Research Essay: Personification as Epistemic Practice in *Origin of Species* and the Modern Synthesis

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Abstract

This essay makes two arguments. First, personification - attributing intelligence and motivation to an entity that lacks it, purely for the purposes of analysis - was a core epistemic practice both for Darwin and the neo-Darwinian 'modern synthesis'. Second, the essentialisation of species - that is, treating species as a 'natural category', is a surprising artifact in academic philosophy and our general culture, because Darwin himself was species nominalist (that is, he believed species to be man-made, conventional categories), and because there is no clear definition of a species in biology. Nevertheless, this tendency to essentialize species can be explained by the persistence of incorrect explanations for human and animal altruism, partly from the distaste that many philosophers have towards the modern synthesis. We come to these conclusions by reading Charles Darwin's *On The Origin of Species By Means of Natural Selection (1859)* and Richard Dawkins' *The Selfish Gene* (1976)[1]

[1] it is, after all, the 50-year anniversary of this remarkably popular book

Introduction

If only because they are widely considered the most influential biology books of the 19th and 20th centuries, respectively, a close reading of Charles Darwin's *On The Origin of Species By Means of Natural Selection (1859)* and Richard Dawkins' *The Selfish Gene* would seem to be instrumental to understanding the core practices and prejudices of professional biologists. This is exactly what this essay therefore is setting out to do.

Summary of Books

Before we turn to epistemic practices, let us first briefly summarize the books in question. Darwin's *Origin of Species* argues against the immutability of species, and proposes *natural selection* as the dominant driver of species change. Darwin's book was enormously impactful in convincing biologists of the reality of *evolution*, but it took almost a hundred years for them to warm up to the same degree to natural selection. The discovery of the gene and the sequencing of DNA prompted a re-evaluation of the theory (the so-called 'Modern Synthesis') in which both *gene* and the *organism* were entities subject to natural selection. Dawkins book put into words for a popular audience an implicit orthodoxy amongst biologists working in this tradition (such as W.D Hamilton and others). The projected quality of 'selfishness' in *Selfish Gene* (1976), an example of the personification as epistemic tool which we shall discuss, is due to the observation that any self-replicating entity that has survived for half a billion years would have to be ruthlessly self-interested.

Ways of Knowing Illustrated from Darwin to Dawkins

These two most impactful biology books of all time would seem to reveal a lot about the ways of knowing in biology. But what are these ways? John V. Pickstone has typified three primary ways of knowing that recur in the history of natural and social sciences: *natural history* (the describing and classifying of things) *analysis* (breaking them down into various elements) and *experimentation* (controlling phenomena and systematically creating novelties) [1]. Pickstone uses this typology to trace how various social and political histories have interlinked with 'dominant' or 'recessive' ways of knowing in the natural and social sciences. By showing how technological developments made their way into scientific practice, the book narrows the gap between the history of ways of knowing (science or *episteme*) and histories of ways of doing (technology or *techne*) [1].

We give a few examples from Darwin's writings to illustrate Pickstone's categories. We start with *natural history*. A core argument in *On The Origin of Species* is the de-essentialisation of 'species'. Darwin, after all, faces a steep hill trying to convince his Victorian audience that the Creator played no role in their development. Rather than attack it head-on, he argues from existing plant catalogues that the line between 'species' and 'varieties' is blurred, and in fact seems to depend on *human categorization*, rather than a divine one. To argue this, Darwin introduces three categories: 'real species' - acknowledged by all to be species, 'doubtful species' - whose specieshood is debated, and 'real varieties' - acknowledged by all to be varieties. Using data on the geographic range of plant species and varieties from H.C Watson, he shows that what some naturalists have called 'real varieties', others have called 'doubtful species':

> H. C. Watson has marked for me in the well-sifted London Catalogue of plants (4th edition) 63 plants which are therein ranked as species, but which he considers as so closely allied to other species as to be of doubtful value: these 63 reputed species range on an average over 69 of the provinces into which Mr Watson has divided Great Britain. Now, in this same catalogue, 53 acknowledged varieties are recorded, and these range over 77 provinces; whereas, the species to which these varieties belong range over 143 provinces. So that the acknowledged varieties have

> very nearly the same restricted average range, as have those very closely allied forms, marked for me by Mr Watson as doubtful species
>
> — [2, p. 47]

The geographic range is relevant because it was held to be a key distinguishing feature between species and varieties in Victorian biology: a variety was held to have a smaller geographical range of a species. But of course, Darwin points out, this is not the sign of a natural category, but a truism:

> Varieties generally have much restricted ranges: this statement is indeed scarcely more than a truism, for if a variety were found to have a wider range than that of its supposed parent-species, their denominations ought to be reversed.
>
> — [2, p. 47]

Next, let us illustrate Pickstone's *experimental* way of knowing with another example from the *Origin*. This time Darwin draws on results from experiments done by Kölreuter and Gärtner on the fertility of the offspring of plants from differing species. He starts by setting up the 'standard view' among his peers:

> The view generally entertained by naturalists is that species, when intercrossed, have been specially endowed with the quality of sterility, in order to prevent the confusion of all organic forms.
>
> — [2, p. 182]

He then proceeds to show that experiments attempting to understand the essence of this 'specially endowed quality' have failed.

