of promiscuity can be blocked by making explicit the kinds of systems to which the theory properly applies. And as concerns malfunctions, we should agree that the theory cannot for the occurrence of systematic malfunctions, but we also should insist that this is a virtue, not a vice. The attribution of malfunctions to natural nonengineered traits is, on my view, at odds with our naturalistic approach to inquiry generally and with the theory of evolution by natural selection specifically.[42]

My point then is that such accounts then are not normative in the sense I am interested in, and thus cannot be used to justify normative claims. In addition, a common perception of

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[41] In fact, Sheldon Davies would not employ this strategy to justify what should$_e$ occur because the argument of *Norms of Nature* is that functions are *not* normative

[42] Davies, *Norms of Nature: Naturalism and the Nature of Functions*, 29.

capacity accounts is that they do not set out to account for functional norms. For instance, Valerie Grey Hardcastle observes that,

> To take the most famous example of a pragmatic approach, Robert Cummins (1975) claims that the function of T in O is E if T is a component of O and E contributes causally to the O's capacity to whatever it is that O does. In this case, what counts as the function depends on how we understand the larger system. ... Champions of the etiological notion of function turn up their noses at pragmatic approaches, however, for the price of generality is normativity, or so the etiology advocates claim.[43]

Furthermore, in the *locus classicus* for capacity accounts, Cummins' 1975 paper 'Functional Analysis', Cummins does not consider functional norms in his account (in contrast to the other accounts he discusses in the paper).[44]

However, I ought to stress that this is not to say that one cannot have a capacity account of function which sets out to explain functional norms, although proponents of such accounts are divided on the point. Hardcastle for instance argues that capacity accounts (what she calls pragmatic approaches) do sustain norms—although this is relative to the scientific discipline which investigates phenomena to which functions are attributed. On the other hand Davies argues that capacity accounts do not.

One notable example of a capacity account which sets out to account for functional norms is provided by Christopher Boorse. While he would not classify his account as a capacity account, it shares many features with other capacity accounts, which is why I include it in this section.[45] (He classifies it as a General Goal Contribution (GCC)

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[43] Hardcastle, "On the Normativity of Functions," 145-146.
[44] Cummins, "Functional Analysis."
[45] The general goal contribution (GCC) account he advocates holds that functions are causal contributions to goals. If one takes goals as being a broader part of a system *S*, such as a living organism, one can see the similarities between capacity accounts and GGC accounts. My own view therefore is that GGC accounts are a particular kind of capacity account.

account.[46]) His account differs from other capacity accounts in that it provides greater limits upon the attribution of function. So *prima facie*, it could distinguish to a sufficient degree between what should$_e$ occur from what occurs or may occur, which if true would mean his account accommodates norms and thus escapes the second objection. Nevertheless, for reasons I shall discuss in the next section, his account is vulnerable to the third objection. It is also vulnerable to other objections, which will be drawn out in Chapter 6.

NORMATIVE CAPACITY ACCOUNTS OF FUNCTION: CHRISTOPHER BOORSE

On Boorse's general goal-contribution (GGC) account, functions are simply causal contributions to goals.[47] So functions on his account may be attributed to both artefacts and to living organisms. Moreover, in the case of living organisms he motivates his account by appealing to the fact that that goal-directed behaviour is ubiquitous among living things.[48]

His notion of goals relies on some cybernetic account of goal-directedness using ideas from systems theory.[49] Concerning this he says,

> That account [of goals] derives mainly from Rosenblueth, Wiener, and Bigelow (1943), but was elaborated by Sommerhoff (1950, 1959), Braithwait (1953), and Beckner (1959) before its first use in a GGC analysis of functions by Nagel (1961). According to the Sommerhoff—Nagel view, a system S is 'directively organized', or 'goal-directed', towards a result G when, through some range of environmental variation, the system is disposed to vary its behavior in whatever way is required to maintain G as a result.[50]

While many of these elements of goal-directness are also features of some artefacts, Boorse suggests there are two notable key differences between living organisms and

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[46] Boorse, "A Rebuttal on Functions," 63.
[47] Boorse, "A Rebuttal on Functions," 63, 70.
[48] Boorse, "A Rebuttal on Functions," 68. Interestingly his account also includes artefacts too.
[49] Boorse, "A Rebuttal on Functions," 69.
[50] Boorse, "A Rebuttal on Functions," 69.

artefacts.[51] The first is that the behaviour of organisms is ultimately directed towards survival, until reproduction. The second difference is that goal-directness is a feature of different multiple layers of organization in the organizational hierarchy.[52] This is especially evident in living organisms. Of course, it is true that ever-developing technology means that these key differences between artefacts and living organisms are being eroded. Yet even if ultimately both were equally complex, I doubt Boorse would see this as being an objection to his account, since he does not seem concerned with distinguishing between functions in living organisms and functions in artefacts. He is quite comfortable in attributing functions to artefacts. In any case, if an artefact was extremely complex and orientated towards survival to reproduction, then the distinction between living organisms and artefacts would blur.

One of the main characteristics of his account, which differentiates it from other capacity accounts, is that the contribution is limited to the contribution to goals rather than to any contribution to any broader capacity of the system. Consequently, in comparison to other capacity accounts, Boorse's GGC-account is not so promiscuous since it precludes objects without goals as having functions. Thus a good deal of the promiscuity surrounding the attribution of function is eliminated.[53] For example, Boorse's GGC-account would not allow for any of the intuitively implausible attributions of function that are raised by opponents of capacity accounts. For instance, opponents of capacity accounts point out that on capacity accounts mists, rocks, clouds, streams and dirt somewhat implausibly have functions. Indeed, Boorse himself notes that capacity accounts are,

> ... now seen to have a serious problem of overbreadth. For one thing, it generates functions in non-biological sciences where teleological language is absent. It implies that the function of mists is to make

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[51] He gives examples of cruise-missiles, servomechanisms, and thermostatically controlled furnaces. See Boorse, "A Rebuttal on Functions," 69.
[52] Boorse, "A Rebuttal on Functions," 69-70.
[53] Boorse, "A Rebuttal on Functions," 73.

> rainbows (Bigelow and Pargetter 1987: 184), the function of rocks in a river is to widen the river delta (Kitcher 1993: 390), 'the function of clouds [is] to make rain with which to fill the streams and rivers' (Millikan 1989a: 294), and the function of dirt stuck in a pipe is to regulate the water flow (Griffiths 1993: 411).[54]

But mists, rocks, clouds, and dirt etc. do not have goals. This is because any response to external stimuli they make is not to any goal. For instance, clouds do not act for any goal (*pace* Aristotle), in contrast to organisms, which act for self-preservation.

However, despite such a restriction his GGC-account is still quite promiscuous regarding the attribution of function since causal contributions to goals can be very broadly construed. For instance, it permits the attribution of functions to causal contributions to goals which occur once and by accident. Indeed, Boorse uses the example of a telephone summoning him before a truck crashes into his parlour or a bee sting that brings him to a doctor who spots that he has a curable melanoma.[55] In these cases, according to his account, the function of the telephone is defence against wayward trucks and the function of bee stings cancer diagnosis since survival is a goal. Furthermore, he says that "There is no reason for me to deny, that for me on this occasion, the beesting [sic] served that function."[56]

However, he deflects this problem by drawing upon a distinction between weak and strong function statements. A weak function statement is weak precisely because it can be performed once and only by accident.[57] For instance,

> For a system *S* directed to goal *G* at time *t*,
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> > *X* performs the function Z in the *G*-ing of *S* at *t* if and only if at *t*, the *Z*-ing of *X* is a causal contribution to *G*.[58]

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[54] Boorse, "A Rebuttal on Functions," 65. Boorse uses the term 'causal-role analysis of functions' whereas I use capacity accounts of function.
[55] Boorse, "A Rebuttal on Functions," 71.
[56] Boorse, "A Rebuttal on Functions," 71.
[57] Boorse, "A Rebuttal on Functions," 71.

In contrast, strong function statements are statements such as, '*The function of X is Z*', or '*A function of X is Z*', or '*X has the function Z*'. The difference between them is how often or consistently the function gets performed.[59] He says,

> A trait *X*'s contribution to a goal, then, if made sufficiently often, becomes the function of *X*, or *X*'s function, if it is *X*'s only regular contribution and is a function of *X*, or among *X*'s functions, otherwise.[60]

So when a weak function is performed 'sufficiently often' it then becomes a strong function. The 'sufficiently often' is then cashed out in terms of typicality or normality, especially, what is typical or normal for the species which the individual with the trait X belongs.[61] According to Boorse, strong function statements are the kind of function statements that writers usually analyze, with which he wishes to pitch his own GGC account of functions against.[62] So he deflects the problem of promiscuity by only considering his account in terms of strong function statements since that is what everyone else does too.

Moreover, strong function statements are of interest because they are normative. That is, they make claims concerning what should$_e$ occur in contrast to what does occur. Usually this is in terms of some kind of token-type relationship.[63] For instance, Boorse says,

> One does see occasional medical references to what is normal for an individual. But the standard medical concept of normal function, surely, is implicitly species-relative:
>
> *The* [or *a*] *normal function of X is Z in species S*,
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> where *S* is *Homo sapiens* for ordinary medicine or animal species for vetinary medicine. I have argued at length that medically normal function of any token item (for example, a single human heart) is analyzable as an

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[58] Boorse, "A Rebuttal on Functions," 70.
[59] Boorse, "A Rebuttal on Functions," 71.
[60] Boorse, "A Rebuttal on Functions," 72.
[61] Boorse, "A Rebuttal on Functions," 72. He admits the boundary between weak and strong function statements is quite vague. See: Boorse, "A Rebuttal on Functions," 71.
[62] Boorse, "A Rebuttal on Functions," 71.
[63] Boorse, "A Rebuttal on Functions," 72.

> output within a statistically typical range of contributions to survival and reproduction b tokens of that type in an age group of a sex of a species ... So qualified, my view is that theoretical medial normality of the organism means statistically species-non-subnormal biological function of all its parts and processes [Italics and indentation in original].[64]

So in essence, on Boorse's account, what should$_e$ occur in contrast to what actually does occur for living organisms is the typical/normal contribution to survival and reproduction for the species to which the living organism belongs.

I take it there are two problems with his account of function. The first is that it relies upon an appeal to typicality. For instance he says,

> "Like other authors, I will simply accept that, when cardiac diagnosis by heartbeat has become genuinely species-typical, *for long enough*, heart sounds will be a normal function of the heart in the human species." [Italics added for emphasis][65]

(Nowhere is "long enough" defined.) Yet he seems reluctant to admit that this imprecision is a fault because 'typical' and 'normal' are, he suggests, vague concepts.[66] This is correct. But as we have seen, such a lack of precision is a problem for justifying normative assessments of living organisms. This is because without sufficient precision the normative assessment of living organisms is not adequately justified.[67] In other words, unless this issue is addressed, his account falls foul of my fourth objection. While the account is normative, it does not adequately justify normative assessments of living organisms. Consequently, we cannot appeal to Boorse's account to adequately justify the normative assessment of living organisms.

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[64] Boorse, "A Rebuttal on Functions," 72.
[65] Boorse, "A Rebuttal on Functions," 87-88.
[66] Boorse, "A Rebuttal on Functions," 71-72.
[67] One could make the case that Boorse is being deliberately vague because the vagueness is appropriate (drawing on Aristotle's point in *Nichomachean Ethics* 1094b10-15 that we ought to only expect the precision apt for the subject matter). My response is that if it is true that such vagueness is correct then the project of normative ethics of ascertaining what we ought to do is therefore very limited because it is vague.

Of course, the imprecision could be addressed. One could tightly specify the various parameters involved in ascertaining what is normal or typical. However, this raises the second problem, namely justifying the specification within the ambit and resources of the natural sciences. Of course, one could subjectively justify them, but such justification arguably stands outside the natural sciences. Or one could objectively justify them, but the problem is how. I contend that the possible means for doing so within the ambit and resources of the natural sciences are considered in this work and that they all fail for the reasons noted. Consequently, I argue there is no objective justification for any particular parameter for what is normal over and against alternatives.[68]

Take the choice of the type for example. When we say that an individual X is normal or abnormal, we are treating X as a token of some type Y, at some level of abstraction. Moreover, X is normal or abnormal with respect to the type Y. For example, when we say Porky the pig is a normal pig, we are treating Porky as a token of the type *Sus scrofa* and are claiming that Porky is normal with respect to the type *Sus scrofa*. However, the type *Sus scrofa* is not the only possible type to which Porky may belong. Porky may belong to the type Mammal, or Domesticated Animal and so on. Boorse uses species. My point is that this choice requires justification over and against alternatives. This is because the judgement that any token is normal or abnormal significantly depends on the choice of type. Porky *qua* Type A may be normal but *qua* Type B may be abnormal. Moreover, the fact that Porky belongs to the type *species* is not sufficient because it is not the only type Porky may belong to.

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[68] Clearly, essentially this is a restatement of my third objection to the natural sciences appealing to functions to justify the normative assessment of living organisms.

Furthermore, for the sake of argument, let us assume that the choice of the type *species* can be justified over and against other possible types. However, here is an analogous problem to the one above. Namely, there are multiple different and incompatible conceptions of the type *species*, and the choice of species conception also requires justification over and against alternatives.[69] Of course, the obvious reply to the above example is to say that one ought to choose the scientific conception of species because we are dealing with appeals made to the natural sciences. However, as we shall see in Chapter 6, this riposte does not suffice either for similar reasons.

There are also other parameters involved in ascertaining what is normal and similar problems arise. For example there is the measure of normality for the trait or individual in question which involves some particular kind of statistical aggregation. This might include the average, a particular number of standard deviations, the mode, or the median etc. of the population in question. Again the problem is justifying which measure of typicality to employ because different measures give different answers. Thus on one measure a token of some type could be 'normal', attracting positive normative assessment, but on another measure they could be 'abnormal', attracting a negative normative assessment. Of course this ought to be a familiar point: I also made it in Chapter 3.

In summary, an appeal to a Boorsian account of functions to justify normative assessments is a kind of appeal to typicality. Consequently, my objections to Boorse's account are those raised to the appeal to typicality, which was reiterated above. In essence, this is my fourth general objection. That is, for some concepts of function there are various parameters, which in this account define what is typical and thus species typical

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[69] Clearly, essentially this is a restatement of my fourth objection to the natural sciences appealing to functions to justify the normative assessment of living organisms.

contributions to goals. These require specification, but no specification can be objectively justified over and against alternatives. Consequently there are many different and even contradictory normative assessments which are equally justified by an appeal to species typical contributions to goals. Moreover, I also contend that this objection also applies to remaining accounts of function, which I shall now discuss.

3.3 Propensity accounts: Bigelow and Pargetter

Bigelow and Pargetter begin their account of the concept of function with the claim that the description of function for some biological character characterizes an existing item through reference to some future event or state(s) of affairs.[70] For instance, the function of the stomach at time *t* is to break down food at time *t'*, where *t'* is later than *t*.

They correctly note that this future-oriented characterization has been difficult to assimilate in the scientific view of the world.[71] Certainly, such teleological explanations have long been rejected by science because, for instance, the implication of reverse causation, where the future explains present events of state(s) of affairs. As they note,

> ... when we describe the function of something in the present, we make reference to a future event or effect which, in some cases, will never occur. Hence, prima facie we, cannot be describing any genuine, current property of the character.
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> Even when a character does perform its supposed function, the future events that result from it cannot play any significant "scientific" role in *explaining* the nature and existence of the character. The character has come into existence, and has properties that it does have, as a result of prior causes. It would still have existed, with just the current properties it does have, even if it had not been followed by the events that constitute the exercise of its alleged function. Hence its existence and properties do not depend on the exercising of its functions. So it is hard to see what explanatory role functions could have.[72] [Emphasis in original.]

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[70] John Bigelow and Robert Pargetter, "Functions," *Journal of Philosophy* 84 (1987): 181.
[71] Bigelow and Pargetter, "Functions," 181.
[72] Bigelow and Pargetter, "Functions," 181-182.

Yet despite this point being evident, some form of 'teleological' explanation has remained entrenched in explanations of the biological world.[73]

So Bigelow and Pargetter propose a propensity account. They hold that aetiological accounts (typically conceived) are the main alternatives to their account.[74] The essential difference between the two kinds of account is that on aetiological accounts, the presence of a certain trait is taken to be explained by its past contributions to fitness, whereas on their account, it is explained by the trait's propensity or disposition to contribute to fitness in the future. They suggest that ultimately what explains the success of past contributions to fitness is the propensity or disposition in the past to contribute to fitness in the future.

> If we imagine (or find in the vast biological record) a case in which a character is sustained by a chance sequence of accidents, rather than a standing propensity, then it would not be appropriate to describe the character as having a function. This can happen when a character is linked with another character that does bestow a propensity and where variations in the character just have not occurred to allow selection against the inoperative character. It can also happen by sheer chance ...
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> Consequently, what confers the status of a function is not the sheer fact of survival-due-to-a-character, but rather, survival due to the propensities the character bestows upon a creature.
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> The etiological theory describes a character *now* as surviving a function, when it *did* confer propensities that improved the chances of survival. We suggest that it is appropriate, in such a case, to say that the character *has been serving that function all along*. Even before it had contributed (in an appropriate way) to survival, it had conferred a survival enhancing propensity on the creature. And to confer such a propensity, we suggest is what constitutes a function.[75] [Emphasis in original.]

The problem with propensities or dispositions is that it is difficult to ascertain what they are, except retrospectively. For example, we can only know that trait T in organism O has the propensity or disposition (P) to contribute to the fitness of O via an effect of type E at t_1 by looking at what the trait T has done to contribute to the fitness of O at t_2. In short,

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[73] Typically, such explanations are cashed out in functional terms, where accounts of the concept of function attempt to avoid such issues as future causation.
[74] Bigelow and Pargetter, "Functions," 187.
[75] Bigelow and Pargetter, "Functions," 191-192.

there are epistemological difficulties in ascertaining the function of a trait *T* based upon the propensity or disposition to contribute to fitness in the future.[76]

Of course we could assume that the propensities or dispositions (*P*) of trait *T* in organism *O* is the same as the contributions of trait *T* to fitness is presently. But this raises another problem. One would need to assume that the operation of the causal order is exactly the same in the future as it has been in the past. However, this begs the question concerning the operation of the causal order because it assumes that the causal order will operate as it has done, when it may well not do so since the causal order is contingent. Consequently, this assumption is not a reliable one. (The problem here is not particular to Bigelow and Pargetter but to any kind of account that relies upon propensities and dispositions.) The significance of the assumption is, as I shall show, in the problems this raises for justifying the normative assessments of living organisms.

On the other hand, as Bigelow and Pargetter note, this kind of move within the sciences of biology is not without precedent: it occurs in the evolutionary concept of fitness.[77]

> Fitness is not defined retrospectively. It is, roughly, a dispositional property of an individual (or species) in an environment, which bestows on that individual (or species) a certain survival potential or reproductive advantage. It is a subjunctive property: it specifies what will happen or is likely to happen in the right circumstances, just as fragility is specified in terms of breaking or being likely to break in the right circumstances. And such a subjunctive property supervenes upon the morphological characters of the individual (or species). Hence there is no circularity involved in casting fitness as an explanatory role in the Darwinian theory of evolution.

However, while I take it this provides a response to the issue of defining a property retrospectively; it does not remove the epistemological difficulties in ascertaining what the function of a trait is.

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[76] This is a point which also applies to using Boorse's account of the concept of function to justify the normative assessment of living organisms.
[77] Bigelow and Pargetter, "Functions," 189.

Bigelow and Pargetter suggest that four features of propensity theory ought to be made explicit:[78]

1. The account is relative to a specific environment;[79]
2. Functions are truly dispositional in nature. In particular, they are specified subjunctively: they *would* give a survival-enhancing propensity to a creature in an appropriate manner, in the creature's natural environment. This is true even if the creature does not survive or is never in its natural environment;[80]
3. The notion of "survival-enhancing propensity" is defined in formal terms using the probability calculus.[81]
4. The propensity theory can be extended beyond biological functions to the functions of artefacts.[82]

I highlight them because the first one raises a matter of interest. The account is relative to a particular environment because the propensities or dispositions of a trait *T* cannot be ascertained unless the context is specified. Consequently, the account falls down if a particular environment is not specified. The reason for this is that the operation of any entity occurs in some context, and this context is an essential element of its operation. A different context can meant the entity operates differently. For instance, the operation of enzymes in a cell is sensitive to the pH of the cell. In these cases, the enzyme operates differently at different pHs. So the propensity or disposition of the enzymes' operation in the cell in the future cannot be known unless the pH is specified. Moreover, all attributions

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[78] Bigelow and Pargetter, "Functions," 192.
[79] Bigelow and Pargetter, "Functions," 192.
[80] Bigelow and Pargetter, "Functions," 193.
[81] Bigelow and Pargetter, "Functions," 193-194.
[82] Bigelow and Pargetter, "Functions," 194.

of function are effectively prefaced with "assuming environment X." For example, in this case, the function of enzyme X is assuming some pH.

This move is of interest because in effect, it is the same as question-begging the operation of the causal order noted above. That is, the attribution of function assumes a particular environment when in fact this may not, and over time certainly will not remain be the case.

The fact that this is the familiar problem of induction does not absolve such appeals from the consequential problems with justifying normative assessments. Neither does adding a condition to such appeals which assume such constancy. This is because the move also involves the same question-begging operation of the causal order noted above and essentially the appeal to such function concepts effectively becomes a kind of appeal to history. Therefore, this move to address a potential weakness in propensity accounts raises further problems for justifying the normative evaluation of living organisms.

I believe one big flaw in using appeals to propensity accounts to justify the normative assessment of living organisms is that it is difficult to ascertain what the propensities to contribute to fitness entail, even in retrospect. This is critical because these propensities to fitness effectively specify what should$_e$ occur in contrast to what occurs or may occur. And if one cannot sufficiently ascertain what should$_e$ occur then the Normative Distinction cannot be adequately sustained.

The problem is an epistemological one. Prospectively the propensities to contribute to fitness are unknown unless one assumes that the operation of the causal order remains the same. But, it is possible, even likely, over time that the operation of the causal order will

differ in a significant way. This point raises a further difficulty. Namely, the same trait could have very different propensities to contribute to fitness depending on the choice of future timeframe. Consequently, the future timeframe needs to be defined. This is because the propensity to contribute to fitness could, and over long timeframes, is likely to change significantly. It could become harmful, change and become beneficial, and then alter again and again. The problem of course is justifying the choice of timeframe.

Of course, one could hedge the operation of the causal order with *ceteris paribus* assumptions. That is one could say, "All other things being equal trait X has Y propensity to contribute to fitness thus, X has the function of Y." But this move effectively begs the question on the propensities to contribute to fitness. This is because the operation of the causal order could be different and we are assuming that it will not be. The problem with this move is that it also effectively begs the question concerning what should$_e$ occur. This is because on this kind of appeal to functions, it is *Y* propensity to contribute to fitness which determines the function of *X*, and thus what should$_e$ occur.

Furthermore, retrospectively, one cannot ascertain what the propensities to contribute to fitness are or were. This is because it is well known that what occurs or has occurred is not solely the outcome of natural selection and differential fitness, even absent human interference.

One might respond to this line of argument by saying that all the specification of an environment *E* does is relativize the function to a particular environment *E*.[83] That is, if the environment remains constant then trait *T* has function *F*, but if the environment *E*

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[83] D. M Walsh has an account which relativizes functions to an environment, although it is an aetiological account. He holds that the function of a trait is its contribution to fitness in a particular environment. See: Denis M. Walsh, "Fitness and Function," *British Journal for the Philosophy of Science* 47 (1996).

changes, then trait *T* has function *F'* relative to the new environment *E'*.[84] The point is that apparently there is no need to *assume* a particular environment because we can say that in environment *A*, *B*, *C* etc. (assuming the dispositions of trait *T* to contribute to fitness are different) then trait *T* has the functions *K*, *J*, and *L* and so *X*, *Y*, and *Z* should$_e$ occur (on the basis of these functions).

This also relativizes the normative claim. So if we claim that *Z* should$_e$ occur in contrast to *X* and *Y* because *Z* has the function *L*, then *Z* should$_e$ only occur in environment *C*. In environment *A*, *Z* should$_e$ not occur. Rather, *X* should$_e$ occur because *K* is the function in this context. This appears to be an advantage because normative claims do seem to be relative to the environment or context. For example, it would be somewhat counterintuitive to claim that species of blind cockroaches that live their lives in caves (in complete darkness) are defective, when sight would be of no use or benefit. Indeed, on a propensity account, their eyes would not have a function because sight in this environment has no propensity to contribute to fitness, which neatly accords with my intuitive normative assessment of cave dwelling cockroaches.

However, there is a problem with this move. Namely, it undercuts the Normative Distinction. Specifically, it narrows the contrast between what should$_e$ occur and what may occur. This is because the environment circumscribes (and in part specifies) what may occur. So in a fully specified or defined environment there no difference between what should$_e$ occur and what may occur because the causal system is effectively fully determined. That is, in a fully specified environment what should happen is what will

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[84] However, I should note that in some cases the trait *T* may not have a function *F* in the new environment *E'* because in the new environment *E'* the trait *T* has no propensity to contribute to fitness which would explain its presence.

happen. Consequently, the Distinction dissolves to the extent the environment is defined or specified.[85]

Moreover, the claim that there is no need to assume a particular environment in both propensity and capacity accounts does not stand up to scrutiny. Consequently, my previous objections stand. This is because functions are constituted relative to a particular environment or system on these accounts. That is, a trait *T* only has a function *J*, *K*, *L*, in particular environments *A*, *B*, *C*. So if you take away the particular environment a trait *T* is in and you take away the function a particular trait *T* has. So for instance, for trait *T* to have function *L* environment *C* needs to occur because the propensity to contribute to fitness is relative to environment *C*. In a different environment, such as *A* and *B*, trait *T* will have a different function, such as *X*, and *Y*. For example, the eyes of a cockroach only have the propensity to contribute to fitness where there are variations in light. They do not have a propensity to contribute to fitness in complete darkness.

Yet, on the face of it, one could still argue that appeals to propensity accounts could still justify normative assessments. This is because apparently, the Normative Distinction is maintained in two significant ways. The first is that the propensity to contribute to fitness could be at the level of some type abstraction (such as species) such that a token could malfunction in not doing what tokens of that type typically do in a particular environment. What should$_e$ occur is what is typical of tokens of the type despite the fact some tokens of the type do not. In response to this I say that this brings us back to the objections I made to Boorse's account of functions. Namely, that we cannot objectively justify the particular choices necessary to define what is typical of the type. For example,

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[85] I accept that there is no need to fully define or specify the environment in the ascertaining functions on a propensity account.

we would need to choose and objectively justify some population and timeframe. I maintain that this cannot be done.

The second way the Normative Distinction is maintained is by the fact that in the case of propensity theories at least, we are talking about the *propensity* of an element in a particular environment to make a contribution to fitness. Consequently, even in a particular environment, it is not certain that the element in question will make the requisite contribution to fitness.[86] Thus there can be a difference between what should$_e$ occur and what occurs. While it is true that the *function* is effectively determinate in a particular environment, the key point is that in such an appeal to functions there needs to be a possible difference between the norm defined by the function and what occurs. And this is certainly the case where the norm defined by the function is a propensity to make a certain contribution to fitness.

However, this is at the cost of making normative claims rather anaemic. That is, one cannot say with any certainty of what should$_e$ occur, rather what propensity should$_e$ occur. This seems to be at odds with normative language.

3.4 Aetiological Accounts

Aetiological accounts of the concept of function are based on some kind of explanation of why the trait is present in the entity. In other words, the function *F* of trait *T*, which produces an effect of type *E*, in some entity *A*, is determined via some kind of explanation of why the trait *T* is there in a token of *A*.[87] Or more specifically for functions in biology, the function *F* of trait *T* in an organism is determined by some kind of explanation of why

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[86] This point holds insofar as the environment is specified. In a fully specified environment it does not because the causal system is determined and there is no difference between what should$_e$ occur and what occurs.

[87] The schema is adapted from Buller. See: Buller, "Etiological Theories of Function: A Geographical Survey."

the trait *T* is there in the token organism.[88] They are interesting for my purposes because they are compatible with the natural sciences and can produce a normative conception of function. Thus they generally escape my first two objections.

For the majority of aetiological accounts, the explanation of why the trait *T* is there in organism *O* is based upon the *past* contribution(s) to fitness, to organism *O*, of the trait *T* with effect of type *E*, where tokens with trait *T* were selected for (over alternatives) because of *T*'s contribution to the fitness of *O*'s ancestors.[89] Examples of such accounts include the work of Millikan and Neander.[90] I ought to note, though that some aetiological accounts have a weaker requirement.[91] Specifically, they do not require the trait *T* to be selected *for*. That is, the trait in question does not need to be selected for in competition with alternatives. Instead, all that is required of the trait *T* is it makes a general contribution to fitness and therefore to the fact that organism *O* survived to reproduce. Examples of such accounts include the work of Buller and Price.[92] However, this weaker requirement is generally not the biggest difference between such accounts. Rather, the most common difference between accounts is over the timeframe for the contribution(s) to fitness, independent of whether the contribution was selected for, or merely some causal contribution to the success of the reproduction of trait *T* in *O*'s lineage. There are two schools of thought. The first holds that the timeframe is the period designated by the original contribution to fitness, whereas the second holds that it is designated by a recent

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[88] The organism is the typical level at which functions are attributed in the biology. Of course, potentially, there are other levels too.
[89] The schema is adapted from Buller. See: Buller, "Etiological Theories of Function: A Geographical Survey," 506-507.
[90] See: Ruth G. Millikan, "In Defense of Proper Functions," *Philosophy of Science* 56 (1989), Ruth G. Millikan, *Language, Thought, and Other Biological Categories* (London: Cambridge, Massachusetts, 1984), Karen Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence," *Philosophy of Science* 58 (1991), Karen Neander, "Misrepresenting & Malfunctioning," *Philosophical Studies* 70 (1995).
[91] This distinction is based on Buller's distinction between 'strong' and 'weak' versions of aetiological theory. See: Buller, "Etiological Theories of Function: A Geographical Survey."
[92] See: Buller, "Etiological Theories of Function: A Geographical Survey.", Carolyn Price, *Functions in Mind* (Oxford, 2001).

contribution to fitness, if any. Where there is no 'recent' contribution to fitness in this timeframe, it is deemed that the token has no function. The former are generally called the ancient-history accounts, and the latter are generally called recent-history accounts. Respective examples of such accounts are provided by Neander and Godfrey-Smith.[93]

ANCIENT HISTORY ACCOUNTS: KAREN NEANDER

My characterisation of Neander's account of function is derived from three papers: 'The Teleological Notion of Function', 'Functions as Selected Effects: The Conceptual Analyst Defence', and 'Misrepresenting & Malfunctioning'.[94] Neander's account of functions is explicitly indebted to the work of Larry Wright and Ruth Millikan.[95] Consequently, I believe Neander's account can be usefully contrasted with both theorists in order to help explicate it.

The core of her account of functions, in her own words, is summarized in the following:

> **Def:** Some effect (Z) is the proper function of some trait (X) in organism (O) iff the genotype responsible for X was selected for doing Z because doing Z was adaptive for O's ancestors.[96]
>
> So, on this definition, the proper function of a kangaroo's pouch is to protect her joeys because this is the effect of ancestral pouches that was adaptive and that caused the underlying genotype to be selected.

As noted, Neander's view is indebted to Wright's account.[97] Her account is like Wright's in that her *explanans* (in the definition) describes why the trait with the function

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[93] Peter Godfrey-Smith, "A Modern History Theory of Functions," *Nous* 28 (1994), Karen Neander, "The Teleological Notion of 'Function'," in *Function, Selection, and Design*, ed. David J. Buller (New York, 1991).
[94] Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence.", Neander, "Misrepresenting & Malfunctioning.", Neander, "The Teleological Notion of 'Function'."
[95] Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence," 168.
[96] Neander, "Misrepresenting & Malfunctioning," 111.
[97] Neander explicitly makes this point in Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence," 168: Footnote #2.

is there. It is there because the effect (Z) of the trait was adaptive for organism (O's) ancestors. So for a pig's heart, the pumping effect of the heart is there because the genotype responsible for the heart pumping was adaptive for the pig's ancestors. Where her account obviously differs and is a development of Wright's account is that Neander cashes out the 'because', 'reason', 'why' or 'consequence' of Wright's *explanans* (in his account of function) in terms of evolution by natural selection. As it stands, Wright's *explanans* in his analysis of functional ascription is agnostic about what could fulfil the 'because', 'reason', 'why', or 'consequence' etc. While Wright's account of functions could include evolution by natural selection as the 'because' etc., it does not require it.[98]

Neander's account is also very similar to Millikan's account of functions.[99] However, despite the fact that Millikan's account is earlier than Neander's, I discuss the latter. I do so for a number of reasons. The first is the accounts were developed independently and for quite different purposes. As Griffiths notes, Neander's intent is to explicate the notion of functions for biology, whereas Millikan's aim in her account is to serve a project in the philosophy of language.[100] This makes Neander's account more directly applicable to the natural sciences.

The second is that Neander's account is one of conceptual analysis of how the concept of function is used in scientific contexts, whereas Millikan's definitely is not.[101] Indeed, Neander attempts to defend conceptual analysis in the context of functions, and also to

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[98] There is nothing in the definition that excludes it.
[99] Neander also explicitly makes this point in Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence," 168: Footnote #2.
[100] Paul E. Griffiths, "Functional Analysis and Proper Functions," *British Journal for the Philosophy of Science* 44 (1993): 147-148.
[101] See Ruth G. Millikan, "Biofunctions: Two Paradigms," in *Functions: New Essays in the Philosophy of Psychology and Biology*, ed. André Ariew, Robert Cummins, and Mark Perlman (Oxford, 2002), Millikan, "In Defense of Proper Functions.", Millikan, *Language, Thought, and Other Biological Categories.*

defuse and undermine Millikan's objections to it.[102] This means that it highly unlikely that appeals to functions to justify the normative assessment of living organisms are appealing to Millikan's notion of function. Whereas if Neander is successful in her aim of conceptual analysis, then it is likely that appeals to function within the natural sciences are consonant with her account.

However, her account of how the concept of function is used in scientific contexts is limited. This is because her conceptual analysis of function clearly does not cover, or is not applicable to every branch of the natural sciences—particularly to every branch of the sciences of biology which she focuses upon. For instance, the use of the concept of function in biochemistry is at best only partially consonant with her aetiological account. Take for example, the claim that the function of Factor VII in human beings is to bind with tissue factors released by damaged tissues to form a complex to initiate the process of blood coagulation.[103] Biochemistry texts and experience suggest that use of the concept of function in biochemistry is generally more consistent with capacity accounts.[104] That when biochemists speak of the function of Factor VII, they are speaking of the causal contribution it makes to some broader capacity, rather than historical contributions to the fitness of the organism. To be sure, *some* usages of function in this context are consistent with the function being the past causal contribution to fitness, but certainly not the majority.

The third and perhaps the most important reason is that it is not clear whether Millikan's notion of function is normative, or normative in the sense that I am interested

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[102] Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence," 169.
[103] Donald Voet, Judith G. Voet, and Charlotte W. Pratt, *Fundamentals of Biochemistry* (New York; Chichester, 1999), 318-319.
[104] See Voet, Voet, and Pratt, *Fundamentals of Biochemistry*, 318-319.

in.[105] In contrast, Neander's notion is clearly normative.[106] Obviously, if Millikan's concept of function is not normative, then any appeal to it falls foul of my second objection.[107]

However, Neander's and Millikan's accounts are otherwise very similar. Compare Neander's summary of her account above with the following summary from Millikan:

> A proper function of such an organ or behavior is, roughly, a function that its ancestors have performed that has helped account for proliferation of genes responsible for it, hence helped account for its own existence.[108]

The two summaries are essentially equivalent. Basically, they share two characteristics. First, they both claim that ultimately proper functions are prescribed and determined by the action of natural selection. In a nutshell, it is the causal contribution to fitness of trait *T* that designates the function *F* of *T*. The point is to distinguish between what an element is *for* and what it happens to do.[109] The second characteristic they share is that both accounts take the view that the proper function of an element is determined by the last period in which natural selection positively acted—selected for—the relevant effects of the element. This interpretation is supported by the way in which both theorists treat vestiges.[110]

Neander's account is committed to holding that vestigial organs, such as the human appendix, still have the function of digesting cellulose. This is because digesting cellulose (presumably) was the effect of ancestral appendices that was adaptive and caused the underlying genotype to be selected for.

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[105] Millikan, *Language, Thought, and Other Biological Categories.*
[106] Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence.", Neander, "Misrepresenting & Malfunctioning.", Neander, "The Teleological Notion of 'Function'."
[107] Ruth G. Millikan, "In Defense of Proper Functions," in *White Queen Psychology and Other Essays for Alice* (Cambridge, Massachusetts, 1993), Millikan, *Language, Thought, and Other Biological Categories*, Ruth G. Millikan, *White Queen Psychology and Other Essays for Alice* (Cambridge, Massachusetts, 1993).
[108] Millikan, "In Defense of Proper Functions," 14.
[109] This is point is made by others. For instance by Griffiths in Paul E. Griffiths, "Functional Analysis and Proper Functions," in *Function, Selection, and Design*, ed. David J. Buller (New York, 1999), 145.
[110] However, Griffiths makes the point that Millikan's account only provides a minimal gesture to dealing with the issue of vestiges. See Griffiths, "Functional Analysis and Proper Functions," 148.

The problem with this is that it is counter-intuitive, and this is why I believe ancient-history accounts are inferior to the other kinds of aetiological account. Typically we would say that human appendices do not have functions, rather than saying they have functions that they no longer perform. This is particularly damaging to Neander because she is committed to a conceptual-analytical account of functions.[111] The fact that her account gives a counter-intuitive description or analysis of the human appendix means that her account does not entirely accord with how the concept is used in everyday discourse. Moreover, it does not accord with how the concept is used in scientific discourse either, which is also the explicit focus of Neander's account.

However, not all historical theorists are of the ancient history variety. The objection raised above is only applicable to ancient history accounts of functions. It is not applicable to recent history or propensity accounts of functions. For example, if we take our case of the human appendix, under a recent history account of functions it does not have a function. This is because the appendix is not making any causal contribution to fitness within the 'recent' timeframe and thus does not have a function in this sense.[112] Consequently, it is to a recent-history account of functions I now turn.

RECENT HISTORY ACCOUNTS: GODFREY-SMITH

The best known recent-history account comes from Peter Godfrey-Smith. His account of the concept of functions generally is very similar to Neander's account. It too relies upon the history of the contributions to the fitness of the organism for ascribing and determining

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[111] Neander, "Functions as Selected Effects: The Conceptual Analyst's Defence."
[112] As I have noted in my discussion of Boorse's GGC account; there are considerable issues in demarcating what is the 'recent' and what is the 'ancient' timeframe.

the function of the element in question. Where it differs from Neander's account is that instead of relying upon the timeframe where the element was first actively selected for (which explains its presence), it relies upon the timeframe where the element was last maintained by natural selection for the ascription and determination of the element's function.[113]

Godfrey-Smith summarises his account in the following definition:

> Biological functions are dispositions or effects a trait has which explain the recent maintenance of the trait under natural selection. This is the "modern history" approach to functions. The approach is historical because to ascribe a function is to make a claim about the past, but the relevant past is the recent past; modern history rather than ancient.[114]

However, his account is not intended as *the* account of functions. He admits and indeed advocates that there are room for other analyses of functions in biology such as the capacity accounts of function already described.[115] Rather the point of his paper is to analyze what he takes to be an existing concept of 'function', which plays a particular theoretical role within biology.[116] The method is via a kind of conceptual analysis.[117] Moreover, he also explicitly acknowledges that his recent history view is a development of both Wright's and Millikan's work, although it stands independently of their accounts.[118]

Godfrey-Smith takes his leave from Wright because of the breadth of Wright's criteria for attributing a function to an element or item. Instead, Godfrey-Smith adopts what he calls an intermediate third position between these views on the attribution of functional status. This stipulates that: (1) the functionally characterized element must be part of and reside within a broader or larger biological system; and (2) the explanation of the

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[113] The 'maintenance' here does not have to be 'active': if natural selection is indifferent or it is merely maintained rather than having an overall negative effect upon fitness, then this still counts as 'maintaining' the function.
[114] Godfrey-Smith, "A Modern History Theory of Functions," 344.
[115] His argument for this view is contained in Peter Godfrey-Smith, "Functions: Consensus Without Unity," in *Function, Selection, and Design*, ed. David J. Buller (New York, 1999).
[116] Godfrey-Smith, "A Modern History Theory of Functions," 344.
[117] Godfrey-Smith, "A Modern History Theory of Functions," 344.
[118] Godfrey-Smith, "A Modern History Theory of Functions," 345.

functionally characterized element must be in terms of a positive contribution to the fitness of the larger system.[119]

So Godfrey-Smith's account embodies features from both aetiological and capacity accounts, and thus it could rightly be called a 'combination' account. Nevertheless, I include Godfrey-Smith in the aetiological camp rather than in the capacity account because he makes a direct and interesting contrast to the ancient-history aetiological accounts of theorists such as Neander.

The significance of course is that recent-history accounts of function largely escape the objections made to other kinds of accounts. For starters, the attribution of functions is far more in line with intuition. Unlike ancient-history accounts, for instance, recent-history accounts claim that present human appendices are non-functional rather than being dysfunctional. Neither are recent-history accounts as susceptible to the practical problems in ascertaining why the trait was selected and how it contributed to fitness. And as we shall see, unlike propensity accounts, they do not beg any questions concerning the operation of the causal order.

So arguably, Godfrey-Smith's account of functions and recent-history accounts of function in general are better accounts of the concept compared to their ancient-history rivals and to other kinds of account. That is, apparently they provide a more accurate account or explanation of something's function—what that something is *for*. However, it is not clear that they do any better in justifying the normative assessment of living organisms.

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[119] Godfrey-Smith, "A Modern History Theory of Functions," 349.

Ultimately, any appeal to an aetiological concept of function relies on history to justify normative claims. In other words, if *X* is the function of *Y*, in organism *Z*, then *X* should$_e$ occur in *Z* because *X* is the past—ancient or recent—contribution to fitness that explains its presence in *Z*. Consequently, both ancient-history and recent-history accounts are equally vulnerable to the objections raised to appeals to history to justify the normative assessment of living organisms.[120] Indeed, one problem here has to do with justifying the particular choice of timeframe that the 'ancient' and 'recent' history refer to necessary to justify normative assessments. Of course, a good case has been made in recent-history accounts for a 'recent' timeframe rather than an 'ancient' timeframe, but the problem apparently remains.

One response would be to claim that it usually makes no difference to how we define the timeframe because we usually get the same answer irrespective of the chosen period. That is, under any reasonable interpretation of 'recent' timeframe we get the same answer to what the function and functional norm is. The pumping heart is the obvious example. Under any plausible recent timeframe, the function of the heart—that which explains the presence of the heart under natural selection—is to pump blood. Moreover, in those cases where this is not the case, and the choice of timeframe does make a difference about what function to ascribe, our intuitions are equally fuzzy about what function to ascribe and what therefore should$_e$ occur. Clearly, there is something to this, which this example demonstrates. Indeed, I concede the point. However, while correct, ultimately, I argue that appeals to recent history accounts still fail to adequately justify normative assessments. The main reason is because there is an unjustified privileging of the past over the future.

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[120] As noted in Chapter 3, the appeal to history is a particular kind of appeal to typicality—i.e. *past* typicality.

Take the following example. Let us assume that intelligent alien biologists visited Earth millions of years ago who were interested in ascertaining the function of particular elements of living organisms using the aetiological account of functions. Upon examining the jawbones of some organisms they concluded that they had the function of supporting their internal structure since this was their most recent contribution to fitness which explains their presence. Moreover, on any reasonable past timeframe, population etc. they have this function. Consequently, if they appealed to function, assuming this of function, they would be committed to claiming that these bones should$_e$ support the internal structure of these organisms. They would also be committed to maintaining that such organisms would be defective if these bones did not support the structure of the jaw.

However, we know in 2008 that at some point in the aliens' future that these bones take on another role: they become co-opted by the auditory system of these organisms' descendents and are used to transmit and amplify sound waves from the environment. So what ought we say concerning what should$_e$ occur with respect to these bones at the time the aliens' visit Earth in the light of present knowledge? In particular, what ought we say when the changes begin manifesting, particularly when the function of supporting their internal structure is diminished, and the function of transmitting amplifying sound waves is only beginning and imperfect. Ought we say that these organisms are defective? The appeals to recent history accounts of function would (at the time the aliens visit) justify the *status quo* and condemn changes, because according to this account, the function of the bones is to support the structure of the organisms. Appeals to function would claim that such organisms are defective and would do so for a least a couple of generations—until the explanation of the bone's presence included the new function. Yet from the perspective of the present, it is not clear that any initial condemnation is warranted. The evolution of a better and more efficient auditory system has its obvious advantages. Of course this is the

wisdom of hindsight. However, such occurrences do raise doubts over any normative assessment justified by an appeal to functions on the basis of recent history: positive or negative the assessment may well be premature and mistaken (in the long view).

The problem in general is that such appeals to function are essentially an appeal to history and assume that the present and the future should$_e$ be the same as the past. This implies that change in the future should$_e$ not occur and thus condemns innovation as being defective. Or more charitably, it implies that change should$_e$ only occur once it has been sustained for long enough, otherwise it should$_e$ not.[121] However, justifying this assumption is problematic. Initially condemning all change as being defective seems wrongheaded and it implicitly makes an unjustified claim concerning what should$_e$ occur.

There other weaknesses with the appeal to recent history accounts for justifying normative assessments too. Recent history accounts are committed to maintaining that we are only justified in making such assessments after sufficient time has passed.[122] That is, we can only tell whether the changes in the bones of the jaw are defective or not after the passage of a certain amount of time. However, this means that appeals to recent history accounts to justify normative assessments are retrospective. Yet *all* normative claims—claims concerning what should$_e$ occur can be prospective. That is they can all refer to some possible future state of affairs. Arguably, this is a weakness of the appeal since all these prospective normative claims also require justification. Take for example the claim that "Domesticated sows about to farrow should$_e$ be able to build a nest." Retrospectively, the claim can be justified by an appeal to recent history functions because such behaviour has

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[121] Of course how long 'long enough' is, is a moot point.

[122] The difficulty is that it in the present it is often difficult to tell whether an innovation is good or bad for the entity now, in the near future, or the far future. Again how long one must wait until we make an assessment is a difficult question to answer. In this case, with the benefit of hindsight, we would have to wait millions of years.

a function, which is frustrated in the case of modern industrial farming systems.[123] Yet the claim is prospective. Those who make it intend that it ought to apply in the future and not just to the relatively immediate future.

Recent history theorists could reply by saying that we do not know what behaviour should$_e$ occur in the future because we do not know what contribution the behaviour makes which explains its presence. If this is the case, we cannot justify the claim that "Domesticated sows about to farrow should$_e$ be able to build a nest" by an appeal to recent history accounts of function. But such claims are common. Consequently, if recent history theorists make such a reply their theory is irrelevant as an appeal to justify prospective normative claims. Of course, the appeal to recent history could justify such claims if it assumed that the future will be the same as the past. That is, in all possible futures pumping blood is what explains why the heart is there under natural selection. But this assumption cannot be plausibly sustained, particularly over evolutionary timescales.

Recent history accounts, like all historical aetiological accounts, do not attribute functions to new innovations. This is because some period of time needs to pass in order to distinguish between functions and happy accidents which confer some benefit. For instance, we would not say that the function of a Bible in a breast pocket is to stop bullets even when a Bible in a breast pocket has stopped a bullet and saved a soldier's life. On the other hand, there are cases where intuitively a rapid (or immediate) change would confer a new function. For example, imagine that the requisite changes in ancestor mammals' jaw bones occurred in the subsequent generation such that they changed immediately to improve the efficiency of transmitting and amplifying sound waves rather than supporting its internal structure. According to the aetiological account of functions the bones should$_e$

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[123] That is, there is an explanation which describes why this behaviour exists under natural selection.

still support the internal structure of the organisms because this was the most recent contribution to fitness which explains its presence. Yet, intuitively at least, it seems wrong to say that the new generation of organisms are defective because the bones no longer fulfil their function as per aetiological accounts. And intuitively, it also seems wrong to say that the bones are malfunctioning as they would be on aetiological accounts, especially when they make an arguably greater contribution to fitness via an enhanced auditory system.

Of course, some number of future generations a recent history theorist could claim that transmitting and amplifying sound waves is the function of the bones because this explains why the bones are present. But in response to this I would reply that it is unclear how many extra generations are required to distinguish between functions and happy accidents—one, two, three, or more? And this point in turn raises the question why *this* period rather than that without being accused of being arbitrary in different cases. It may well be the case that the answer to this question is fuzzy. But the recent history theorist owes us an explanation of why it should be this (fuzzy) number of generations rather than some other (fuzzy) number.

Furthermore in every case where some entity changes its function there is going to be a point of equipoise in the different contributions to fitness which explains its presence. That is, in our example, there is going to be a point where the bones make equal contributions to fitness supporting the structure of the organisms and to their auditory system. In this situation, it is unclear what should$_e$ on the basis of aetiological accounts of function. This is because ultimately there are two different contributions to fitness which could explain their presence in the organisms.[124] I suppose in cases where the contributions are

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[124] One could argue that given what we know of the future in this case that the bones in question ultimately loose the function of supporting the internal structure of the organisms because eventually they do not support their internal structure and they make no contribution (positive or negative) to fitness.

complementary, at the point of equipoise one could maintain that they both should$_e$ occur. Although, I take it that immediately prior and beyond this point of equipoise, the question of what should$_e$ occur remains unclear.[125] However, in many cases, such as our example, the contributions are mutually exclusive. That is, one of them can only be made at the expense of the other: the better the bones become at one function—transmitting and amplifying sound waves—the worse they become at performing the other—supporting the structure of organisms (and vice versa). But in this case these normative claims are in tension with each other because one can only make its contribution at the expense of the other. In other words, maintaining that the bones should$_e$ support the structure of these organisms implies that they should$_e$ not transmit and amplify sound waves since both cannot occur.

Clearly, these points do not apply to entities which do not change and evolve through time. However, living organisms and elements of living organisms do change and evolve over time. Change is an intrinsic element to life.

4. Conclusion

This chapter argues that appeals within the natural sciences to the concept of function do not justify the normative assessment of living organisms. They fail to do so because such appeals are vulnerable to one or more fatal objections. There were six I raised. The first was that the explicit ontology of the natural sciences is incompatible with the nature of the concept of the function being appealed to. (Consequently, those within the natural sciences

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[125] I am not convinced that a simple majority justifies the function to attribute. In the example, at one point in the history, the majority explanation for the presence of the bones was that they supported the structure of the organisms, but the future trajectory of the explanations was transmitting and amplifying sound waves. (I.e. from generation to generation the proportion of explanations for the presence of the bones changed towards the latter explanation.) In this case, it seems plausible to me to say that the attribution of function according to the recent history account based on a majority contribution should be doubted because the majority is going to change.

cannot appeal to such notions on pain of ontological incoherence.) The second was that the concept of function is not normative. (So those within the natural sciences can hardly appeal to such notions of the concept on pain of ontological incoherence.) The third was that there are many different concepts of function, but no single concept of function can be objectively justified over and against the alternatives. (Consequently, there are many different even contradictory normative assessments which are justified by an appeal to the concept of function.) The fourth one was that for some concepts of function there are various parameters which require some specification, but no specification can be objectively justified over and against alternatives. (So, like the third objection, again there are many different and even contradictory normative assessments which are equally justified by an appeal to such concepts of function.) The fifth one was that some concepts of function normatively assess present change as being defective in opposition to intuitions to the contrary. And finally the sixth objection was that some concepts of function are unable to justify prospective normative claims without unjustifiably privileging the past over the future.

Philosophical accounts of the concept of function can be roughly classified into four kinds, although the boundaries between them can be blurred. These are: (1) value centred or teleological accounts; (2) capacity accounts; (3) propensity accounts; and (4) historical accounts, which come in ancient history and recent history variants.

I argued that these different kinds of function are vulnerable to various problems which mean they are unsuited to justify the normative assessment of living organisms. For example, value centred and teleological accounts of the concept are generally vulnerable to the first objection since it is generally held that they are ontologically incompatible with the natural sciences. This said I was not convinced that this is necessarily the case. Indeed,

I suggested that arguably the best contemporary example of a value centred or teleological account by Mark Bedau may be compatible. Nevertheless it still fails because it lacks a necessary account of value and therefore fails to reassure us that it does escape the first objection.

Capacity accounts are generally vulnerable to the second objection because generally they do not provide a normative conception of function. Hence, in general, capacity accounts do not sustain the Normative Distinction—a point demonstrated by the fact they generally cannot and do not account for dysfunctions. That is, failure to make any contribution to a broader system capacity is not deemed to be dysfunctional. However, there is at least one notable exception, Christopher Boorse's General Goal Contribution (GCC) account. Yet given the specifics of his account—notably his use of normal functions which drew upon an appeal to typicality—his account as an appeal to justify normative assessments of living organisms fails for the same reasons as the appeal to typicality. Moreover, his use of species-typical contributions to goals, particularly to survival and reproduction, to ground normativity leaves many parameters unspecified and importantly unjustified. Unless some justification can be found for choosing one set of specifications over another, it will not be possible to appeal to Boorse's notion of a function to ground normative assessments.[126] In short, Boorse's account also suffers from the fourth objection.

Propensity accounts are also vulnerable to the second objection. This is because propensities to contribute to fitness are vague and thus they do not so sharply sustain the

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[126] Boorse rightly claims that what is typical is vague. However, what is typical has various parameters with a range of values which need to be closely specified and the choices of value justified if appeals to typicality are to be adequate to justify normative assessments. For instance, In Boorse's case, he makes use of the term species without specifying which concept of species he is using, let alone justifying it over and against the tenable alternatives. In other cases, the specification of the range of values is implicit but not justified.

Normative Distinction. That is, what should$_e$ occur is not so sharply defined, especially in contrast to recent-history and ancient-history accounts of function. This is an epistemological problem. That is, it is difficult to know what the propensities a trait has to contribute to fitness unless one makes unjustified assumptions about how the causal order will operate. But this raises the problem of effectively begging the question concerning what should$_e$ occur because what should$_e$ occur is then effectively specified by these assumptions. Moreover, if the (natural) assumption is that the causal order will operate in the future as it has in the past then essentially one is making an appeal to history, which has problems as we have seen.

Finally, we come to aetiological accounts. They are effectively immune from the first and second objections. (The third objection applies to the appeal to function *per se*.) Ancient history accounts have problems with timeframe selection, albeit at different relative periods in the past. Of course, a good case has been made for recent-history accounts over ancient history accounts. However, recent-history accounts are vulnerable to the fifth and sixth objections. That is, in some cases, they assess contemporary change (which contrasts to the past) as being defective contrary to intuitions to the contrary. They are also unable to justify prospective normative claims without unjustifiably privileging the past over the future. In other words, they also suffer from the objections to the appeal to history because both kinds of aetiological account draw upon an appeal to history to ground their account of functions.

Furthermore, the appeal to functions does not escape the third objection even excluding accounts of function which are ontologically incompatible with the natural sciences and are not normative. Of those remaining clearly, there are different accounts of the concept and arguably none can be categorically justified over and against the alternatives. The crux of

the matter is that there is an irreducible pluralism which makes justifying particular normative assessments over and against possible alternatives untenable. Indeed, in some cases we would be left with an appeal to functions equally justifying that X should$_e$ occur and not X should$_e$ occur, which is a fatal contradiction. Indeed, the only way the appeal to functions could escape this objection is if there is one true account of the concept of functions. But this looks implausible.

We could perhaps argue that we should adopt the account of function that makes the best fist of sustaining the Normative Distinction. On these grounds, arguably the best is some recent history account of the concept. Such accounts sustain the Normative Distinction better than the alternatives. However, as we have seen the latter fails in the end because it suffers from the objections to the appeal to history. Consequently, if I am correct, then the appeal to the natural sciences to justify normative assessments of living organisms via an appeal to functions is not tenable.

So now we have two appeals which could justify the normative assessment of living organisms remaining on the table. These are the appeals to development (ontogeny) and the appeals to species (phylogeny). So it is to these remaining appeals I now turn.

Chapter 5: Why the appeal to ontogeny fails to justify the normative assessment of living organisms.

1. Introduction

The claim this chapter seeks to defend is that we cannot justify the normative assessment of living organisms by an appeal to ontogeny. Ontogeny is the process of individual living organisms' development from origin to maturity.[1] It occurs with great regularity. Indeed, there are living organisms which have developed in the same way for millions of years.

To some extent, it is this striking stability over time which underlies the intuition that this appeal justifies the normative assessment of living organisms. That is, the fact that living organisms have developed consistently which at least partially underlies the claim that they should$_e$. For instance, the claim that the New Zealand tuatara should$_e$ develop as it does is, at least in part given some credence by the fact it has developed the same way for some 200 million years.[2]

Yet the appeal to development is *not* an implicit and indirect appeal to regularity *per se*, or to history. Rather it attempts to justify normative assessments via the causal system responsible for development. In other words, the claim is that this system specifies what should$_e$ occur rather than what regularly occurs or has regularly occurred. For instance, the appeal attempts to justify the normative assessment "Porky the piglet should$_e$ be born with two eyes, two ears, and a curly tail" by the fact this is what the developmental system specifies (in advance of it occurring). In contrast, the appeals to regularity and history

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[1] It is often contrasted with phylogeny, which is the development of a group. Typically the group is conceived as a species. I shall deal with the appeal to phylogeny in the next chapter.

[2] Tuataras resemble lizards but technically they belong to a different taxonomic order. Indeed, they are the only remaining member of the order Sphenodontia, which tuataras excepting, died out some 60 million years ago.

attempt to justify this normative assessment because piglets are regularly born with these characteristics or have been born with them for thousands of years.

Consequently, the appeal to development escapes the objections I raised to these appeals in chapters 3 and 4. To reiterate, I objected to the appeal to typicality because it either fatally weakens the Normative Distinction, or begs the question concerning what should$_e$ occur. And I objected to the appeal to history because this requires a choice of timeframe and population which either is circular or cannot be objectively justified. The appeal to ontogeny escapes this objection because it does not utilize time or population in its conception. The fact that ontogeny is consistent through long periods of time for certain populations such as species is orthogonal to the appeal.

Furthermore, the predominant account of ontogeny in the natural sciences describes how the causal system ostensibly *is* able to specify what should$_e$ occur. It asserts that there are instructions for development in advance of it occurring in the way that blueprints specify the form of a building. Specifically, it claims that these instructions are represented in the DNA/RNA of organisms and executed by cells. So what should$_e$ occur is what the instructions specify in advance of development, and actual development is what does occur. Thus the Normative Distinction is maintained. Clearly, the difference between what should$_e$ occur and what occurs can be distinguished, as illustrated by congenital malformations caused by morphogens like Thalidomide.

So it appears that my thesis that the natural sciences do not justify the normative assessment of living organisms is in deep trouble. However, I argue that such appearances are mistaken. Specifically I pursue four lines of argument which make the case that we cannot appeal to ontogeny to justify the normative assessment of living organisms.

The first line of argument rests on the claim that accepting the standard account of development as a justification for normative assessments leads to the justification of some strongly counter-intuitive normative assessments. While it is possible to accept these, it is at the cost of either foregoing our intuitions about normative assessments of living organisms, or altering the nature of the appeal to ontogeny, such that it is vulnerable to objections made earlier.

The second line of argument claims that the nature of the instructions preformed in the DNA/RNA of living organisms are not sufficient to determine what should$_e$ occur. Consequently, we cannot appeal to these instructions to sustain the Normative Distinction. While we could assume some form of standard background causal context in which DNA/RNA would specify what should$_e$ occur, such an assumption is not warranted because it begs important questions. Furthermore, it would also involve privileging genomic contributions to the causal system of development over other kinds of contributions operating in development, which brings me to my third line of argument.

This rests on the claim that there is no adequate justification for privileging one kind of contribution to the developmental causal system over and against other kinds of contribution operating in development. Such privileging is necessary if the appeal to development is to adequately justify the normative assessment of living organisms.

The fourth and final line of argument is a radical one. It claims that the idea there are preformed instructions for development contained in DNA or RNA is wrong, notwithstanding its considerable scientific utility and fecundity. If successful, it means that the natural sciences cannot appeal to ontogeny to justify normative assessments because it

is the alleged preformed elements which sustain the Normative Distinction. Yet I ought to stress that the case against the natural sciences appealing to ontogeny to justify the normative assessment of living organisms does not depend upon this line of argument, so even if it fails my thesis is preserved.

However, before I begin these arguments I believe it is worthwhile to provide an overview of how development has been and is explained in the natural sciences. The appeal to development is based on the causal system responsible for development described by and explained within the natural sciences. So knowing something of the scientific explanation of development is essential for understanding what the appeal entails.

2. Scientific accounts of development

The explanation of development within the science of biology occurs within the discipline of developmental biology. To explain it I shall draw upon Scott F. Gilbert's classic *Developmental Biology*.

Gilbert notes that the two fundamental questions of developmental biology are: (1) how does the egg give rise to the adult, and (2) how does the adult (ultimately) reproduce itself?[3] It is the first of these questions that is pertinent to the appeal to development to justify the normative assessment of living organisms. If the way in which the egg gives rise to the adult specifies how development should$_e$ occur before it does, then there is a plausible way to sustain the Normative Distinction and thus justify normative assessments.

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[3] Scott F. Gilbert, *Developmental Biology*, 6th ed. (Sunderland, Massachusetts, 2000).

There are two kinds of explanation in the scientific literature on development which seek to address this first question. The first is based on some form of preformation and is called a 'preformationist explanation'. Classically, preformationist explanations held that development was merely the expansion of the already fully formed organism. In contrast, preformationist explanations offered today claim that development is preformed in the instructions, plans, or blueprints contained sequences of nucleic acids (DNA or RNA). The second is based on epigenesis and is called an 'epigenetic explanation.' Epigenetic explanations claim that development is the assembly of the organism from various components. The components are also assembled in other epigenetic processes, and this recursion ultimately goes down to raw materials. So epigenesis is much more than expansion. Where preformation and epigenesis differ is over whether the adult organism is already completely present (in some sense) in the fertilized egg; or if they are formed *de novo* in each generation within the process of development.

The history of the explanation of development within the natural sciences can be seen as an argument between the two kinds of explanation. Broadly, there have been two phases of debate. The first was over which kind of explanation was true: that is, whether epigenesis *or* preformation was true. The second, which is still continuing today, is over the extent to which each kind of explanation is true. That is, the current debate is largely over the extent to which development is epigenetic or preformed.

This said, recently it has been argued that development can be explained entirely by epigenesis. For instance, the philosopher of biology Susan Oyama argues for this view, along with others in the Developmental Systems Theory (DST) movement.[4] However, notwithstanding such arguments, the consensus explanation of development is that there

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[4] As far as I know, for obvious reasons, there is no one advocating the opposite view.

are preformed instructions which are made concrete by epigenesis. For instance, Gilbert remarks,

> In this hypothesis, wherein epigenetic development is directed by preformed instructions, we are not far from the view held by modern biologists that most of the instructions for forming the organism are already present in the egg.[5]

Interestingly, the debate between epigenesis and preformation in the explanation of development is also connected to the debates concerning the explanation of human nature where genes and nature are pitted against the environment and nurture. For instance, the idea that development is explained by preformed instructions in genes neatly parallels the claim that human traits are explained by instructions in genes, which exist at the beginning of human development. And the idea that development is explained by epigenetic assembly is close to the idea that human traits are explained by the environment. Moreover, the modern consensus explanation of development mirrors the modern consensus explanation of human nature. The modern consensus explanation of development holds that it is explained by both epigenesis and preformation. Likewise, human nature is explained by genes and the environment, nature and nurture. Finally, the significant issue for both explanations is ascertaining the extent to which genes and nature on one hand, and the environment and nurture on the other, explain development and human nature.

The connection is important because ultimately some significant moral claims depend upon whether or to what extent human nature is explained by genes/nature and environment/nurture. This is because it is thought that moral agents are morally responsible to some extent for the latter but not for the former, although with technological advances moral agents are becoming responsible for both. Specifically, in the case of

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[5] Scott F. Gilbert, *Developmental Biology*, 7th ed. (Sunderland, Massachusetts, 2003), 8.

human beings *qua* moral agents, they are not responsible for the environment in which they grew up in, but they are responsible to some extent for the environments they inhabit as adults.

2.1 A brief history of the debate between epigenesis and preformation

Gilbert claims that debate between epigenesis and preformation began in the seventeenth century.

> With Malpighi [1628-1694] begins one of the great debates in embryology—the controversy over whether organs of the embryo are formed de novo ("from scratch") at each generation or whether the organs are already present, but in miniature form, within the egg (or sperm). The first view is called **epigenesis**, and it was supported by Aristotle and Harvey. The second view is called **preformation**, and it was reinvigorated with support from Malpighi.[Bold in original][6]

Malpighi challenged epigenesis on the basis of his microscopic account of chick development showing that the un-incubated chick egg already had a great deal of structure.

Support for preformation then came from a variety of sources. First, it had the backing of the contemporary worldview, including the sciences, religion, and philosophy. Secondly, it was a simpler view since all development consists of in preformation is growth—or unrolling—rather than creation and formation. Neither did it require the hypothesis of some extra and mysterious force for development as epigenesis did. Third, it accorded with the belief at the time that species were eternal and constant. Consequently, by the mid-eighteenth century preformationism was dominant.

However, the case for epigenesis was rejuvenated by the German embryologist Kaspar Freidrich Wolff. Wolff showed by carefully observing chick embryos that particular embryonic parts were developed from tissues that had no counterpart in the adult organism. For instance, the heart and blood vessels could be seen to develop afresh in every

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[6] Gilbert, *Developmental Biology*, 6.

generation, whereas according to preformationist theory they had to be present from the beginning of development. Of course, the new epigenesis proposed by Wolff was not without its problems. To explain how an organism is created afresh in each generation he hypothesized an unknown force—the *vis essentialis* (or essential force)—to organize embryonic development.[7]

Reconciliation between the views was attempted by the philosopher Immanuel Kant and the biologist Johann Fredrich Blumenbach.[8] However, ultimately with the development of new experimental techniques in developmental biology it became increasingly clear that preformationism in its original guise was untenable. These new techniques enabled the documentation and description of the epigenesis of various structures. For example, it was ultimately demonstrated through a number of techniques that the different cells of the dividing egg had different fates—that is they became different structures and tissues. It was also demonstrated that cells migrated in development. Both phenomena are inconsistent with traditional preformationism.

Gilbert highlights three investigators (contemporaries and friends) who were particularly influential in the rebuttal of preformation and the restablishment of epigenesis. These were Christian Pander, Karl Ernst von Baer, and Heinrich Rathke.

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[7] The need for such a hypothesis comes from the view that Matter requires organization into Form. This is view is supported by the fact that rocks do not organize themselves into houses. The hypothesis would have been problematic for a number of reasons. For instance, during the eighteenth and nineteenth centuries there was a rejection of teleological explanations in biology and clearly *prima facie* Wolff's hypothesis could be interpreted as making an appeal to teleology. Furthermore, in positing an unknown force, Wolff effectively make the equivalent move some Creationists do today saying (about Creation) "God did it somehow—end of story."

[8] Gilbert, *Developmental Biology*, 6-7.

Pander studied the chick embryo and discovered the three germ layers of triploblastic organisms: the ectoderm, mesoderm, and endoderm. He showed that the layers did not form their organs independently, which supports epigenesis but not preformation.

Rathke looked at the development of frogs, salamanders, fish, birds, and mammals and showed that the development of vertebrates were similar. In particular he demonstrated that vertebrate pharyngeal arches became the gill apparatus in fish, but became mammalian jaws and ears (among other things), which again is consistent with epigenesis but not preformation.

Von Baer extended Rathke's work, and discovered the notochord and the mammalian egg. He is also known for four inter-related generalizations surrounding embryonic development that have since been called von Baer's Laws. These are: (1) the general feature of a large group of animals appear earlier in development than do the specialized features of a smaller group; (2) less general characters are developed from the more general, until finally the most specialized appear; (3) the embryo of a given species, instead of passing through the adult stages of lower animals, departs more and more from them; and (4) therefore the early embryo of a higher animal is never like a lower animal, but only like its early embryo. The significance of these generalizations is that again they are consistent with epigenesis but inconsistent with traditional preformationism. Consequently, the view that living organisms themselves were preformed was thoroughly discredited. Nevertheless, the doctrine of preformationism was not (and is not) totally exorcised from the explanation of development in the natural sciences.

Obviously, given the evidence, the doctrine of preformationism needed to change, and what changed was what it asserted to be preformed. So instead of claiming that adult living

organisms themselves are preformed, preformationism now claims that the instructions, plans, or blueprints for adult living organisms are preformed in the genomes of embryonic living organisms. Adult organisms are preformed in the sense that they are ostensibly represented in the DNA of the fertilized egg *prior* to the adult form being instantiated. The claim is that it is instantiated by the information contained in the DNA of the fertilized egg being 'translated' or 'read' through the various epigenetic processes of development. Moreover, it is a claim that is supported by contemporary genetic discourse and it escapes the objections raised to old preformationism.

As noted above, the pertinent point is that the modern view of development proposes that the development of living organisms is partly preformed in the information contained in various sequences of nucleic acid of the zygote. It is pertinent because such preformation can be used to sustain the Normative Distinction. In particular, the preformed instructions could specify what should$_e$ occur in development and these specifications may rightly be contrasted with what occurs or may occur. Take for instance, the normative assessment "Porky the piglet is defective" (because she is born with one eye, one ear, and no curly tail). She is normatively defective on the modern account of development precisely because she differs significantly from the instructions for her form (at that point in development) contained in her zygote. She should$_e$ have been born with two eyes, two ears, and a curly tail because these traits were preformed in the instructions in the zygote. Yet for some reason, the specified outcome was thwarted and she was born with one eye, one ear and no curly tail.

So if the contemporary view of development described by Gilbert is true, then my thesis that the natural sciences do not justify the normative assessment of living organisms seems to be in trouble. This is because apparently we could appeal to the idea that the

Normative Distinction can be grounded in facts about an organism's genome. However, I believe there are at least four lines of argument which show otherwise, and it is to these I now turn.

3. Objections

3.1 Counter-intuitive normative assessments

My first objection is that accepting the standard account of development from the natural sciences has the consequence of justifying strongly counter-intuitive normative assessments. The kind of scenarios I have in mind are ones where the preformed instructions specify deviant norms we would not intuitively accept. In such cases epigenetic development follows the preformed instructions perfectly. So for instance, if the preformed instructions specify that Porky the piglet should$_e$ be born with one eye, one ear, and no curly tail, the appeal to development implies that this should$_e$ occur. But this is counter-intuitive. According to the norms of pig development Porky should$_e$ be born with two eyes, two ears and a curly tail.

Furthermore, cases where preformed instructions specify something deviant from the norm for the species are not unusual. Most genetic diseases which affect development do so. Take Downs Syndrome for example. The syndrome is caused by the preformed instructions in the extra partial or complete copy of chromosome 21. So if preformed instructions specify what should$_e$ occur then according to this appeal Downs Syndrome should$_e$ occur.

Indeed, deviations from what is typical for the species are part-and-parcel of individual development. This is because change is a consistent feature of genomes. Indeed, genome copying introduces changes since it is imperfect and mistakes get through despite there

being many different error correcting mechanisms. Moreover, in some circumstances these error-correcting systems are deliberately down-regulated.[9] Another example is transposons. These are sections of the genome which move around the genome and can disrupt genomic functioning. (These transposable elements (transposons) code for enzymes that can haphazardly insert themselves into the genome.[10]) Then there are numerous external causes of genome change such as external chemical agents. These can either directly or indirectly alter the genome by altering base pairs or interfering with repair mechanisms. Another example is retroviruses which can act like transposons by inserting themselves in the host organisms' genome and disrupt genomic functioning too. Consequently, there are cases, albeit rare ones, where the preformed instructions in the genome specify a process of development which is atypical or abnormal. Down's Syndrome is one example. In this case there are three copies of chromosome 21 instead of two because of an error in cell-division which was not corrected.

Then there is also the effect of human agency to consider. For instance, genetic engineering alters organisms' genomes and as a result the consequent preformed instructions specify something deviant from what has historically or typically occurred in that species. A genetically engineered cow may be able to excrete valuable proteins in her milk, but intuitively such a capability is not normal for the domesticated sow. Or a genetically engineered pig may in the future be able to produce organs which are suitable for transplanting into human beings, but again intuitively this is not normal for a domesticated pig.

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[9] "End of Evolution," *New Scientist* 174 (18 May 2002, 2002).
[10] Voet, Voet, and Pratt, *Fundamentals of Biochemistry*, 806.

So how might one respond to such cases and preserve the appeal to development? There are a number of possibilities. One would be to deny our intuition concerning normative assessments. For instance, we might insist that Porky the piglet is not defective if she is born with one eye, one ear, and no curly tail if the preformed instructions specify these characteristics. Or we might insist that she is defective if she is born with two eyes, two ears, and a curly tail when the preformed instructions specify otherwise. In other words, one possibility would be to accept these counter-intuitive implications. However, as noted in the introduction, this would be an odd move to make since we are seeking to justify a set of normative assessments by an appeal to development, not to radically alter them.

Another possibility is to argue that something goes wrong when genomes alter. For instance, if the genome replication system fails to accurately replicate the genome such that a difference in development is specified.[11] However, this is a difficult argument to sustain.

Genome change is an essential element of evolution. Indeed, on some accounts of evolution genome change *is* evolution. For instance, as Griffiths and Gray note,

> Open almost any biology textbook and you will find the following definition: Evolution is change in gene frequency. This definition reflects the conventional view of natural selection and the conventional view of heredity. Natural selection occurs because individuals vary, some of these variations are linked to differences in fitness, and some of those variants are heritable (Lewontin 1970). Because variants that are not heritable cannot play a role in natural selection, and because the mechanism is presumed to be genetic, evolution is defined as change in gene frequencies.[12]

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[11] Inaccurate replication of the genome does not necessarily bring about differences because of the redundancy built into the genetic code. For instance, if the DNA sequence triplet CCC was changed to CCA, and this error was not fixed, proline would still be produced if the triplet was translated.

[12] Paul E. Griffiths and Russell D. Gray, "Darwinism and Developmental Systems," in *Cycles of Contingency*, ed. Susan Oyama, Paul E. Griffiths, and Russell D. Gray (Cambridge, Massachusetts, 2001), 195. In text citation: Richard C. Lewontin, "The Units of Selection," *Annual Review of Ecology and Systematics* 1 (1970).

So if one is committed to the view that something goes wrong when genomes alter, one is also committed to the view that something goes wrong when organisms evolve, which is nonsensical.

Genomic change is necessary for organisms to adapt to changing circumstances. Arguably, this is a fundamental good for the organism and the species it belongs to. Moreover, to some extent the rate of genome change in the cells of organisms is under the cell's control.[13] For instance, in certain situations, such as cellular stress, the fidelity of error-correcting mechanisms is altered by the cell such that more errors are permitted in order to enable the genome to adapt.[14]

Furthermore, evidently we accept that genome change is good in some circumstances, such as where the change is adaptive. Indeed the evaluation of genome changes, on some basis, can change over time, especially evolutionary time. So while some genome change can be evaluated, on some basis, as being good (or bad) at time t_1, at t_2 (in the future) it can be evaluated as being bad (or good). For example, we might evaluate a genome change is being *dysfunctional* now (on some account of function), but in the future we might evaluate it as being *functional* (or vice versa). It could even be the case that various genome changes are evaluated as being dysfunctional at t_1, functional at t_2, and dysfunctional at t_3.

However, much more plausible is the claim that genome change may be a source of abnormality. However, this implicitly brings into play an extra set of norms. Significantly, these are independent of what the genome specifies. They need to be in order to

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[13] I am not using deliberately here in any intentional sense.
[14] See for example "End of Evolution."

differentiate which differences in development specified by the genome are abnormal and which are normal. Yet notice this moves us beyond the appeal to development to some other kind of appeal such as the appeal to typicality.

So we might be able to preserve the appeal to development by normatively evaluating genome changes and making some kind of assessment of whether they should$_e$ or should$_e$ not occur. For instance, we could distinguish between genome changes that are adaptive, functional, or good in contrast to genome changes that are maladaptive, dysfunctional or bad for the organisms. In such a case we could say that where the preformed instructions specify something maladaptive, dysfunctional or bad, these should$_e$ not occur, and where they specify something adaptive, functional or good that these should$_e$ occur.

But as noted above, the problem with this move is it changes what is being appealed to, to justify the normative assessments of living organisms. That is, we are no longer appealing to development—what the genome species—to justify normative assessments. Take for example our normative assessment of Porky. If she is born with one eye, one ear, and no curly tail we would assess her as being defective. But if we justify this assessment by saying she is defective because these characteristics are dysfunctional (in comparison to having two eyes and ears and a curly tail), we are no longer appealing to development. Consequently, changes in what is being appealed to mean that other objections come into play. For instance, if the justification for the claim that Porky is defective because having one eye, ear, and no curly tail is dysfunctional in some sense (in comparison to having two eyes, ears, and a curly tail), then all the objections to the appeal to functions discussed in chapter 4 apply. Furthermore, this move, and similar moves, seem to assume some notion of the organism's good or flourishing which is implicit and unexplained.

The same point applies to claims that the preformed instructions should$_e$ specify what is typical for the species at present or historically. In this case the causal system is not doing all the normative work; it is appeals to regularity *per se* or history, which I have already discussed, and the appeal to species, which I shall discuss in Chapter 6. And again my objections to these appeals come into play. Indeed the point applies to any second-order evaluation of development. Whatever drives the evaluation becomes the appeal which is used to justify it.

3.2 Insufficient preformation to justify normative assessments

My second objection to the appeal to development is that what is preformed is not sufficient to justify the normative assessment of living organisms. That is, what is held to be preformed in the genome alone does not fully and sufficiently specify what should$_e$ occur.

To see why, take any living organism at the beginning of its developmental cycle and extract its genome. For pigs this would involve extracting the DNA from the zygote. Then sequence this genome precisely and represent it in some universal form such as in binary. Send it into space where hopefully eventually some advanced alien intelligence discovers it. Now if the representation of the pig genome provides instructions then the advanced alien intelligence ought to be able to reconstruct the pig. However, they could not, because they would need to know something of the system in which it was embedded. Fundamentally, an organism's genome or representation thereof only has a particular meaning in specific context such as a pig cell or representation thereof.[15] So to reconstruct the pig from the representation of the pig's genome the alien intelligence would also need a representation of the context in which it was embedded. So clearly genomes only provide

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[15] Indeed, theoretically, the same instructions which specify the development of a pig in a pig cell, in a different context could specify the development of another organism or entity.

preformed instructions for development in a suitable context. In the case of pigs, a pig genome only provides preformed instructions for the development of a pig if it is contained in a pig zygote.

Yet if the context is necessary, can it be claimed that the *genome* fully and sufficiently specifies what should$_e$ occur in development? Surely, the specification of what should$_e$ occur is a joint product of genome and context. Indeed, it is widely recognized within the discourse of genetic explanation that the gene operates within other elements in the system, such as the rest of the genome, the cellular context, and the broader environment. As Lisa Gannet says,

> If there is one incontrovertible fact about genetic causation, it is that there are, strictly speaking, no "single gene" effects. *All* traits, no matter how simple, result from the interaction of many genes and the environment. It may seem trivial to assert that a trait can only be deemed 'genetic' only relative to a necessary background of genetic and nongenetic factors. [Italics in original.][16]

But if this is correct, this means that the genome alone is not sufficient to specify what should$_e$ occur. This completely undercuts the appeal to development as it stands because it is based on the assumption that the genome alone specifies what should$_e$ occur. Yet clearly, the genome alone does not specify what should$_e$ occur. Rather it is some particular combination of genome and the environment.

This said, I am sure that proponents of the predominant account of development would be happy to accept attributing causal responsibility to the interaction between genome and environment. However, this move has significant problems. For instance, it makes it difficult to attribute causal responsibility for what should$_e$ occur to genomic contributions. Moreover, it also undermines the appeal to development where this is understood in terms

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[16] Lisa Gannett, "What's in a Cause?: The Pragmatic Dimensions of Genetic Explanations," *Biology and Philosophy* 14 (1999): 350.

of the predominant theory because this effectively claims that what should$_e$ occur is preformed in the genome. Finally, if development really is caused by both the genome and the environment, we are also left with the issue of justifying the evident privileging of genomic causal contributions over the environmental causal contributions in explanations of development.

Then there is the fact that similar genomes may give a wide variety of developmental outcomes in different environments. In such a case, there are problems in ascertaining what should$_e$ occur and consequently there are difficulties in sustaining the Normative Distinction. Of course, one could argue that the genome *G* specifies *X* in some typical or historical environment *E*, but then we have all the problems with the appeals to typicality and history already noted.

Moreover, attributing causal responsibility in a causal system is pragmatic. For instance, a short circuit in a switch has the effect of creating sparks. However, the effect of creating a fire requires a fuel load and the presence of oxygen. The absence of any of the other elements means that the fire could not occur despite there being sparks. Yet typically we would say that where there is a short circuit creating sparks in the presence of a fuel load and oxygen creating a fire, the cause of the fire was the short-circuit. This is in spite of the fact that every causal element is required for a fire to occur. So it seems to me that the description of the cause of the fire is a pragmatic short-hand for describing the entire operation of the causal system.

Of course, one could make the case that in this example the switch's short-circuit is the cause because it explains why fire occurred then and not before. This makes the attributing causal responsibility a function of our explanatory interests which can and do vary.

However, while it is a reasonable move it effectively makes attributing causal responsibility subjective. That is, persons with different explanatory interests may well attribute causal responsibility differently for the same effect in the (objective) causal system. Take our fire for example. An agent could attribute the cause of the fire to the failure of the fire suppression system which was meant to flood the area with non-combustible nitrogen. Or another agent could attribute the cause of the fire to the fact combustible materials (fuel) were present near the switch, when in fact the plan for the building specified otherwise.

The problem with this is that it gives rise to multiple incompatible attributions of causal responsibility for outcomes, which are all equally true, assuming the causal system is correctly characterized. For instance, the cause of the fire above is equally the switch's short-circuit, the failure of the fire suppression system, and the mistake in implementing the specification for the building. If it is the case that attributing causal responsibility is pragmatic and relative to specific explanatory interests, then it is somewhat arbitrary to attribute causal responsibility for development to the genome.

Clearly, this blunts the appeal to development for justifying the normative assessment of living organisms because there is no single justifiable source which specifies what should$_e$ occur. We are left with appealing to the environment and genome together to ascertain what should$_e$ occur. In this case we would say something like "organism DNA in pertinent developmental environments *a*, *b*, *c* should$_e$ produce developmental outcome *p*, *q*, *r*, *s*."

However, there are at least two significant problems with this move. The first is that it would involve justifying some rather counter-intuitive normative assessments. For

instance, if we followed this line, we would be committed to claiming that the developmental malformations caused by the drug thalidomide should$_e$ occur. This is because all other things being equal, human DNA in a pertinent developmental environment *b* containing thalidomide produces malformations. Obviously, this is at odds with our intuitive normative assessments of such developmental outcomes.

The second problem with this move is that sustaining the Normative Distinction becomes problematic. This is because using multiple privileged elements to specify what should$_e$ occur weakens the Normative Distinction where the specifications of the elements differ or conflict. For instance, one element specifies that X should$_e$ occur, and another specifies that Y should$_e$ occur, we are then left with the problem of ascertaining what ultimately should$_e$ occur—X, or Y?[17] And using every element in the causal order to specify what should$_e$ occur dissolves the Normative Distinction entirely. This is because there could be no distinction between what should$_e$ occur and what occurs or may occur since it is the entire causal order that determines what occurs or may occur.

Take for example how the sex of American Alligators is determined. It is determined by nest temperatures during the middle third of embryonic development.[18] Females are the outcome at temperatures below 31.5°C; mixed ratios are the outcome at 32°C; and males only are the outcome between 32.5-33°C. Decreasing numbers of males are the outcome as temperatures approach 35°C, and beyond 35°C, only females occur.[19] The genome in this case does not specify what should$_e$ occur. Rather it is the joint product of the genome and

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[17] I should note that the possibility or fact of moral conflict does not imply there are no moral truths. Neither does the possibility or fact of conflicting should$_e$'s show that there are no true should$_e$-statements. My point is in such cases we cannot adequately ascertain what should$_e$ occur and thus we cannot adequately justify normative assessments over and against alternatives. In other words if X should$_e$ occur at t_1 and Y should$_e$ occur at t_1, then what should$_e$ occur at t_1? (I assume that X and Y are both true but mutually exclusive.)

[18] "American Alligator." (Last Updated: February 12, 2001). Available at www.csc.noaa.gov/acebasin/specgal/gator.htm. Accessed: 30 December 2002.

[19] "American Alligator."

the environment. Yet the specification does not distinguish between what should$_e$ occur and what actually does occur. We can only say *ceteris paribus* what the sex will be given a particular incubation temperature during the middle third of embryonic development. Indeed, arguably, there is no prior specification for what should$_e$ occur. That is, when the fertilized egg is laid we cannot say what sex should$_e$ occur until after the middle third of embryonic development.

This said, one could make the case that what the genome of the American Alligator specifies is female alligators. Note that it is only within a number of temperature ranges that male alligators are born but otherwise female alligators are born. So we could say that American Alligators should$_e$ be born female, but in some situations it is over-ruled by the context. But even if we accept that this is the case, the Normative Distinction *cannot* be adequately sustained unless the privileging of genomic causal contributions to development can be justified over and against contextual causal contributions to development. And to do this it would need to be demonstrated that one kind of contribution to the causal system of development is more significant or important than the other. I argue that this cannot be demonstrated. Indeed my third objection is that one cannot justify the privileging of one kind of contribution to the causal system of development over and against the other.

3.3 Insufficient justification for privileging genomic contributions to the causal system of development

My third objection to the appeal to development justifying the normative assessment of living organisms is that it relies upon the privileging of genomic contributions over and against other kinds of contributions to the causal system of development, but this privileging cannot be justified.

The appeal to development claims that what should$_e$ occur is that which is preformed in the instructions in the genomes of living organisms. Clearly then it relies upon the privileging of genomic causal contributions to development over contextual ones because it is genomic contributions rather than anything else that specify what should$_e$ occur. However, I argue that there are at least three reasons derived from the facts of development which indicate that the privileging of genomic contributions over and against contextual contributions is not justified.

The first of these is that this privileging is not consistent with the acknowledged fact that the specification of what should$_e$ occur is the product of both genomic and contextual contributions to the developmental causal system. In other words, it is clear that the specification for what should$_e$ occur is the joint product of at least two necessary but insufficient kinds of contribution. The point is that one cannot objectively privilege one kind of contribution over the other since *both* are necessary, and therefore the implicit privileging of one over the other which occurs is not justified. Indeed, as I demonstrated in my second objection, the genome itself does not specify anything absent being embedded in a very particular context.

One might respond to this point by denying it and claiming instead that one can objectively privilege one kind of causal contribution to the causal system over the other. Take for example striking a match and it lighting. The natural answer to the question "What causes the ignition?" is "Striking the match." This is despite the fact that for ignition there needs to be sufficient atmospheric O_2 and a functional match (and for safety matches a suitable surface). Clearly, in this case there is some privileging of the striking contribution to the causal system over and against the other operational contributions.

My rejoinder to this privileging is to point out that the natural answer to the question is a pragmatic description—a short-hand explanation of the ignition in question. To be precise, the ignition involved many different contributions to the causal system which were necessary for ignition to occur in this case. These include: (1) sufficient atmospheric O_2; (2) heat source (striking); and (3) easily ignitable material. So did the O_2 cause the ignition? Yes, but in part, in conjunction with the other contributions. Did the easily ignitable material cause the ignition? Again yes, in conjunction with the other contributions. Finally, did striking the match cause the ignition? Yes, it did, but in conjunction with the other contributions to the causal system.

To explain the ignition one needs every element, but to use every element in an explanation is cumbersome.[20] While we might privilege one contribution to the causal system over and against the others in an explanation to simplify it; this simplification does not warrant privileging that contribution as the basis of specifying what should$_e$ occur. So I am not denying that in explanations of development there may be good reasons to highlight one contribution over the other. But I am claiming that these reasons do not warrant the privileging of one kind of contribution over another for specifying what should$_e$ occur. Take phenylketonuria (PKU) for example.

PKU is caused by a mutation in the gene for the enzyme phenylalanine hydroxlase—a key component in the metabolism of the amino acid phenylalanine. So essentially, PKU is the disease state caused by un-metabolized phenylalanine. Signs and symptoms include epilepsy, severe mental retardation, and behaviour problems in children, although the severity of these varies significantly.

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[20] Furthermore, this pragmatism is effectively subjective.

Classically, the disease is treated by abstaining from foods containing phenylalanine. So not surprisingly, PKU is the main example of the necessity of particular environments for some genetic diseases. Generally, the genetic mutation is given primary causal responsibility even though a particular environment is required. I admit that such an attribution seems obvious and natural because normally the presence of phenylalanine in the diet does not cause PKU. Yet clearly the genetic element in this case is only a necessary but not sufficient contribution, *like the environmental element.* So while it seems natural to highlight the genomic contribution over the contextual contributions to the disease, it does not follow that either kind of contribution ought to be privileged.

Indeed, in *any* known case, where one divides an account for a biological trait into genetic and environmental elements, one cannot state the genomic cause of a trait without implicitly stating the environmental causal context (or *vice versa*). *All* genomic causal contributions to a causal system rely on an environmental causal context. As Sarkar remarks,

> It has usually gone unnoticed that, before whether some feature is genetic can be determined, what must be agreed upon is what it means to call something "genetic." No technical result defines that term and, unfortunately, there is no easy way to define it. Resort to the usual philosophical strategies of definition – for instance, the introduction of genes as necessary or sufficient conditions for the features, or an appeal to genetic causation – is of little help. If it be suggested that a feature be called "genetic" if and only if some gene (or set of genes) is necessary for its genesis, virtually all organismic features would turn out to be genetic because of the simple fact that many genes that act during the earliest stages of embryonic development are always necessary for the continued development of the embryo. If it be suggested that a feature is "genetic" if and only if some gene (or set of genes) is sufficient for its genesis, nothing would turn out to be genetic because any gene can act only in suitable (biochemical or developmental) environments.[21]

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[21] Sahotra Sarkar, *Genetics and Reductionism* (Cambridge, 1998), 4.

This point tends to be forgotten because a minimal environmental causal context is generally assumed and placed without acknowledgement into the background.[22]

In the case of PKU we could argue that it is environmentally caused given a particular genetic causal context. In other words, we can say the presence of phenylalanine in the diet of human beings will cause PKU in the context of a mutation in the phenylalanine hydroxylase gene in the genome of a human being. Or we could equally argue that PKU is genetically caused given a particular environmental context. That is, we can say the presence of a mutation in phenylalanine hydroxlase gene in the genome of human beings in the context of the presence of phenylalanine in their diet will cause PKU.[23]

The second reason why the privileging of genomic causal contributions to development over and against contextual causal contributions is not justified is that such privileging is not consistent with the fact that control of development is distributed between genomic and contextual contributions. We could only privilege genomic contributions to development over environmental contributions if the former were solely responsible for the control of development.[24] That is, if genomic causal contributions provided the only organizational form and force for development. For instance, if they were the only means for organizing the assembly of the various components involved in development. But if both contribute then surely both have some responsibility.

On the other hand, the claim that genomic causal contributions to developmental systems specify development does have some *prima facie* plausibility. DNA specifies

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[22] See Gannett, "What's in a Cause?: The Pragmatic Dimensions of Genetic Explanations." for an excellent discussion of this point.
[23] Generally, only the latter locution is used, and genetic explanation is reified compared to environmental explanation.
[24] The reason one would privilege control of development is that this determines the outcome of the process.

RNA and RNA specify proteins which are the building blocks of the cell. Indeed, the Central Dogma of Molecular Biology which claims that information flows only one way from DNA to protein gives further credibility to the claim since information and thus control flows one way.

However, clearly genomic causal contributions to development are not solely responsible for the control of development. One can point to a number of examples of non-genomic control of development. For instance, bithorax mutants of *Drosophila* may be caused either by an environmental or a genomic contribution—respectively the introduction of the volatile liquid ether into the developmental environment, or a change in the DNA. Then there is the example of the determination of the sex of American Alligators already discussed. In fact, control of development is widely distributed between and within genomic and contextual contributions.

A possible rejoinder to these points is that the genome controls the majority of development in comparison to the environment. That is, one could also privilege genomic contributions to development over contextual contributions to development if the former were mostly responsible for the control of development. But this is not the case either. For instance, the evidence shows that the genome is controlled by the intra and extra-cellular environments it is embedded within.

The third and final reason why the privileging of genomic causal contributions to development over and against contextual contributions is not justified is that this privileging is not consistent with the fact that inheritance in development extends beyond the genome.

I admit that one could privilege genomic causal contributions to development over and against contextual contributions if only the former are inherited and thus significant in an evolutionary sense. Indeed, typically the only thing that is recognized in developmental and evolutionary biology as being heritable are genes. The reason why is well-stated by Dawkins:

> The special status of genetic factors is deserved for one reason only: genetic factors replicate themselves, blemishes and all, but non-genetic do not.[25]

It is in this process of replication, particularly the replication of genes between generations, that genes are heritable. The crux of heritability is that only entities with heritable traits are evolutionarily significant because only heritable traits are subject to natural selection and therefore the process of evolution. Indeed, because genes are the only entities that are typically recognised as being heritable, evolution is often defined in terms of changes of gene frequencies in populations.

However, it is not the case that only genes are inherited in development. At the beginning of development an organism inherits a number of variable developmental resources—both genetic and non-genetic. Indeed, most living organisms go to a great deal of effort to ensure their offspring inherit roughly the same developmental resources as they did. Salmon are the obvious example. Salmon go to a great deal of effort to breed and lay their eggs in the same part of the river they originated from.[26] Presumably, this is because the fact that the parent or parents have survived to reproduce is due, at least in part, to the specific developmental resources they received.

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[25] Richard Dawkins, *The Extended Phenotype : The Long Reach of the Gene* (Oxford ; New York, 1999), 99.
[26] The point is not affected by the fact that salmon are, in some sense, genetically programmed to go a particular part of the river. If Dawkins is correct, it is genes controlling the 'robot' Salmon body which go to a great deal of effort to ensure they are placed in a particular environmental context. The evolutionary logic is that if they have survived to reproduce then clearly the environment they were placed in was conducive to survival. Unless luck played a role of course.

So many different kinds of developmental resource are inherited in some sense from generation to generation in numerous cycles in that lineage of organisms. Commenting on this point, Griffiths and Gray note:

> Development frequently requires gravity or sunlight or, for a hermit crab, a supply of discarded shells from other species. These factors are unaffected by the activities of past generations of the species that rely on them. Nevertheless, the organism must position itself so that these factors interact with it and play their usual role in development. While the evolving lineage cannot make these resources, it can still make them part of its developmental system. It is uncontroversial to describe these resources as playing a role in development. [27]

Furthermore, genes are not the only resource for development that provides heritable variations within lineages. These are the variations needed for evolution to occur through natural selection. While it is true that genes provide heritable variations within lineages, it is also true that other developmental resources can also provide heritable variations. For example, a particular population of a species that lives in the same location from generation to generation inherits a particular relationship to the climate of that location, which in turn may have an effect upon development. However, over time, especially over considerable lengths of time, this climate is going to vary with consequences concomitant to the kind of contribution climate makes to development in this population of a species and their evolution. Furthermore, climates can vary between locations. Thus for different populations of the same species, there can be reliably perpetuated differences between the different populations in these places. For instance,

> Many nongenetic resources are reliably passed on across the generations. Variations in these resources can be passed on, causing changes in the life cycle of the next generation. It is still more puzzling to find many of these very phenomena discussed, and their evolutionary significance recognised [in the light of the popular view that only genetic factors are inherited and of evolutionary significance] ... [28]

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[27] Griffiths and Gray, "Darwinism and Developmental Systems," 196.
[28] Griffiths and Gray, "Darwinism and Developmental Systems," 196.

Or to take another example, virtually all adult mice that live in the London Underground have stumpy tails.[29]. No doubt this is due to the environmental exigencies of life in the Underground, where there are many opportunities to reduce tail length by accident. The point of course is that these environmental exigencies are reliably inherited in these mice's life cycle.[30] In other words, these exigencies are a consistent part of Underground mice from generation to generation, and will be for as long as the trains run on the Underground.

At the outset of development underground mice both inherit a genome and an environment. *Both* are reliably present in successive generations and explain (at least in part) why each generation resembles the previous one. *Both* reliably affect development. Tails are reliably amputated by the environment. Coat colour is reliably determined according to genetic specification.

One might reply to this point by noting that non-genomic developmental resources are not selected themselves and so are not subject to evolution. Consequently we could privilege genomic developmental resources on the basis that only they are subject to evolution in contrast to non-genomic developmental resources. I suppose we could privilege genomic resources on this basis. However, it does not follow from the fact that non-genomic developmental resources are not selected themselves and are not subject to evolution by natural selection that they are insignificant biologically (or indeed to the

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[29] The example is inspired and partly drawn from Susan Oyama, *The Ontogeny of Information*, 2nd ed. (2000), 46-48.

[30] I realise that 'reliable' and London Underground do not sit comfortably together. Perhaps better would be 'reliable enough' to cause stumpy tails in all adult mice living in the Underground. My point is that the concept of inheritance can be applied to any cause in development which is reliably present in successive generations which explains in part why each generation resembles the previous one. See Griffiths and Gray, "Darwinism and Developmental Systems," 196.

process of evolution). Broadly, any developmental resource that affects the fitness of an organism from generation to generation is significant in evolution, especially the evolution of that organism. And clearly, non-selected non-genomic developmental resources affect the fitness of organisms. The climate is one such example.

3.4 A radical epigeneticism

My fourth objection to the appeal to ontogeny to justify the normative assessment of living organisms is that development is radically epigenetic. Or in other words, my objection is that there is no preformation in the development of living organisms. Consequently, there is no way to sustain the Normative Distinction since it is some preformed element—the genome—which specifies what should$_e$ occur in contrast to what occurs or may occur. It differs significantly from my other objections in that it rejects the present consensus view on how development is to be explained. So it is likely to be contentious.

I ought to note that my argument against the appeal to ontogeny does not depend upon this objection. I take it that the appeal to ontogeny fails if any of my three previous objections are correct. However, I discuss and consider radical epigeneticism because I happen to believe it is true. Moreover, while it is a minority and contentious view within developmental biology—the textbooks on the subject do not even discuss it—it does have considerable standing in the philosophy of science literature, particularly in the guise of Developmental Systems Theory (DST).

The radical epigeneticism I discuss and advocate here has its origins in the book *The Ontogeny of Information*, written by the philosopher of biology Susan Oyama.[31] This is

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[31] Oyama, *The Ontogeny of Information*.

intended as a contribution to the debate over whether the development of human nature is largely due to nature or nurture, genes or environmental, biology or culture etc.

Her advocacy of a radical epigenetic account of development as a contribution to the debate over the development of human nature ought not to be surprising. I noted the connections between the explanation of development and the debates concerning the explanation of human nature above. First, the idea that development is explained by preformed instructions in genes neatly parallels the claim that human traits are explained by instructions in genes, which exist at the beginning of human development. Second, the idea that development is explained by epigenetic assembly is close to the idea that human traits are explained by interactions with the environment. And finally, the modern consensus explanation of development mirrors the modern consensus explanation of human nature. Development is explained by both epigenesis and preformation. Likewise, human nature is explained by genes and the environment, nature and nurture.

However, as I have already noted, it is generally accepted that development is caused by *both* nature and nurture—preformation and epigenesis. Moreover, the claim that development and human nature is explained by both nature and nurture seems to be obviously true. Consequently, one ought to ask, why does Oyama reject this view?

In short, Oyama rejects this view because she has an objection to preformationism. Specifically she has an objection to preformationism because it implies an ontology which separates form and matter, and advocates the idea that form precedes instantiation in organisms.[32]

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[32] Oyama, *The Ontogeny of Information*, 1.

So rather than preformation explaining how form comes about in the organism, she proposes that epigenesis explains it. This is made clear in the following. She states:

> ... it is ontogenesis, the inherently orderly but contingent coming into being, that expresses what is essential about the emergence of pattern and form without trapping us in infinite cognitive regress (where was the pattern before it got here?). A proper view of ontogeny, however, that doesn't simply resolve into one of the old ones, requires that the idea of ontogenesis not only apply to bodies and minds, but to information, plans, and all the other cognitive-causal entities ... [33]

The cognitive-causal entities that Oyama refers to are entities that impart design and function to material. Examples include information, plans, or programmes, and in the context of living organisms, genes are exemplars *par excellence*. As she notes,

> The discovery of DNA and its confirmation of a gene theory that had long been in search of its material agent offered an enormously attractive apparent solution to the puzzle of the origin and perpetuation of living form. A material object housed in every part of the organism, the gene seemed to bridge the gap between inert matter and design; in fact, genetic *information*, by virtue of the meanings of *in-formation* as "shaping" and as "animating," promised to supply just the cognitive and causal functions needed to make a heap of chemicals into a being.[34]

Clearly, the intuition behind the idea that genes are cognitive-causal entities is the preformationist one, where material objects require design and function to be imparted to them because they are separate from material and exist prior to any embodiment (in material).

In place of preformation, Oyama argues that epigenesis is applicable to these cognitive causal entities, such as genes. This means that

> Developmental information itself, in other words, has a developmental history. It neither pre-exists its operations nor arises from random disorder. It is neither necessary, in an ultimate sense, nor a function of pure chance, though contingency and variation to its formation and function. Information is a difference that makes a difference (G. Bateson,

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[33] Oyama, *The Ontogeny of Information*, 3.
[34] Oyama, *The Ontogeny of Information*, 14.

> 1972, p. 315), and what it "does" or what it means is thus dependent on what is already in place and what alternatives are being distinguished.[35]

So for instance, information about an organism's form comes to exist *in* the process of development rather than being prior to it. Regarding this point, Oyama claims:

> It is my contention that developmental information does "develop," not by special creation from nothing, but always from the conditional transformation of prior structure—that is by ontogenetic processes. Depending on the level of analysis, such transformation can be described as resulting from interactions *among* entities, such as cells or organisms, or from interactions *within* an entity, such as an embryo or family. Since sets of interactants can be at least partially nested, a change in focus is sufficient to shift from one perspective to the next.[36]

So while it is true that information exists at every point in development it is not pre-existing information *for* a particular form, although in retrospect it would appear that way.

Therefore, in claiming that sources of form, such as developmental information, do not pre-exist their operations, Oyama rejects the preformationist assumptions concerning the origin of form in organisms. If sources of form do not exist before their operations then there is no prior instance of the form to explain the subsequent form in the organism. In other words, what Oyama is rejecting is the idea for instance that there is a blueprint or plan in acorns for causing adult oak trees. Whatever 'form' there is only comes to be *in* and *after* the processes of development.

Essentially, Oyama's claim is that it is epigenesis all the way down—even to the level of information. Consequently, if her ontogeny of information thesis is correct, then there is no place for preformation within development at any level, including the genetic where it currently resides.

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[35] Oyama, *The Ontogeny of Information*, 3. In text citation: G. Bateson, *Steps towards and ecology of the mind* (New York, 1972).
[36] Oyama, *The Ontogeny of Information*, 4.

However, the significant point is that, if Oyama is correct, it would mean we could not appeal to development to justify the normative assessment of living organisms. This is because there could be no developmental outcome that should$_e$ occur in contrast to what actually does occur. For instance, the natural sciences could not appeal to development to justify the normative assessment "Porky the new-born piglet is defective," where she is born with one eye, two legs, and no tail. This is because if she is right, there is no preformed information for Porky being born with two eyes, four legs, and a tail. Information on Oyama's account only comes to be in the process of development, but not prior to it. Consequently, one cannot ascertain what should$_e$ occur in development and the Normative Distinction cannot be sustained.

Given that this or any radical epigeneticism is opposed to the modern consensus view why ought we consider it? As noted above, while it is a minority view with developmental biology, such views are gaining traction, particularly in the philosophy of biology. For instance, Developmental Systems Theory (DST) is in the forefront of philosophical debate concerning development.

DST builds upon, expands, and advances Oyama's work in the *Ontogeny of Information*, and she is a central figure within it. DST is an alternative to orthodox general theoretical frameworks on development, heredity, and evolution. It has been built from a wide range of theoretical and practical disciplinary perspectives, which include animal behaviour and psychobiology, genetics, developmental biology, and molecular biology.[37] Moreover, it cannot be identified with a single person or within a single school of thought,

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[37] See n.3 Susan Oyama, Paul E. Griffiths, and Russell D. Gray, "Introduction: What Is Developmental Systems Theory?," in *Cycles of Contingency*, ed. Susan Oyama, Paul E. Griffiths, and Russell D. Gray (Cambridge, Massachusetts, 2001), 9. for references

notwithstanding its connection to Oyama's work.[38] Furthermore, DST and developmental systems theorists draw on work and thinkers who would not be considered or consider themselves to be part of the movement.[39]

However, the main reason I believe one ought to accept a radical epigenetic account of development, such as DST, is that it provides a better explanation of development than the present orthodoxy. That is, I contend that DST provides explanations which are better representations of what is going on in development—better in the sense of being more truthful. For example, in orthodox theories traits are thought to be the joint product of *two* kinds of developmental causal contributions—typically classified as genomic (or genetic) and environmental contributions. Part of the rationale for this division is that genomic or genetic causal contributions are heritable but environmental contributions are not. Yet as I have shown this is rationale is not correct. Furthermore, such a classification is crude. For instance, it does not acknowledge the multiple kinds of environmental contributions operating in developing systems at different times and at different levels of abstraction. DST recognizes these points. It recognizes that environmental traits may be heritable, and it eschews this division between gene/genome and environment. Indeed, it insists that traits have multiple contributions from *many* developmental resources, and that these can be classified and thought of in a number of ways.

This said, even if one is unconvinced that a radical epigenetic account of development is correct, I take it that the other three objections provide sufficient reasons to deny that the natural sciences may appeal to development to justify the normative assessment of living organisms.

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[38] Oyama, Griffiths, and Gray, "Introduction: What Is Developmental Systems Theory?," 2.
[39] Susan Oyama, Paul E. Griffiths, and Russell D. Gray, eds., *Cycles of Contingency* (Cambridge, Massachusetts, 2001).

4. Conclusion

The appeal to development to justify the normative assessment of living organisms in essence is the appeal to the causal system responsible for development to sustain the Normative Distinction. In the course of this chapter I have argued that such an appeal fails for four reasons.

The first is that the appeal as it stands justifies unintuitive normative evaluations. If we accept the appeal to development as it stands, then we are forced to justify unintuitive normative assessments such as "Porky the piglet should$_e$ be born with one eye, one ear, and no curly tail," if this is what the preformed instructions specify should$_e$ occur. Consequently, it seems to me that there is something seriously amiss with this appeal. Therefore, either we are forced to give up on our intuitions surrounding normative assessment, or we ought to reject the appeal as being unsatisfactory.

The second reason the appeal to development fails is because what is held to be preformed alone does not specify what should$_e$ occur and thus sustain the Normative Distinction. The appeal to development to justify normative assessments assumes that what is preformed in the genome is sufficient to specify what should$_e$ occur. In other words, it assumes that one can determine from the genome alone what is preformed and therefore what should$_e$ occur. However, this is false.

The meaning of the genome is determined by both the genome and the environments it is embedded in, and the interaction between them. That is, we cannot say what is preformed in the genome without also specifying the contexts it is part of and how they interact. For example, we cannot say what sex is preformed in the genome of the American

Alligator because this requires a specific interaction between the genome and the environment during the middle third of embryonic development.

The problem with this is that it effectively dissolves the Normative Distinction. This is because drawing upon the genome and the environments it is embedded in, and the interactions between them to specify what should$_e$ occur, means there is no distinction between what should$_e$ occur and what actually does occur. The interaction between the genome and the environments it is embedded in within development is the operation of the causal order. It determines what occurs.

My opponents might respond by saying "I agree that it is not that the genome alone that specifies what should$_e$ occur in development, but the genome in a specific environment." For instance, this could be the typical or historical environment. But the developmental system is the genome in a specific environment. Consequently, specifying the genome and environment determines the outcome of the developmental system, which in turn effectively begs the question concerning what should$_e$ occur.

One might escape this charge if one could justify a particular environment over and against the alternatives. For instance, the ancestral environment is one obvious contender. Yet if my objections to the appeal to history are correct then the choice of this environment is not justified over and against the alternatives. Moreover, to assume the ancestral environment without justification begs the question concerning what should$_e$ occur.

The third reason the appeal to development fails is because the necessary privileging of genomic contributions to a developmental causal system to sustain the Normative Distinction obviously cannot be justified. As it stands, the appeal relies upon privileging

genomic contributions to sustain the Normative Distinction. This is because the Normative Distinction dissolves if other kinds of contributions are also involved in specifying what should$_e$ occur. That is, if both genomic and other kinds of contribution were involved in specifying what should$_e$ occur, then there would be no difference between what should$_e$ occur and what occurs or may occur. Yet clearly, development is caused by both the genomic and the environmental contributions.

Moreover, there is also no objective justification for privileging any kind of contribution over another. This is apparent particularly in the fact that every contribution in development is necessary but insufficient for its effects. The evident privileging is purely pragmatic.

The fourth and final reason the appeal fails is that the present consensus account of development is arguably false. That is the model that development is preformed in the genes and instantiated epigentically is incorrect. Rather every aspect of development, including information occurs via epigenetic processes. If correct, the appeal fails because development cannot sustain the Normative Distinction.

Chapter 6: Why the appeal to species does not work

1. Introduction

The claim I am going to defend in this chapter is that the natural sciences cannot justify the normative assessment of living organisms by an appeal to species concepts. In other words, I argue that the natural sciences cannot appeal to the fact that living organisms belong to a particular species to justify normative assessments.

I realise this is a bold claim. The appeal to some kind of species concept to justify the normative assessment of living organisms is pervasive in human discourse. Indeed, arguably, the most common kind of normative assessment is a comparison between a token living organism and a species type. For instance, take my standard normative assessment "Porky the piglet is defective [because she was born with one eye, one ear, and no curly tail]." The most natural way to read this is as a comparison between Porky and some kind of set designated by the term 'piglet'.

What underpins such assessments are some supposed relationships between the token and type such that the token should$_e$ have the pertinent characteristics of the type. In the case of Porky, it is supposed that there is a relationship between Porky and her species such that Porky should$_e$ have the characteristics of the species. Specifically, she should$_e$ have two eyes, two ears, and a curly tail.

Yet despite the fact that such appeals to species are common, I maintain that they ultimately fail. Broadly I argue they fail because there is at least one of four objections which may be levelled at this appeal. These are as follows:

Objection #1: The implicit or explicit ontology of the natural sciences is incompatible with the species concept being appealed to.

Consequently, one cannot appeal to such notions of the concept on pain of ontological incoherence.

Objection #2: There are many different concepts of species, but no single concept of function can be objectively justified over and against the alternatives. Consequently, there are many different even contradictory normative assessments which are justified by an appeal to the concept of species.

Objection #3: For some concepts of species there are various parameters which require some specification but no specification can be objectively justified over and against alternatives. So there are many different and even contradictory normative assessments which are equally justified by an appeal to such concepts of species.

Objection #4: The species concept being appealed to is not normative. Therefore, one cannot appeal to such concepts to justify normative assessments of living organisms.

Of course, these objections are essentially the same as the objections levelled against the appeal to functions. So again, together, these objections amount to the claim that presently at least there is no tenable appeal to species which adequately justifies the normative assessment of living organisms.[40] By now, these objections should be extremely familiar and perhaps deserving of some labels. We could respectively call them the: 1. Incompatibility Objection; 2. The Pluralism Objection; 3. The Parameter Objection; and 4. The Normative Objection.

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[40] There may be some account of species that is compatible with a proposed ontology of the natural sciences that is normative and provides a single set of determinate and coherent normative evaluations which I am unaware of. This is a limitation of my thesis.

I ought to note that while the appeal to species is closely akin to the appeal to phylogeny they are not the same. Phylogeny is typically understood as the process of the development of species of living organisms through time.[41] So the appeal to phylogeny is the appeal to the *processes* which bring species into existence. In contrast, the appeal to species is the appeal to the consequences of these processes. This said I do in effect examine the appeal to phylogeny because there are concepts of species based upon phylogeny. Not surprisingly, I argue that the appeal to phylogeny fails too to justify the normative assessment of living organisms.

2. Species Concepts

As noted in the introduction, the appeal to species in the normative assessment of living organisms is pervasive.[42] However, it is not apparent that such appeals are ambiguous. This is because the concept and its use in discourses are extremely diverse, especially in scientific discourse. For instance, in scientific discourse species are conceived in terms of sets, classes, individuals, and relations.

So there are at least four basically different ways of thinking about the ontology of species.[43] This means that without clarification an appeal to species could be an appeal to a number of very different notions. So here is an overview of the different ways species are conceived. I ought to note that my discussion is not intended to provide a full and complete

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[41] It is usually contrasted with ontogeny. The point is to highlight that the development of living organisms occurs at different levels over time. To simplify, the latter is at an individual level, whereas the former is at some kind of corporate level.

[42] At the outset, I wish to acknowledge my debt to David N. Stamos' work *The Species Problem* in the following discussion of concepts of species. As we shall see, the concept is a complicated one, and I have benefited immensely from the map of the territory he provides. Indeed, I am sympathetic to his account and argument in the book for the view that species are real complex biosimilarity relations, although *pace* Stamos, I would contend that species and the concept species are plural, and reject his arguments that they are not.

[43] David N. Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology* (Lexington, 2003), 285.

description of the various ways species are conceived. For instance, I do not discuss every species concept which falls under the categories below. Nor is it intended to criticize or justify any particular conception of species.

2.1 Species Nominalism

Species nominalism is the claim that "... biological species are not real, that they have no objective reality outside the mind, that they are ultimately arbitrary, man-made groupings of individual organisms conventionally bracketed together by general names for the purpose of linguistic convenience."[44]

Apparently, it is not a popular view of species in either scientific or ordinary discourse. For instance, moral claims to preserve particular species, or to institute particular species-specific welfare practices are not generally thought to be based on some figment of human imagination. I suggest that this is because the intent and belief behind most appeals to species are intended as appeals to real entities.[45]

Yet species nominalism needs to be considered despite its unpopularity. Stamos suggests there are at least four reasons why it ought to be. The first one he proposes is that one cannot observe a species—only purported examples of members of species.[46] In other words, he suggests that we cannot directly observe a type, only ostensible tokens of a type. That is, one cannot say for certain that what is being observed genuinely is a token of some type unless one begs the question concerning the reality of the type.

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[44] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 31.
[45] This is irrespective of whether the intention and belief is ultimately justifiable.
[46] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 31.

The second reason is that species realists have come up with a number of different and incompatible theories of what species are.[47] Evidently, they cannot agree which one is correct, or true, and how to resolve the disagreement, and even the contradictions between them.

However, arguing from "We cannot agree about X" to "There is not viable concept of X" is not a strong argument. One side of the argument could be wrong and as yet this cannot be determined. Furthermore, while the failure to justify a particular real species concept provides at least *prima facie* evidence that species are not real, it is not the only possible inference. For instance, they could be real and plural. If this is the case, they have no tenable means to objectively resolve disagreements between them. This is significant because then the appeal to species could equally justify contradictory normative assessments. For instance, where the appeal to species concept S_1 justifies normative assessment A, and appeal to species concept S_2 justifies normative assessment not-A.

The third reason why species nominalism ought to be considered is that ontologically it is the most parsimonious solution to the problem of the nature of species.[48] Of course, this assumes that parsimony is desirable, and typically it is, given Occam's Razor. Yet one ought to be careful to note that Occam's point is that entities ought not be multiplied beyond what is necessary to explain. It certainly is not the case that the simplest possible ontology is always the correct one.

The final reason why species nominalism ought to be considered is that it is a position which a few people have adopted.[49] They have reasons for doing so which are at least

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[47] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 31.
[48] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 31.
[49] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 31.

plausible *prima facie*, and thus this view needs to be considered, despite the fact species nominalists are apparently in the minority. Examples of species nominalists within the sciences of biology include: J. S. L. Gilmour, Benjamin Burma, and Alan Shaw.[50]

2.2 Species as Classes

Classes are real objective abstractions of various kinds.[51] However, given that the term 'class' may be understood in a number of ways, I take it that it is important to briefly describe what I mean when I use the term. When I use 'class', I am referring to an intensionally defined or conceived abstraction. For instance, the class PIG defined by 'the animals in Farmer Brown's North Field' is intensionally conceived. In the world I am referring to, presently these are the four sows: Porky, Bacon, Brawn, and Trotters. Last year there were four sows: Grunt, Squeek, Squeal, and Snort. The class is abstract in the sense that its constitution is independent of particular animals. That is it does not matter who or how many pigs live in Farmer Brown's North Field. Yet the class is still real—at least as long as Farmer Brown's field exists.

In contrast, when I use 'set' I am referring to extensionally defined objects—collections—which by nature are concrete or particular. For instance, the set PIG this year are the individuals Porky, Bacon, Brawn, and Trotters. And the set PIG last year are the individuals Grunt, Squeek, and Snort. So the set PIG has changed between this year and last year. Probably the most important difference between sets and classes on this view of these concepts is that the latter must have common (nontrivial) properties in common, whereas, the former may, but need not. In other words, a set may be an arbitrary collection of objects, but a class cannot be.

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[50] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 74-97.
[51] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 99.

There have been a number of different kinds of class which have been proposed to account for the species concept. These include: species as elementary classes (of some sort); species as cluster classes; and even species as abstract classes, such as ecological niches.

Species as defined by a common genetic essence is an example of a species as an elementary class. The idea in this case is that species are defined according to a set of common genetic properties which every member shares. So an individual organism is a member of a particular species because it shares the requisite genetic properties or properties with all other members.

Another example of a class used to define a species concept are cluster classes. They differ from essential genetic classes in that they are, as Stamos puts it, "loosely essentialistic." While there is a criterion which defines the class, there is no single property or a set of properties from the criterion, which is necessary or sufficient for membership. All that is required to be a member is possession of certain properties or sets of properties, within the set, which fulfil some minimum quorum. For instance, consider a set of organisms O, which potentially may have the following properties: (a, b, c, d, e, f, g) with a minimum quorum of four properties. E.g. O: $O_1 = (a, b, c, d, g)$; $O_2 = (a, b, c, e)$; $O_3 = (c, d, e, f)$; $O_4 = (a, c, e, f, g)$; $O_5 = (a, c, d, e, g)$; $O_6 = (b, e, f, g)$. There are no properties or single set of properties common to all yet there are various clusters of shared properties such as a and c.

Finally, we come to the notion of species as abstract classes defined by ecological niche. That is, a particular ecological niche defines a particular species, notwithstanding that there may be significant morphological and or behavioural differences between

individual living organisms which occupy the same niche. Take for instance, the apex predator ecological niche. An apex predator is the predator at the top of a particular food chain. In essence, apex predators are organisms which are not preyed upon in their adult form. In other words, no other kind of living organism hunts apex predators as their primary source of food, although apex predators may kill each other for other reasons. Examples include, Lions, Tigers, Great White Sharks, Killer Whales, Crocodiles, Alligators, Pythons, Boa Constrictors, and Eagles.[52]

Niches are abstractions in the sense they are not constituted by their members at any point in time. That is they designate collections of individuals which change over time, but while membership changes, the niche itself does not change. For instance, over evolutionary time, apex predators have changed significantly, but the niche itself has not. For instance, once upon a time, an apex predator upon land was *Tyrannosaurus Rex*, whereas today an apex predator is *Panthera leo*.

Moreover, interestingly, I believe a case can be made for the view that Foot's *life form* concept in *Natural Goodness* is a kind of abstract class very much akin to an ecological niche.[53] Specifically, life forms are abstractions precisely in the same way ecological niches are abstractions. That is, they are not constituted by their members at any point in time. In other words, while membership of the life form changes over time, the life form itself does not change. Moreover, the propositions which describe niches such as 'apex predator' are logically unquantifiable in precisely the same way as the propositions which

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[52] Occasionally, different apex predators do try and turn another apex predator into a meal, but this is rare, probably because it is so dangerous and in the long-term damaging to fitness. For instance, where there is a long association of apex predators they tend to move in different circles even if they prey on the same animals. E.g. Killer Whales and Great White Sharks. However, where there is a more recent association the attempts are more common. E.g. non-native Boa Constrictors released in the Florida Everglades are known to try and kill Alligators, who are the native apex predator. Unfortunately, for Boa Constrictors at least, success is often fatal.

[53] Foot, *Natural Goodness*, especially Chap. 2 pp. 25-37.

describe life forms are unquantifiable: they do not speak of individuals, although they can; nor do they predicate something that is true of every apex predator. For instance, apex predators do not have predators predating upon them, but Allie the Alligator was predated by Peter the Python. Furthermore, in order to understand niches one must also understand the particular context of the niche. In other words, we cannot understand any particular apex predator unless we know something of its natural history. This parallels Foot's claim that in order to understand the propositions which define life forms one needs to look at the context, or in Thompson's terms, the originator of the concept of life form, "... the natural-history account of the *life form* or species: of how creatures of this kind live."[54] Now if these similarities bear up, I believe a good case can be made for the notion that the life form can be understood in terms of the natural sciences.

2.3 Species as Individuals

The origin of the conception of a species as individuals is attributed to Michael Ghiselin's 1966 paper 'On Psychologism in the Logic of Taxonomic Controversies', which appeared in *Systematic Zoology*.[55] Yet, it is his 1974 paper, 'A Radical Solution to the Species Problem' that initiated the movement.[56] But as Stamos notes, Ghiselin does not claim that his view is original; rather he claims that all he has done is made explicit what biologists and naturalists have held implicitly in their practice and writings for some two hundred years.[57]

Although Ghiselin is credited with originating the conception, the view is also normally linked to its other principle proponent: the philosopher of biology David Hull.

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[54] Foot, *Natural Goodness*, 28.
[55] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 181. See: Michael T. Ghiselin, "On Psychologism in the Logic of Taxonomic Controversies," *Systematic Zoology* 15 (1966).
[56] Michael T. Ghiselin, "A Radical Solution to the Species Problem," *Systematic Zoology* 23 (1974). It is this paper that is most commonly cited in relation to the origin of the species as individuals view.
[57] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 181.

Indeed, his first papers on the subject, 'Are Species Really Individuals?' and 'A Matter of Individuality', published respectively in 1976 and 1978 in *Systematic Zoology* and the *Philosophy of Science*, are usually cited in conjunction with Ghiselen's 1974 article, when the view is discussed.[58]

Interestingly, this view of species is presently the predominant one within the sciences of biology. This is despite the fact it is a radical departure from how species hitherto typically have been conceived within human discourses. That is, the 'species as individual' conception of species differs quite significantly from common intuitions concerning species. Take the following case. In the 24th century, humanity discovers complex life on another planet in the universe. Amazingly they have pigs. That is they have organisms that in every respect have the same properties as the species *Sus scrofa*, except they originated on another planet. What species name would we give them? I take it that if we asked everyday folks on the street what scientific name they would give them they would name them *Sus scrofa* too, perhaps adding another name to distinguish their origin—i.e. *Sus scrofa alienus*. But according to the species as individual view, these pigs from another species would be an entirely different species because they are from a separate evolutionary lineage. They would give an entirely different name. Indeed we can see this in cases where animals are discovered in different ecosystems which look like and or play a similar role to already known animals. Take for instance, the discovery of the American robin after the European robin. While they look similar they are unrelated which is reflected in their scientific names *Turdus migratorius* and *Erithacus rubecula* respectively.

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[58] David L. Hull, "Are Species Really Individuals?," *Systematic Zoology* 25 (1976), David L. Hull, "A Matter of Individuality," *Philosophy of Science* 45 (1978).

Or take this example. *Tyrannosaurus Rex* went extinct some 65 million years ago. However, say in the future, by natural or artificial means, organisms evolved such that they have (as far as can be ascertained) exactly the same characteristics as *T. rex* did some 65 million years ago. What species name would we give them? I believe if we asked everyday folks on the street what scientific name to name them, they would name them *T. rex*. But according to the species as individual view, these organisms would need to be called something different.

The alien pig and the new *T. rex* would need to be named differently on the species as individuals view because species identity is maintained through descent. That is members of species are identified as belonging to the same species where they can trace unbroken ancestor-descendant relations. So when these relations fail species die and the identity is extinguished. Or when they have never been, perforce, they are separate identities. Moreover, the identity relation is largely independently of the characteristics they happen to exhibit: the important element is that members share unbroken ancestor-descendant relations.

2.4 Species as Relations

Conceiving species as relations of a particular kind is not new. Indeed, one of the main species concepts in biology, the biological species concept, is conceived in terms of a particular kind of relationship between living organisms—namely, interbreeding. Specifically, Mark Ridley, author of the classic textbook *Evolution*, says:

> The *biological species concept* defines species in terms of interbreeding. Mayr (1963), for instance defined a species as follows: "species are groups of interbreeding natural populations that are reproductively isolated from other such groups." The expression "reproductively isolated" means that members of the species do not interbreed with

> members of other species, because they have some attributes that prevent interbreeding [Italics in original].[59]

However, the 'species as relations' conception of species is new within the literature. It is proposed by David L. Stamos in his *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*—a book this chapter is indebted to.[60] While Stamos's account is not widely considered, I believe it ought to be discussed because it raises many interesting issues. While it can be seen as a development of the biological species concept, the genesis of Stamos' account derives from philosophical, specifically metaphysical considerations.

The bases of Stamos' conception of 'species as relations' are, drawing upon Russell, the following claims concerning the ontology of the world.[61] First, traditionally, everything falls into one of two general categories: universals and particulars. Secondly, if something does not fall into either category, it is not real. Thirdly, the universals category is dichotomous: on one hand *qualities* or *properties*, and on the other hand *relations*.

Following these claims, Stamos suggests that hitherto proposed solutions to the question of the ontology of species have argued: (1) species are not real; (2) species are particulars; and (3) species are universals *qua* instantiating particular qualities or properties.[62] He says that missing from the range of possibilities given by these claims concerning the metaphysics of the world was the view that species are universals *qua* relation(s). For instance,

> No one, as far as I know, including Russell, ever focused on the other universals category. In other words, no one ever emphasized relations in

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[59] Mark Ridley, *Evolution*, 3rd ed. (Oxford, New York, 2004), 351.
[60] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 285.
[61] The plausibility of Stamos' initial case depends on whether one accepts his characterization of ontology. There is no reason to challenge it for or my purposes of describing the different kinds of species concept within the literature.
[62] These correspond to the three different kinds of species conception discussed above.

> the ontology of species. This seems to me a possible fourth paradigm, one with potentially fruitful consequences, which ought to be explored.[63]

The reason he suggests for this failure to explore an obvious avenue to solve the species problem prior to his work is a certain prejudice of history.[64] Whether he is correct, or not, is beside the point. Evidently, this avenue has not been explored in the literature.

What is significant for Stamos is that relations have a different ontology compared to classes and concrete particulars. He claims that relations "... constitute a sort of hybrid category, neither abstract nor concrete, but a fusion of both."[65] For instance, where a relation exists between two physical entities, the relation is not just its relata (the two individual physical entities) but something more.

However, as it stands the claim that species are relations is imprecise since there are different kinds of relations. So again drawing upon Russell, Stamos describes the distinction between internal and external relations to further develop his conception of species. To summarize, a relation is internal if a change in the relation entails an intrinsic change in the character of at least one of the relata, and it is external if the character of any of the relata does not entail any intrinsic change. For instance *below* is an example of an external relation since there is no impact in the intrinsic character(s) of *a* and *b* where *a* is below *b* or *b* is below *a*. On the other hand, *difference* is an example of an internal relation because changes in difference relations between *a* and *b* entail changes in the intrinsic character(s) of either *a* or *b*.

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[63] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 288-289.
[64] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 289.
[65] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 289.

Stamos argues that the relations in the 'species as relations' conception are internal. Specifically, he claims that "... species words denote a type of relation ...and if species are a type of relation, then they must be internal relations." Furthermore, the relations included go beyond similarity relations to incorporate what he calls "appropriate polymorphic relations", which include, "...mating relations, ontogenetic relations, and sociomorphic relations"—the latter being the internal relations between members of different castes in social insects.[66] So it is more accurate to call the 'species as relations' concept the 'species as relation complexes' concept—a point that Stamos makes himself in a discussion of a misinterpretation of his view. He says "... I ultimately made it clear that I though of species as *relation complexes*, composed both of organisms and various internal relations between them."[67]

It is this point which helps distinguish Stamos' view from others, notably, the biological species view. This is a kind of relational view because it holds that species are interbreeding populations. It is an interbreeding relation which defines the species on this view. Interestingly, *pace* many biologists who use this concept of species, Stamos argues that it is not sufficient to group organisms into species and delimit them from one another because it is only a single kind of relation.[68] For instance, there are many populations, which one would group as belonging to the same species, which have the potential to interbreed, but do not actually do so. Moreover, this conception of species is manifestly unsuited to asexual organisms since on this view asexual organisms cannot be members of a species.

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[66] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 291.
[67] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 292.
[68] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 293.

I take it that the critical issue is what relations ought to be included in the relation complex. Stamos discusses a number including; (1) nurturing relations; (2) ecological relations; and (3) similarity relations. Ultimately, he articulates a conception of species which he calls species as biosimilarity complexes, which may involve elements of each. He describes this notion of species as follows:

> A species is a primarily horizontal, all the while dynamic, phenotypic similarity complex of organisms objectively and maximally delimited by causal relations, in the case of sexual organisms mainly interbreeding, ecological, ontogenetic, and possibly social and sociomorphic relations, and in the case of asexual organisms mainly ecological, possibly gene transfer, and possibly social (e.g., colony formation) relations.[69]

We have seen then that there are several different species concepts which might be employed within the natural sciences. Consequently, one could argue that *prima facie* any of these different kinds of species concepts could be used to justify the normative assessment of living organisms.

However, I argue that all these different kinds of species concepts are vulnerable to one or more of the following objections which mean that we cannot rightly appeal to them to justify the normative assessment of living organisms.

3. Objections

3.1 Objection #1: There are appeals to species which are incompatible with the natural sciences: The Incompatibility Objection

The Incompatibility Objection in this case is that if concepts of species are or are thought to be ontologically incompatible with the natural sciences, then we cannot appeal to them to justify the normative assessment of living organisms—at least, not if we are in the

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[69] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 297.

business of showing how we might appeal to the natural sciences to justify evaluative claims. For instance, if the view of the natural sciences was that species are real entities then we could not appeal to species concepts which have a nominal ontology (and vice versa).[70] So minimally, this objection delimits the space of possible species concepts to consider.

However, the objection is flawed for at least two good reasons. The first and foremost one is that clearly there are some species concepts which are compatible with the natural sciences. For example, the species as individual view derives directly from the theory of evolution by natural selection. Consequently, the objection can be easily met.

The second reason the objection is limited is that the obvious examples of incompatibility between concepts of species and the natural sciences are, arguably, not in fact incompatible. For instance, Platonic and Aristotelian concepts of species are thought to be incompatible with the natural sciences, but arguably they are not.

According to Plato, species (or the Forms) are not physical—rather they are a peculiar kind of abstract object.[71] They are fixed and eternal. That is, they do not evolve. Species membership is constituted by resemblance to a Form.

This concept of species is thought to be incompatible with the natural sciences because species *qua* Forms are fixed and eternal and do not evolve. This apparently contradicts the

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[70] However, I should note that the ontology of the natural sciences is disputed and or disputable. Certainly, the majority of those in the natural sciences (without philosophical reflection and or training) believe that the entities they study are real. And (without concrete data) my impression is that most philosophers of science are realists of some stripe (as am I). Yet I believe contemporary scientific practice and knowledge is compatible with a nominalist ontology being the case. This is despite the fact I believe it is a false view because most of the complaints of the nominalists are resolved if one is a promiscuous realist (as I am).

[71] Arguably, Plato's forms are not abstractions as this notion is typically understood. In a sense, the so-called particular world is a world abstracted from the Forms. On Plato's view, as I understand it, physicality is abstract or not (fully) real, or as fully real as the Forms.

central explanatory theory of biology: evolution by natural selection, which largely explains why Platonic conceptions of species are generally not taken very seriously within the sciences of biology.[72]

One could also make a similar case for Aristotle's or Aristotelian conceptions of species. For instance, the philosopher and scholar of Aristotle, James G. Lennox remarks "Aristotle is often characterized, by both philosophers and evolutionary biologists, as the fountainhead of a typological theory of species that is absolutely inconsistent with evolutionary thinking."[73] However, the case is disputed—indeed, Lennox himself denies these conclusions. Indeed, there has been an extensive effort to rehabilitate Aristotle's biological and philosophical credentials.[74] Arguably, the effort has been more successful than in the case of Plato given the paucity of literature defending Plato in contrast to the literature defending Aristotle.

The obvious reason for this greater success is because Aristotle's conception of species differs significantly on a number of key points from Plato's. For instance, for Aristotle, the Forms or species are not abstract, but are concrete. That is, they do not exist outside their particulars or instances. As Aristotle himself remarks, "... it is clear that no universal exists in separation apart from its particulars."[75] Moreover, while it is a disputed interpretation, a case can be made that for Aristotle the Forms or species independently are *not* eternal, rather their eternality depends upon an eternal generation of organisms.[76] So under this interpretation, a species in an Aristotelian sense can go extinct, which is in accordance with

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[72] There have been some efforts to rehabilitate Plato's concept in this context. See: Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 100.

[73] James G. Lennox, "Kinds, Forms of Kinds, and the More and the Less in Aristotle's Biology," in *Aristotle's Philosophy of Biology*, ed. James G. Lennox (Cambridge, 2001), 160.

[74] An effort spearheaded by James G. Lennox, among others, such as David Balme, Pierre Pellegrin, and Allan Gotthelf.

[75] Aristotle, "Metaphysics," 1040b27. See http://www.perseus.tufts.edu/cgi-bin/ptext?lookup=Aristot.+Met.+7.1040b Accessed 28 April, 2007.

[76] See James G. Lennox, "Are Aristotelian Species Eternal?," in *Aristotle's Philosophy of Biology*, ed. James G. Lennox (Cambridge, 2001), 131. for the positive case, which is rejected by by Stamos in Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 102-113, esp n9 p. 104.

evolutionary theory. On the other hand, it is clear, that for Aristotle, the Forms or species themselves cannot change or evolve. Consequently, it might seem that Aristotelian species ought to be condemned like Platonic species because species according to evolutionary theory do change and evolve. However, the fact that Platonic and Aristotelian species do not evolve does not mean that they are incompatible with the natural sciences in general and evolutionary theory in particular.

What Darwin demonstrated is that lineages of living organisms evolved through time, which hitherto had been thought to be impossible. This is because it was held that living organisms were members of particular Forms (or species) created by God which by definition could not evolve. The inference drawn from this belief was that since living organisms were instances of these Forms they could not evolve either and consequently neither would lineages of living organisms over time. So what Darwin demonstrated showed that this inference was mistaken.

But the fact that lineages of living organisms evolve is not incompatible with Platonic or Aristotelian concepts of species. Membership in either Platonic or Aristotelian species only requires that living organisms appropriately resemble the Form, and there is no reason why lineages of living organisms could not resemble different Forms (or species) at different times. For example, there is no reason why lineage L cannot resemble Form A at t_1, and be classified as belonging to species A, and resemble Form B at t_2, and be classified as belonging to species B according to Platonic or Aristotelian conceptions of species.

Moreover, to demonstrate that Platonic and Aristotelian concepts of species are incompatible with the natural sciences Darwin (or anyone else) would have to show that evolution by natural selection entails the evolution of classes. That is, Darwin or anyone

else would have to show that a lineage *L* belonging to class *A* at time t_1, and belonging to class *B* at t_2, entails that class *A* has changed or evolved into class *B*. But he did not and neither has anyone else. The *class* (*A* or *B*) has not changed or evolved: only the *classification* of the lineage *L*, as belonging to class *A* or *B*.

Consequently, the fact that Platonic or Aristotelian concepts of species are not incompatible with the natural sciences leaves us with an intriguing possibility that we might appeal to them to justify the normative assessment of living organisms. However, I take it that such a conception of species suffers from a different problem. It is *not* that they cannot justify the normative assessment of living organisms. Rather the issue is choosing and justifying the application of a particular Form to a particular lineage, when the lineage evidently can resemble more or less many if not an infinite number of Forms. For example, the lineage of human beings over evolutionary time has resembled Forms of bacteria, Forms of amphibians, Forms of reptiles etc. And in the future the lineage of human beings may resemble other Forms very different from the present Form members of the lineage currently most closely resemble.[77] The problem comes in justifying the claim that present members of the lineage should$_e$ be normatively assessed according to the Form they presently most closely resemble rather the Forms they may resemble in the future or have resembled in the past, when such resemblance is contingent and transitory. In other words the problem here is a problem of pluralism, which brings me to my next objection.[78]

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[77] One could also argue that there could be an infinity of human forms, although I believe this line of argument is problematic because it posits an infinite set of essences which designate 'human'. In such a case it would be hard to get normative assessment of the ground for reasons we shall see.

[78] This objection should be familiar by now since I have employed it in Chapters 3-5.

3.2 Objection #2: One cannot choose and justify a single coherent appeal to species: The Pluralism Objection

The Pluralism objection in this case is the claim there is an ineliminable pluralism concerning different species concepts compatible with the natural sciences and no tenable objective justification within the natural sciences for choosing a specific species concepts to justify normative assessments of living organisms. The problem is that different species concepts can justify different even contradictory normative assessments. This is because different species concepts have different ways of delimiting species members and thus they can demarcate different populations who are members. Consequently, potentially at least, individual *A* may be normal in all populations of species concept *X*, but abnormal in all populations of species concept *Y*. Therefore, unless a single species concept can be privileged over and against the alternatives then the appeal to species to justify the normative assessment of living organisms is inadequate because it potentially conflicts.

Admittedly, the problem as stated is largely theoretical because different species concepts generally track the same population. No doubt this is because for the most part different species concepts are assessed on how accurately they demarcate particular populations which are believed to constitute species. For instance, the population demarcated by *Homo sapiens* is the same no matter what species concept one uses. This said, it is an issue are for populations which do not constitute a species on a particular species concept. For instance, populations of asexually reproducing organisms are not a species on the biological species concept because this concept is defined in terms of sexually reproducing populations which can interbreed.[79] This is notwithstanding that such populations are given species names—presumably on the basis of another species concept. So for example, on a species concept based on morphology an organism may be

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[79] In asexually reproducing organisms there is no gene-flow between members of the population and variation only occurs due to gene mutation.

normal/defective with respect to the concept but non-evaluable according to a biological species concept. It is also an issue because arguably it is not accidental that the different species concepts track the same population. Most of these concepts have different parameters which can take a range of values and these determine which individuals are members of the species. These are chosen—at least implicitly—such that they match the target population. Naturally, they can (possibly) take different values which in turn would include different individuals as members. So the choices of parameters are somewhat circular and relative to human interests. Consequently, they require objective justification if the appeal to species is to be objective . I argue later on in this chapter that this cannot be supplied.

Moreover, the claim that there is no single species concept (or set of species concepts) is a popular view, despite being contested by some. Stamos for one argues that one *can* justify a single species concept—his own. He contends that the premises of the argument for species pluralism are false. In particular, he claims that both the following claims are false: (1) no species concept can be privileged over and against another; and (2) every kind of biological investigation or interest requires its own species concept.[80] However, I think his argument fails on many grounds and at many levels.

The first problem is that while his characterization is broadly correct, it only applies to a rather naïve species pluralism. A species pluralist, such as I, need not hold that a species concept cannot be privileged. Clearly, there are some species concepts which work better and worse in different contexts, so at least *pragmatically* they can be privileged relative to some specific context.[81] For example, species concepts which rely entirely on

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[80] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 96-97.
[81] Yet the fact there are different context means that the pluralism objection is still in play and the justification is consequently limited and inadequate.

morphological similarity are not useful when we are interested in giving an account of evolutionary lineages because different lineages adapting to similar circumstances are often morphologically similar. For instance, dolphins are morphologically similar to fish because they have adapted to living in an aquatic environment. Yet dolphins and fish come from very separate evolutionary lineages.

However, to sustain pluralism, species pluralists need only show that there are a number of real and objective species concepts which cannot be reduced to a single concept. And clearly, given the above exposition, there are a number of real and objective species concepts which cannot be reduced to each other. For instance, species concepts based on the possession of some set of essential properties cannot be reduced to species concepts based on common lineages. This is because similarity in morphology or difference in morphology does not track one hundred percent with being part of the same lineage.

Neither does the fact that every kind of biological investigation or interest does not require its own species concept count against pluralism. Again to show pluralism, all one needs to show is that different species concepts cannot be reduced or eliminated.

In addition, Stamos' argument against species pluralism is weak at best. His argument against the species pluralist is seemingly solely based upon the claim that horizontal species concepts have ontological priority over vertical species concepts and thus that horizontal species concepts (at least) can be privileged over vertical species concepts.[82] For instance, he says

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[82] The distinction between horizontal and vertical species concepts draws from the metaphor of the Tree of Life inaugurated by Darwin. Cutting the Tree horizontally gives the species that exist at that point of time. These are horizontal species. Following the distinct branches shows the species which exist through time. These are vertical species. See Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 67-68.

> At any rate, what I find most conclusive against species pluralism, whether realist or nominalists, is that two of its essential premises can be shown to be quite false. First, the premise that no species concept can be privileged over another is falsified by the fact, as I argued earlier, that horizontal species concepts are logically prior to vertical species concepts. As such, the species concepts of palaeontology and phylogenetic taxonomy must yield to species concepts of neontology (the study of living organisms). This is not because of the fact that most of the work is done by biologists is done at the horizontal level, as in population genetics, ecology, biological control, medicine, ethology, etc. My argument is not based on numbers or an appeal to popularity. Neither is it based on the fact, in contrast to Shaw (1969) claim for species concepts in palaeontology, that species concepts in neonology convey a lot of information ... No, my argument is not based on greater amount of information content at the horizontal level either. Instead it is based solely on the logic of the ontology of the situation, as discussed earlier ...[83]

He claims that horizontal species are logically and consequently ontologically prior to vertical species because the reality of the former necessarily entails the existence of the latter but the reverse is not true.[84] Yet even assuming this claim is true, it certainly does not undermine species pluralism greatly as he claims.[85] There are a number of horizontal species concepts which cannot be reduced to each other. For example, biological species concepts cannot be reduced to ecological-niche species concepts. The former is constituted by interbreeding relations whereas the latter is constituted by niche relations. Consequently, *pace* Stamos, the claim that there is an ineliminable pluralism concerning different species concepts compatible with the natural sciences can be defended.

3.3 Objection #3: For some species concepts there are various parameters which require specification but cannot be justified: The Parameter Objection

The Parameter and Pluralism objections in this case are premised on the fact there are multiple kinds of species concepts compatible with and usable within the natural sciences. Both are about problems with objectively justifying choices over and against possible

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[83] See Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 96-97.
[84] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 79.
[85] Stamos, *The Species Problem: Biological Species, Ontology, and the Metaphysics of Biology*, 96.

alternatives. In essence both objections turn on the idea that there is no adequate objective justification of these choices. The justification can only be subjective.

The Parameter Objection is aimed at individual species concepts which have various parameters which determine who are, and who are not members. The objection is that there is no adequate objective justification for particular parameters over and against possible alternatives.

The monophyletic species concept is one example. The parameter in this case is the common ancestor which all members of the species must share in order to be a member of the species. If an individual living organism does not share a common ancestor then it cannot be a member of the species in question no matter how similar it is them. For instance, our alien pig cannot be a member of *Sus scrofa* qua monophyletic species concept because it does not share any ancestor in common with members of *Sus scrofa* (on Earth) despite being otherwise identical.

The Parameter Objection in this case is that the choice of particular common ancestor cannot be objectively justified. Admittedly, it is possible to objectively determine the common ancestor for a particular contemporary population.[86] But this does not justify the choice of ancestor. This is because it is a function of the choice of population and thus it begs the question unless the choice of population can be objectively justified.

Now we could objectively justify the choice of population a number of ways. For example, we could select the population according to some similarity relations that the

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[86] For any particular population at time *t* there is at least one ancestor in the past which everyone shares. For instance, every human being alive today shares a common female ancestor commonly called Eve.

members bear to each other. Or we could choose them because they form an interbreeding population. Or we could use some combination of criteria. However, notice that these are also effectively criteria for other species concepts, which are also vulnerable to the Parameter Objection. For instance, if one uses similarity relations, there is the question of ascertaining and objectively justifying the particular properties which need to be similar and how similar they need to be over and against the possible alternatives. Moreover, the fact that we could select the population according to many different ways or combination of ways also raises the Parameter Objection.

Stamos' species concept is another example. The biosimilarity relation complexes require both the choice of particular kinds of relations and parameters of relation to delimit the requisite species. However, there is no objective way to choose and justify these—or at least Stamos does not provide one. The ones he proposes seem to arise from a black box. And unless there is an objective way to choose and justify these then his concept of species is vulnerable to the Parameter Objection too.

3.4 Objection #4: The appeal to the particular species concept cannot sustain the Normative Distinction: the Normative Objection.

The Normative Objection in this case claims there are species concepts which cannot sustain the Normative Distinction. That is the species concept in question either does not or cannot adequately distinguish between what should$_e$ occur and what actually does occur. The point is that if the species concept cannot sustain the Normative Distinction then we can hardly appeal to it to justify the normative assessment of living organisms.

An example of a species concept that does not adequately distinguish between what should$_e$ occur and what actually does occur are classes based on the possession of essences of some kind, such as genetic essences. The problem with such classes is that they do not

permit the gradations in assessment which is part-and-parcel of normative assessments in discourse. In other words, an individual either is or is not a member of a class defined by an essence. Individuals cannot be more or less a member because it is necessary for them to have the requisite essential properties. Yet normative assessments typically claim that an individual is more or less a member of a particular class.

For instance, it is quite typical to say that organism *x* is 'defective' in contrast to the class/kind *S x* belongs to. For example, "Porky the Piglet is a defective *Sus scrofa*" is a common kind of assessment. Yet if my objection is correct, then the ontology of essential classes/kinds does not allow such a form of assessment. The reason is because for classes/kinds constituted by possession of essences, members must possess *every* essential property; otherwise, they are not members of the class/kind. It is an all or nothing concept. For instance, it would be wrong to say *x* is a 'defective' *S*, even if *x* lacks ONE of two thousand essential properties *p*, which constitutes the class/kind *S*. Rather it would be correct to say *x* is not a member of *S*, and thus cannot be assessed by the norms of *S*. Whereas, in the language of assessment, if *x* lacked one of two thousand properties *p*, we would probably say *x* is a 'normal' *S*.

It might be objected that one need not assess an individual *x* of essential kind/class *S* on the basis of its essential properties. For instance, one could assess it on the basis of non-essential properties. However, how would one assess on the basis of non-essential or accidental properties? The obvious route to take would be to appeal to typicality. That is, we look for *typical* accidental properties and normatively assess according to these. However, as I have shown in Chapter 3, the appeal to typicality fails because it justifies significantly counter-intuitive normative assessments and because of the parameter problem.

Moreover, the remaining conceptions of species based on classes are more or less vulnerable to the Normative Objection. That is, depending on how the particular classes are framed, they are more or less vulnerable to the charge they do not sustain the Normative Distinction—i.e. the distinction between what should$_e$ occur and what occurs or may occur. For instance, broadly framed cluster classes and ecological niche classes are too diffuse to adequately sustain the Normative Distinction. Specifically, they do not adequately specify what should$_e$ occur in contrast to mutually exclusive alternatives. In the case of ecological niche classes, take apex land predators. *Tyrannosaurus rex* is quite different from a tiger, yet both fill this niche well, albeit in very different timeframes. Consequently, with respect to this niche one cannot say which alternative *Tyrannosaurus rex* or tigers should$_e$ occur since they both fit the niche well. Indeed, *any* form that fitted the niche well would do, no matter how different they happened to be. Of course, the class may be tightly framed or drawn, but this is open to the problems noted above.

Furthermore, the species as individuals or species concepts based upon evolution by natural selection are also vulnerable to this objection. The first problem is that it makes the required comparison between the characteristics of the tokens of the type with the characteristics of the type in the normative assessments either untenable or arbitrary.

It is untenable because there is no meaningful comparison between an individual (token) and a population of individuals (tokens) *per se*, which defines the type. Of course, one could compare an individual with another individual token. But the problem is choosing which one when there are many possibilities and these vary considerably. Our individual may be very similar or very different to the comparator. However, given that the population of tokens are all equally members of the type, the comparison of individual

with another individual token is arbitrary. One could retort that some plausible comparator (norm) could be derived from the lineage—the population of tokens which defines the type. For example, there could be some statistical aggregation of the characteristics of the lineage through a period of time and space. But this move is arbitrary. It is arbitrary because it would involve some selection of time and or space for aggregating the characteristics of the individual members into some statistical representation of the lineage. The obvious choice here is to choose and count all possible members of the lineage in all their locations up until the point of normative assessment. But this in my view unreasonably privileges the past, and is an effective endorsement of conservatism. It would label any significant difference as deviation, whereas it could be innovation. For instance, if human beings lived during the time of the dinosaurs and saw the predecessors of birds, it is probable they would label them abnormal dinosaurs, rather than primitive birds.[87] In other words, individuals who arise out of speciation events risk being labelled deviant when in fact they are different.

The second fundamental problem is that this conception of the species naturally does not rule out the gradual change or evolution of a species, such that the characteristics of the lineage at one point of time differ markedly from some later period, either by nature or human beings.[88] Consequently, under this conception of the species, the basis of normative assessment can change over time, albeit usually over very long periods of time. This raises the issue of ascertaining which version of the species one ought to normatively assess a living organism by because different timeframes are going to give different characteristics as norms.

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[87] This is assuming that birds evolved from dinosaurs very slowly.
[88] It also does not rule out rapid changes either.

These problems raise doubts regarding whether the sciences of biology can explain normative assessment through evolutionary theory. At least part of the reason is because the phylogenetic conception of the species is the concept of the species derived from evolutionary theory.

4. Conclusions

The appeal to species to justify the normative assessment of living organisms is an appeal to the fact that individual living organisms bear a certain relationship to entities designated 'species'.[89] The thought is that the relationship, such as being a token of a particular type, adequately sustains the Normative Distinction. For instance, the appeal to species to justify the claim that Porky the pig is defective being born with one eye, one ear, and no curly tail could be to the fact that she is a token of a particular interbreeding community. Or it could be the fact that she is a token of a particular lineage. However, in the course of this chapter I have argued that such an appeal fails because it is vulnerable to one or more of three fatal objections.

The first was the Incompatibility Objection. This turns on the point that that if concepts of species are incompatible with the natural sciences, then we could not appeal to them to justify the normative assessment of living organisms. However, I noted that the force of this objection was limited for at least three reasons. Namely: (1) there clearly are species concepts compatible with the natural sciences; (2) the restriction is quite narrow and can be avoided; and (3) the obvious examples of incompatibility are in fact not incompatible.

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[89] These may be abstractions and lineages.

The second and third objections encompassed the Parameter and Pluralism Objections. The Parameter Objection turns on the difficulty of justifying the choice between one way of specifying the various parameters and another. In other words, it rests on the claim that there are no objective reasons within the natural sciences to prefer one way of specifying the parameters to another.

The Pluralism Objection arises because there are many different and irreducible species concepts compatible with the natural sciences. It turns on the difficulty of justifying the choice between different species concepts. In other words, it rests on the claim that there are no objective reasons within the natural sciences for preferring one species concept (or set of species concepts) to the other alternatives.

The fourth objection was the Normative Objection. This holds that some species concepts cannot sustain the Normative Distinction. That is the concepts themselves cannot adequately sustain the distinction between what should$_e$ occur and what occurs or may occur. Examples included species concepts based on essences and lineages. Clearly, if this objection applies then we cannot appeal to these species concepts to justify the normative assessment of living organisms.

Chapter 7: Meeting the challenge

1. Introduction

The purpose of this chapter is to discuss how my objections to the appeals discussed in Chapters 3-6 apply to the views of Larry Arnhart, William Casebeer, and Philippa Foot, which were examined in Chapter 1. These philosophers apparently provided a challenge to my claim that the natural sciences are not adequate to justify moral judgements about human beings. This is a challenge I aim to defuse.

Broadly speaking, over the previous chapters, I have offered five different kinds of objection to the natural sciences adequately justifying the normative assessment of living organisms. I have labelled four of the five as: 1. The Incompatibility Objection; 2. The Pluralism Objection; 3. The Parameter Objection; and 4. The Normative Objection. To this I could add another label: The Implausibility Objection. This maintains that the appeal or appeals in question justify implausible normative assessments. My argument has been that the various kinds of appeal offered for justifying the normative assessments are more or less vulnerable to these objections.

However, at the outset, I ought to say that I do not believe the Incompatibility Objection applies to the views of Arnhart, Casebeer, and Foot. Specifically, I do not believe it applies to the particular versions of the appeals these authors make to justify moral judgements. While a case could be made that the Incompatibility Objection applies to Foot, it is not a case I care to make. That is, I see no reason why her account of moral judgement cannot be understood in terms of the natural sciences. For instance, as I have noted in my previous discussion of Foot, her central notion of the life form can be understood in terms of the natural sciences. Consequently, my argument against challenge

provided by the views of Arnhart, Casebeer, and Foot relies upon applying the remaining objections.

2. Larry Arnhart

Larry Arnhart in his work *Darwinian Natural Right* provides an account of human nature which draws deeply upon the natural sciences, especially the sciences of biology. It claims that the good for human beings is the desirable for human beings, where the desirable for human beings is defined by the 20 typical natural desires of the human species described by the sciences of biology.

The challenge to the Central Claim came from the fact that Arnhart used this account of human nature to make moral judgements about human beings, which presumably he believes are adequately justified. Specifically, different practices are judged according to whether they fulfil or frustrate some twenty species-typical natural desires. For instance, he negatively judged the practice of female genital mutilation because it frustrated the typical natural desire for sexual pleasure and bodily health in *Homo sapiens*.[90]

My objection to Arnhart's account comes from the fact that his account makes use of a number of the appeals discussed above, but does not adequately address the objections I raise to them. Specifically, the key element of his account of moral judgement is the fulfilment or frustration of some twenty species-typical natural desires. For instance, in the case of female genital mutilation, it is the frustration of the *typical* desires for sexual pleasure and bodily integrity in female *Homo sapiens*, which justifies his negative

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[90] Arnhart, *Darwinian Natural Right*, 14, 248.

judgement of this practice and its practitioners.[91] Clearly, this involves an appeal to typicality.

The first minor point to make is that Arnhart does not say anything about how he measures the typicality of human desires. So it is not surprising that the offers no justification for how this is done. This is a problem because different measures of typicality can give different answers about what is typical.

The second minor point to make is that Arnhart's account is also vulnerable to the charge that it permits contradictory moral judgements. The desirable can change over time such that at time t_1 the desirable is A but at t_2 the desirable is not-A, leading to a contradiction concerning whether A should$_e$ occur. Of course, one could respond by claiming that what should$_e$ occur is the desirable at any particular time t. But then we run into the familiar problem of justifying the timeframe within the natural sciences. According to the Parameter Objection there is no justification within the natural sciences for choosing the ancient past, recent past, present, or even future. Yet this is a problem that Arnhart is quite willing to accept. He claims that the desirable for species is stable enough.[92] I disagree for the reasons already stated.

However, the most serious objection to Arnhart's appeal to typicality is that it justifies some rather odd if not counter-intuitive moral judgements about human beings. For example, one of his species typical natural desires is the desire for war.[93] So according to account of human nature, the good for human beings is the desirable for human beings and this is constituted by 20 species typical natural desires. Therefore, according to Arnhart it

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[91] Arnhart, *Darwinian Natural Right*, 14, 248.
[92] Arnhart, *Darwinian Natural Right*, 9-10.
[93] Arnhart, *Darwinian Natural Right*, 34.

is desirable to go to war, and frustration of this desire is wrong. Consequently, those who seek to frustrate this desire—peacemakers and pacifists—should$_e$ be morally judged negatively. This is a somewhat odd move to make even when there may be some rational justification for going to war.

Arnhart's account also apparently engages the appeal to history. For example he says:

> I will argue that these twenty natural desires are universally found in all human societies, that they have evolved by natural selection over four million years of human evolutionary history to become components of the species-specific nature of human beings, that they are based in the physiological mechanisms of the brain, and that they direct and limit the social variability of human beings as adapted to diverse ecological circumstances.[94]

Yet he does not address any of the problems I noted with this kind of appeal discussed previously. This said, arguably, this is not an appeal to history. Rather it is an appeal to the fact that during some period of time in the past a species-specific nature has been fixed into *Homo sapiens*.[95] In other words, arguably, it is a kind of appeal to species.

In any case, it is clear that Arnhart does make some kind of appeal to species. For instance, he invokes the twenty typical desires of *Homo sapiens* to justify his moral judgements of human beings. While the appeal to species in this case does not directly justify moral judgements—the fulfilment or frustration of twenty typical desires does that—the choice of species concept is important because it defines the population for which the typical desires are ascertained.

One potential problem with Arnhart's appeal to species is the fact he does not say which species concept he is using, let alone offer any justification for the choice. So the

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[94] Arnhart, *Darwinian Natural Right*, 36.
[95] Furthermore, presumably, it does not matter how long it takes for a species-specific nature to be fixed as long as it is fixed and there is a set of species typical natural desires.

twenty typical desires derived from the population defined by the species concept are unjustified. Consequently, the moral judgements based upon whether these natural desires are fulfilled and frustrated are also unjustified.

However, one might respond that for *Homo sapiens* at least, it does not matter which species concept is employed. This is because different species concepts in the case of *Homo sapiens* designate very similar, if not identical, populations. But this is only the case because the parameters of specific species concepts are such that they designate similar, if not identical populations. (The parameters could well be different.) So it seems to me that the parameters are such as they are because we already have a particular population in mind. But this makes the choice of parameters circular as I have discussed previously.[96]

Yet, even if a particular species concept can be justified over and against alternatives, there is the issue that species evolve over time. This raises the problem of justifying the timeframe again for ascertaining what the species typical desires are because these may change. But as I have already noted, Arnhart is willing to accept this problem because he believes the desirable for species is stable enough, and I disagree with his contention.

The remaining appeal Arnhart makes is an appeal to what is natural. In his account, different practices are judged on whether they fulfil or frustrate species-typical *natural* desires, which have been formed by some four million years of natural selection. However, as noted in Chapter 3, there is no scientific basis for distinguishing between natural and unnatural causes and privileging the former over the latter.[97] An agent may distinguish and privilege the natural over the unnatural but this falls outside the scope of

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[96] See pp. 201-202.
[97] Natural human desires in this case are desires that originate and occur independent of human action and choice whereas unnatural human desires are desires that originate and occur via human action and choice.

the natural sciences. Moreover, Arnhart fails to offer any justification for such a privileging. This leaves his account open to all the objections to both appeals noted in Chapter 3.

3. William Casebeer

In Chapter 1 I also discussed the work of the philosopher William Casebeer who, along with Larry Arnhart and Philippa Foot, apparently provided a challenge to my claim that the natural sciences are not adequate to justify moral judgements about human beings. In *Natural Ethical Facts*, Casebeer attempts to provide and defend a naturalized ethic in terms of the natural sciences. He argues that one can better understand the nature of moral theory and its role in moral judgement(s) if we properly understood what morality is.[98] Regarding this he claims:

> Such an understanding will be best informed by treating morality as a natural phenomenon subject to constraints from, influenced by, and ultimately reduced to the natural sciences, particularly the cognitive sciences and biology. [99]

And regarding moral claims, which presumably include moral judgements, Casebeer says that they ought to be reduced to *functional* claims, where functional claims are understood in terms of Godfrey-Smith's "modern history" theory of functions.[100] A theory discussed in Chapter 4.

Consequently, I take it that Casebeer's project fails because of the problems with adequately justifying normative assessments of living organisms via an appeal to recent-history accounts of function, as noted in Chapter 4. Clearly, Casebeer escapes my first two objections raised in chapters 4 and 6. Recent-history accounts of function are compatible

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[98] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 3.
[99] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 3.
[100] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 4.

with the natural sciences and they, like other aetiological accounts of function are normative. However, his is vulnerable to the remaining two objections.

My third objection to the appeal to functions is that there are many different concepts of function, but no single concept of function can be objectively justified over and against alternatives. Casebeer acknowledges the many different concepts of function, although he does not consider teleological or propensity accounts.[101] However, his reason for choosing recent-history accounts over capacity and ancient-history accounts is that it avoids perceived problems with these alternatives.

> Peter Godfrey-Smith has an enlightening analysis of function that steers a path between the Scylla of functional vacuousness (represented by the capacity account) and the Charybdis of functional single-mindedness (represented by the deep-history proper function approach). It is an analysis of proper function as well; however, it relates the functions of traits and characters to their recent evolutionary history.[102]

I accept his point about capacity account of functions. But I am unwilling to accept that the 'single-mindedness' he refers to as a problem in the above quotation, is a unique problem for ancient-history accounts.

What Casebeer is referring to by 'single-mindedness' is the idea that the only content one can derive from ancient-history functions is ultimately reproduction. For instance, he says, "If we gravitate to the distal, super-historically laden conception of function, then the only content we can squeeze out of function is that the ultimate function is to reproduce."[103] However, if this is a problem for ancient-history accounts of function it is also a problem for recent-history-accounts of function. The content of functions—what functions are—is delineated according to the contribution which explains the traits

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[101] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, see Chapter 3, esp. pp 49-54.
[102] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 52.
[103] The claim is not argued. See: Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 52.

continuing existence under natural selection. The only difference between ancient and recent-history accounts is the timeframe for the operation of natural selection. In both cases the content of functions is ultimately reproduction.

One also gets the impression that a recent-history history account of functions was adopted because it suited his theory and project. For instance he says,

> For present purposes, then, a modern-history of functions gives us everything we need from the biological use of the term 'function' to naturalize Aristotle. The other conceptions of function are useful—there is *some* sense in which the distal function of all living things is to reproduce, but that is not to say that all the capacities we exercise have as their immediate *telos* the end of reproduction or that their modern history is to be explained in terms of that capacity. [104]

This demonstrates that his appeal to the natural sciences is not doing all the work of adequately justifying moral judgements.

My fourth objection to appeals to functions was that some accounts of functions have various parameters, which require objective justification, but none can be found. This is particularly a feature of aetiological accounts of function. The major parameter in these accounts of course is the timeframe one considers the contribution which explains the presence of a trait under natural selection. In recent-history accounts the timeframe is 'recent' whereas in ancient-history accounts the timeframe is 'ancient'. My contention in this case is that there is no objective justification for choosing any particular timeframe whether this be ancient *or* recent.

Disappointingly, while Casebeer acknowledges the issue, he avoids it. Rather than supplying a justification for adopting a recent timeframe he defers to Godfrey-Smith. That is he says,

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[104] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 53.

> How far back need one go in order for the history to be ancient rather than modern? This is an empirical question, as Godfrey-Smith notes: "The answer is not in terms of a fixed time—a week, or a thousand year. Relevance fades. ..."[105]

So Casebeer is vulnerable to my fourth objection too.

4. Philippa Foot

The philosopher Philippa Foot is the remaining philosopher I discussed in Chapter 1 who apparently provides a challenge to my claim that the natural sciences are not adequate to justify moral judgements about human beings. Interestingly, Foot connects moral judgement with normative assessment. For instance, her explicit aim is to set out

> ... a view of moral judgement very different from that of most moral philosophers writing today. For I believe that evaluations of human will and action share a conceptual structure with evaluations of characteristics and operations of other living things, and can only be understood in these terms.[106]

She argues that there are 'natural norms' for living organisms, including human beings, derived from the fact they are living, which refer to what Foot calls the 'natural goodness' of living things.[107] These 'natural norms' are not attributes of individuals but to some abstraction variously referred to as the 'species' or 'lifeform'.[108]

Foot connects her species concept to the normative assessment of living organisms by linking specific individuals to a particular species such that these individual should$_e$ exhibit the characteristics definitive of the species. These characteristics are captured by the form 'S are F', 'The S is F', and even 'S's do V', where *S* is a Footian species, *F* is some

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[105] Casebeer, *Natural Ethical Facts: Evolution, Connectionism, and Moral Cognition*, 52.
[106] Foot, *Natural Goodness*, 5.
[107] Foot, *Natural Goodness*, 27.
[108] For Foot, the terms 'species' and 'lifeform' are interchangeable. So for reasons of economy I shall use either interchangeably.

predicate, and *V* is some verb. For instance, "Dogs are carnivores," "The Dog is spotty," and "Dogs do eat meat."

As we saw in Chapter 1, she makes two significant claims concerning these propositions. The first is that propositions of this form are logically unquantifiable, meaning, in the example above that they do not speak of an individual dog, although they can; nor do they predicate something true of every dog. [109] The second is that in order to understand what such propositions assert or claim one needs to look at the natural-history account of the species—or the context of how it lives. That is, we cannot understand reproduction, and propositions concerning reproduction in living organisms unless we know something of their natural history. For instance, reproduction in bacteria differs greatly from reproduction in dogs.

However, while Foot uses the term 'species', I take it that she is *not* using any of the conceptions of the term typically used in the sciences of biology—notwithstanding she can be interpreted that way. This is because her exposition of 'species' is dissimilar to the conceptions of the term typically used in the natural sciences.

On the other hand, as I have discussed in Chapter 6, her account of 'species' does resemble ecological niche species concepts in some respects, although these are not typically used in the biological sciences.[110] That is, one can see significant similarities between the concept of a 'niche' and the concept of a 'life form'. Furthermore, my understanding is that she is comfortable with using the natural sciences to fill out the

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[109] Foot, *Natural Goodness*, 28.
[110] I.e. Ecological niche concepts of species only have narrow applicability within biology. Cf. morphological species concepts.

specifics of her account of 'species' and 'lifeforms'. For instance, there is no reason why her natural history propositions cannot be understood in terms of the natural sciences.

However, my objections to Foot do not depend on whether Foot does or does not use a concept compatible with the natural sciences. Rather my objections are based on features of the concept of life form and the nature of living organisms.

My first objection is that her account of the concept of the life form is too permissive. By this I mean there is little or no restriction on how natural history propositions may be grouped together to define a life form. So potentially, there are an infinite number of ways they could be and thus the choice of any particular grouping needs to be justified. Furthermore, it raises the problem of determining and then justifying which life form an individual belongs to, when it could belong to many different life forms. In turn this makes it difficult to ascertain what should$_e$ occur for individuals by reference to their life form.

One could try to justify a particular grouping of natural history propositions by the fact there are already specific groupings of natural history propositions in existence embedded in particular populations. For instance, there are specific groupings of natural history propositions embedded in various species or sub-species. However, clearly this does not solve the problem given that there are multiple kinds of species concepts and no objective way within the natural sciences to privilege any one over the other.

Another point to be made is that a justification based upon there already being specific groupings of natural history propositions associated with populations is effectively is an appeal to history. This is because the particular and specific association of natural history propositions with a population is due to how the process of evolution by natural selection

has occurred over time with respect to a particular lineage. Consequently, it also suffers from all the problems with the appeal to history identified in Chapter 3. The most significant, in my opinion, is that it essentially begs the question concerning what should$_e$ occur. This is because it assumes, without adequate justification, that the past is normative—the standard upon which those in the present and future ought to be judged, which brings me to my next objection.

My second objection is based on the fact that living organisms evolve and change. Consequently, at some point, there is a grey area concerning whether lineages of living organisms ought to be assessed by their current life form or by the life form they are evolving into. (There could be multiple possibilities.) So at some point there will be ambiguity over what should$_e$ occur—the traits associated with old life form or the new one. So at least for some timeframes, appealing to a life form cannot tell us what should$_e$ occur and thus they are not adequate to justify normative assessments.

5. Conclusion

In Chapter 1 Larry Arnhart, William Casebeer, and Philippa Foot ostensibly provided a challenge to the Central Claim that the natural sciences are substantially independent of the natural sciences because they are not adequate to justify moral judgements about human beings. However, as this chapter has shown, each of these authors is vulnerable to the various objections noted in subsequent chapters. This is because these authors effectively or directly draw upon one or more of the various appeals to justify normative assessments of living organisms examined in the thesis. These include appeals to typicality, history, what is natural, natural selection, species, and function. Consequently, they are vulnerable to the objections already discussed to them justifying the normative assessment of living organisms and thus the moral judgement of human beings.

Conclusion

The aim of this thesis has been to defend the claim that ethics is substantially but not completely independent of the natural sciences because the appeals made to the natural sciences are not adequate to justify moral judgements. Or in other words, the main task of the thesis has been to defend this central claim and in doing so ascertain the extent to which ethics depends upon the natural sciences.

The justification of moral judgements is an essential element in any ethical theory. In a nutshell the justification of moral judgements involves sufficiently privileging some moral judgement *X* over alternative moral judgements *Y*, *Z*, etc. (These include the negation of moral judgement *X*.) This is essential because without adequate justification one cannot rightly ascertain what should$_e$ occur. That is, without adequate justification competing and contradictory moral judgements cannot be resolved. Specifically, one cannot rightly decide between whether *X* should$_e$ occur in contrast to alternatives *Y*, *Z*, etc. Consequently, my main contention is that various appeals to the natural sciences to justify moral judgements do not sufficiently privilege *X* over the other possibilities *Y*, *Z*, etc.

My conclusion that ethics is substantially but not completely independent of the natural sciences is not new. However, one thing that distinguishes my argument for it from the others is that I do not draw upon the traditional arguments within the philosophical literature. For example, I do not draw upon Hume's Law. Indeed, like my opponents I do not see this as an objection to the natural sciences justifying moral judgements. Indeed, I showed that it is a mistake to hold that the logical gap between is and ought precludes the natural sciences justifying the moral judgement of living organisms. This is because logically it is possible to supply bridging premises. In particular, it *is* a mistake to argue:

(1) Human beings are social, rational, animals;

(2) Therefore, human beings ought to be social rational animals

because the argument is invalid. However, it is possible to supply bridging premises. For example:

(1) Human beings are social, rational, animals;

(2) Human beings ought to be what they are;

(3) Therefore, human beings ought to be social, rational, animals.

This is a logically valid argument. Of course, it is another matter whether the premises are true and or justifiable.

In contrast, what I demonstrate is that the appeals made to the natural sciences do not adequately sustain the justification of the moral judgements of human beings. But my point is not that the natural sciences *cannot* sustain the justification of the moral judgement of human beings, but that they *do not* sustain it. In other words, I assume that the natural sciences could do the job, but when it comes to doing it, the natural sciences do not do the job *pace* those who claim that they do. While the natural sciences can provide various means to distinguish between what should$_e$ occur and what occurs; these are not adequate for one or more of the following reasons: (1) they fail to sufficiently privilege what should$_e$ occur over and against alternatives; (2) they justify normative assessments which are strongly counter-intuitive; or (3) some appeals, or some versions of some appeals are not compatible with the natural sciences.

One of the main reasons the appeals fail to sufficiently privilege particular occurrences over and against alternatives is that they fail to adequately sustain the Normative Distinction. The Normative Distinction is the distinction between what should$_e$ occur and what actually does occur. So when I am claiming an appeal does not adequately sustain the

Normative Distinction, what I am claiming is that the appeals to the natural sciences do not adequately sustain this difference between what should$_e$ occur and what does. In other words, I contend that the appeals do not sufficiently distinguish some determinate and coherent (non-contradictory) set of occurrences in the past, present, and future (what should$_e$ occur) from all possible occurrences in the past, present, or future (what does occur).

But evidently, the appeals to the natural sciences justify either multiple internally incoherent (contradictory) claims concerning what should$_e$ occur or multiple internally coherent (non-contradictory) claims concerning what should$_e$ occur. Obviously, the appeals to the natural sciences in the former case are problematic because they justify claims that *X* simultaneously should$_e$ *and* should$_e$ not occur. And the appeals to the natural sciences in the latter case are problematic because they equally justify claims that *X*, *Y*, and *Z* should$_e$ occur. The issue in this case is ascertaining what should$_e$ occur—*X*, *Y*, or *Z*. Any choice between them requires justification and my contention is that this cannot be done on the basis of the appeals to the natural sciences alone. Rather, I argue that any sufficient justification would need to rely upon some appeal beyond the purview of the natural sciences, such an appeal to personal values. However, it is my contention that such appeals would not resolve the problem of pluralism.

I established my claim that appeals to the natural sciences do not justify the moral judgement of human beings by establishing a broader claim. Namely, I claimed that the appeals to natural sciences do not justify the normative assessment of living organisms. The reason for doing this was that surprisingly it is simpler because it avoids many of the distracting complications of human rationality and agency. Moreover, my choice of exemplar organism highlighted some important and interesting issues. For example, my

choice of the domesticated pig highlighted the various problems of utilizing the fact of what is 'natural' to sufficiently sustain the Normative Distinction and thereby adequately justify their normative assessment. The appeal to the fact of what is 'natural' relies upon distinguishing between effects that are dependent and independent of human action, yet the causal order itself does not so-distinguish between 'natural' and 'artificial' effects.[111] To do so, it must be possible to distinguish between identical effects where they are caused naturally or artificially. For example, hypothetically, it must be possible to distinguish between a domesticated pig from present-day Earth caused by human action and a pig from a parallel Earth caused entirely by natural selection where they have exactly the same characteristics or properties. But this is not possible.

Of course, it is possible to distinguish between 'natural' and 'artificial' causes. But the significance of these is either an accident of causal history (objectively speaking), or the consequence of some privileging by subjects. Both are poor bases to justify the normative assessment of living organisms. The former is poor because it seems inconsistent with normative assessments in discourse that they are accidental or arbitrary. For instance, when it is claimed that Porky the sow should$_e$ not be confined in a farrowing crate, the thought is not that this is somehow accidentally or arbitrarily wrong. The latter is poor because the privileging is entirely dependent upon the interests of subjects which can and do vary significantly, and these interests go beyond the ambit of the natural sciences which of course is significant for my project here.

The argument for the broader claim began by providing an account of the normative assessment of living organisms. This seems an obvious and necessary step for

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[111] For example, the 'domesticated' pig of the present-day Earth *could* arise via natural selection in an alternative or parallel Earth.

demonstrating how (and why) the natural sciences do not justify the normative assessment of living organisms. One could hardly demonstrate a failure if one does not give a clear presentation of what the natural sciences fail to do. I used the example of domesticated pigs, in three different although related contexts where they are normatively assessed within the scientific literature. These were their: (1) characterization; (2) health; and (3) welfare.

This literature used the following appeals. The assumption was that given that they are appeals within the scientific literature that they represent proper appeals to the natural sciences. These included appeals to: (1) regularity; (2) history; (3) what is natural; (4) natural selection; (5) the experience of pleasure or pain; (6) functions; (7) development; and (8) species.

The general strategy was to show how each appeal either justified counter-intuitive moral judgements or failed in various ways to sufficiently sustain the Normative Distinction. In the latter case, generally, either there was an outright failure by the appeal to the natural sciences to sustain the distinction (the Normative Objection) or they sustained the distinction but generated a plurality of incoherent options that could not be distinguished by appeal to the natural sciences (the Pluralism and Parameter Objections). In other words, the appeals could not distinguish between what should$_e$ occur and what occurs or may occur. Or, they could distinguish between them, but they distinguished many different incoherent options of what should$_e$ occur in contrast to what occurs or may occur, which could not be justified and or privileged.

An example of the former was the appeal to development. Even assuming the standard combination account, which employs preformationist and epigenetic elements, the appeal

to development, as it stands, does not adequately distinguish between what should$_e$ occur (or not) and what occur or may occur (or not). This is because on this account it is the genome alone which specifies what should$_e$ occur. However, the genome alone clearly does not do so. Any specification by the genome concerning what should$_e$ occur actually depends upon a specific environment. (Typically, this is assumed.) Yet the specification of the genome and the unjustified assumption of a specific environment essentially dissolve the distinction between what should$_e$ occur and what does occur. This is because the specification and assumption effectively stipulates the behaviour of the causal order—that is, what occurs or will occur. (The reason is that the genome and the environment together encompass the entire causal order.) Now this issue could be avoided if some justification could be supplied for assuming a particular environment. Otherwise, one effectively begs the question concerning what should$_e$ occur. The obvious candidates are the typical environments for genome X, or the historical environments of genome X. But these run into the problems of the appeals to typicality and history.

An example of the latter was in the appeal to history and ultimately in the appeal to functions too.[112] As I discussed in Chapter 4, the only scientifically compatible account of functions which is plausibly normative is based either on an appeal to the history of contributions to fitness under natural selection, or the propensity to contribute to fitness under natural selection. By far the most popular account is the appeal to the history of positive contributions to fitness under natural selection.[113] So typically, appeals to function, ultimately are a kind of appeal to history—the history of natural selection. However, one of the main problems is that such an appeal to history of organisms is sensitive to the timeframe. This is because the nature and extent of the causal contributions to fitness may

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[112] The only scientifically compatible account of functions which is plausibly normative is ultimately based on an appeal to the history of positive contributions to fitness under natural selection or the propensity to positively contribute to fitness under natural selection in the future.
[113] That is causal contributions that increase fitness.

change significantly over time. In particular, over time the same cause may positively contribute to fitness, negatively contribute to fitness, or have no significant contribution to fitness. And over significant periods of time the kinds of contribution are likely to change significantly. Consequently, under an aetiological account of functions we need to know the causal contribution(s) (if any) that entity *A* makes which increases fitness in order to designate the function (if any) of *A*. For instance, during the timeframe T_1 the causal contribution(s) *c* of *A*, may positively increase fitness, but at timeframe T_2 the causal contribution(s) *c* of *A* may make a negative contribution. Thus, at timeframe T_1 *A* has the function *c*, but at T_2 it does not. The issues of course are the choice(s) and justification of the choice(s) of any particular timeframe $T_1 \ldots T_n$. Unless one can objectively choose and justify a particular timeframe for function(s) designation, the appeal to history, in effect, distinguishes many different and incoherent options of what should$_e$ occur (or not) in contrast to what occurs or may occur (or not), especially over evolutionary time. While one could designate 'ancient' history or 'recent' history as the proper timeframes, such designations suffer from two significant problems. The first is that there is no tenable objective way of choosing between ancient history and recent evolutionary history because there are examples in functional discourse where both give the intuitive answer to what the function of entity *A* is. The second is that even if one could objectively choose between ancient history and recent history accounts there are problems with both kinds of accounts. For example, ancient history accounts produce counterintuitive results, such as in case of vestigial organs. And recent history accounts in some cases negatively assess contemporary change as being defective contrary to intuition. Furthermore, such accounts are unable to justify prospective normative claims without unjustifiably privileging the past over the future. These make up a significant proportion of all normative claims.

Probably the primary limitation of my argument that appeals to the natural sciences are inadequate to justify the normative assessment of living organisms are inadequate is that there may be appeals I have missed, appeals which are believed wrongly to be false or true, or appeals hitherto undiscovered, which intuitively justify normative assessments and adequately sustain the Normative Distinction. However, the burden of proof is upon those who contend that this is the case.

So notwithstanding these real limitations, what follows from my arguments? If correct, I take it that there are two responses. The first is a rejection of ethical naturalism conceived in terms of the contemporary natural sciences. While Hume's Law does not necessarily or logically preclude the move from fact to value; presently at least, the move via bridging premises cannot be made via the natural sciences because the appeals to the natural sciences to justify these premises fail. To reiterate, they fail because: (1) some appeals, or versions of some appeals to the natural sciences actually are not compatible with the natural sciences; (2) they justify normative assessments which are strongly counter-intuitive; and (3) they fail to sufficiently privilege what should$_e$ occur over and against alternatives.[114]

It also seems to me that for such an ethical naturalism conceived in term of the natural sciences to be successful, the appeals to the natural sciences would need to adequately justify both the normative assessment of living organisms and the moral judgement of living organisms. But if I am correct, they do not.

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[114] There are at least two kinds of failure to sufficiently privilege what should$_e$ occur over and against alternatives. The first is the failure of a single kind of appeal to privilege what it claims should$_e$ occur over and against other kinds of appeal. For example, the failure of the appeal to typicality to privilege what it claims should$_e$ occur in a particular situation over and against say the appeal to development. The second is the failure of an appeal to privilege what should$_e$ occur in contrast to possible alternatives generated by the same appeal. This occurs in appeals which have various parameters whose choice cannot be adequately justified.

However, this is not a response I would advocate. For starters, as Charles Pigden points out, ethical naturalism is not necessarily committed to the natural sciences as most conceptions suggest.[115] That is, one need not be committed to the form of ethical naturalism which holds that ethical properties are natural properties where a natural term or property is one that can be employed or referred to in natural scientific explanations.[116] Natural properties or terms may stand outside natural scientific explanations as they are presently conceived. My point is that for ethical naturalism to be true all that is required is that the ontology of the world be entirely 'natural' and not include the 'supernatural'. But this commitment does not require that we rely solely upon the natural sciences notwithstanding they are apparently successful in describing the 'natural' world. Therefore, the second response to my arguments is to embrace a wider ethical naturalism which goes beyond the natural sciences.

This is the response I would advocate. The implications, however, are left for future research.

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[115] Charles R Pigden, "Naturalism," in *A Companion to Ethics*, ed. Peter Singer (Oxford, 1993).
[116] Crisp, "naturalism, ethical."

Appendix A: Glossary of Terms

Normative Distinction	The distinction between what should$_e$ occur in the past, present, or future; and what occurs in the past and present, or possibly will occur in the future.
The Central Claim	Ethics is substantially independent of the natural sciences because appeals made to the natural sciences are not adequate to justify moral judgements about human beings.
The Normative Objection	The claim that a certain scientific concept is not normative. Hence we cannot appeal to it to justify normative assessments.
The Parameter Objection	The claim that a certain appeal to the natural sciences to justify normative assessments presupposes certain parameters, the choice of which cannot be justified by an appeal to the natural sciences alone. Consequently, such an appeal begs the question concerning what should$_e$ occur.
The Pluralism Objection	The claim that a certain appeal to the natural sciences to justify normative assessments involves multiple irreducible conceptions, but it is not possible to justify the choice of one single conception over and against alternatives. Consequently, such an appeal gives rise to different or contradictory normative assessments.
The Incompatibility Objection	The claim that the appeal (or a version of the appeal) to the natural sciences to justify normative assessments uses a concept that is incompatible with the natural sciences.
The Implausibility Objection	The claim that an appeal to the natural sciences to justify normative assessments gives rise to implausible normative claims.

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