Citing experimental evidence from Kölreuter and Gärtner, he concludes that the inability for organisms of different species to create offspring, as well as the general infertility of those offspring when they do occur, is incidental rather than essential. If it were essential, the results from hybridization experiments would be systematic. Instead, they are sporadic and volatile:

> The sterility is of all degrees [...] two most careful experimentalists who have ever lived, have come to diametrically opposite conclusions [...] It is generally different, and sometimes widely different, in reciprocal crosses between the same two species. It is not always equal in degree in a first cross and in the hybrid produced from this cross.
>
> — [2, Ch8, p. 204]

Darwin concludes that there is no more reason to think "species have been specially endowed with various degrees of sterility to prevent them crossing and blending in nature", than to think that trees have been specially endowed with the difficulty of being "grafter together in order to prevent them becoming inarched in our forest". That a frog can't mate with a giraffe is due to the incidental result of the incompatibility of their genitalia, rather than an a priori design choice.

We have illustrated two of Pickstone's categories (*natural history* and *experiment*). To illustrate *analysis* we turn to the Modern Synthesis of biology: Analysis is characterized by Pickstone as "reducing complex phenomena to simple principles" [1, p. 56]. For instance, how do we explain that animals in the wild tend to form clusters or herds? In 1972 W.D Hamilton published his "Selfish Herd" model [3], a mathematical predator-prey model that explains the clustering behavior by simulating prey organisms that minimize their individual's probability of being attacked. When prey

use their neighbors as living shields, groups and herds naturally follow, with almost no assumptions about the organisms in question [4]. W.D Hamilton is said to use *analysis* because he has reduced a complex behavior involving many organisms into an emergent property from a simple rule.

Personification as epistemic practice (Darwin and Dawkins)

In their writings, both Darwin and Dawkins make use of personification. I argue that their use of personification is not merely a literary device, but should be viewed as an essential part of the epistemic practice of biology.

Darwin personifies *Nature* (as in "Nature acts uniformly and slowly during vast periods of time on the whole organisation") and *natural selection* (as in "natural selection is continually trying to economise in every part of the organisation" [2, p. 113]) Dawkins, on the other hand, personifies genes and organisms. Clearly, both Darwin and Dawkins use personification clearly as a didactic tool to make complex ideas simpler for their lay-audiences. But it is a mistake to suppose that this is only done in their function as popularizers[2]. Instead, I argue that personification is used as an *analytical* way ("breaking down a complex phenomenon into a simple principle") of knowing by which professional biologists make discoveries and come to understand the world.

Both Darwin and Dawkins are at pains to stress that we should not take their personification *literally*.

> So again it is difficult to avoid personifying the word Nature; but I mean by Nature, only the aggregate action and product of many natural laws, and by laws the sequence of events as ascertained by us.
>
> — Darwin, Origin of Species

In her introduction to the 2009 reprint of Darwin's *Origin of Species*, Gillian Beer argues that Darwin *needs* a strongly personified view of Nature, going beyond a metaphorical one [5]. This is evident, for example, in the following passage:

> as man can certainly produce great results by adding up in any given direction mere individual differences, so could Nature, but far more easily, from having incomparably longer time at her disposal
>
> — *Origin of Species* [2, p. 64]

Dawkins is more forceful:

> Personification of genes really ought not to be a problem, because no sane person thinks DNA molecules have conscious personalities, and no sensible reader would impute such a delusion to an author.
>
> — *Selfish Gene* (30th Ann. Ed.) Prologue p. xi [6]

Indeed, this passage appears to endow Nature with the agency to "produce great results". However, Beer doesn't make it clear what she means by "needs". If she means that Darwin's *theory* needs a strong personification of Nature, that is to say - that *Origin of Species* could not make its argument

[2] I should stress that both *Selfish Gene* and *Origin* are written primarily for educated general readers, not professional biologists - although of course many professional biologists have read these works.

cogently *without* resorting to the personification of Nature as an *explanans*, I strongly disagree. Instead, Darwin's use of the metaphor as such is perfectly justified by his own explanation for it:

In other words, the use of a personified *Nature* is not essential to the argument for natural selection, but serves merely as a useful shorthand for the many natural laws which lead to the survival of some and death of other species. This begs the question, if Darwin knew that the personification of Nature was a merely a convenient metaphor, why was he not more careful about avoiding passages like these in *Origin*:

> Nature acts uniformly and slowly during vast periods of time on the whole organisation, in any way which may be for each creature's own good
>
> — Darwin, Origin of Species

I can think of two reasons. First, as mentioned - it is a useful shortcut and thus a good didactic tool. A central part of the Origin of Species is to draw analogies between artificial selection and natural selection. By comparing Nature to a human breeder ("as man can certainly produce great results… so could Nature"), he uses the familiar to make the radical intelligible.

But there is another, perhaps more important reason why Darwin personifies *Nature* despite the risks of being taken literally. To understand that, we must turn to the social context in which Darwin was working. We have to understand that Darwin was addressing a broadly educated audience and writing as a popular science writer in addition to an accredited naturalist: Parts of *Origin of Species* have the lyricism that made *Voyages of the Beagle* of a huge success, whereas others read more like his dense technical writing in **The Structure and Distribution of Coral Reefs** or the **Study of the Cirripedia**. He was thus ready to be met with moral as well as biological objections. In particular, the objection that Darwin's ideas were fundamentally more bleak than natural theology, which viewed "all manifestations of nature" as "aspects of a relationship between God and Man" [5]. Personifying Nature, therefore, helped soften the moral blow by maintaining the awesomeness of creation - replacing a real, active God with a personified, metaphorical Nature.

However, if Gillian Beer uses "needs" to mean that Darwin's everyday practice as a biologist led him to personify Nature, then I agree. In this case, we can view the personification of Nature as an epistemic practice typical of 19th century biology which has fallen out of favour (giving a way to the personification of genes and organisms in ways I shall detail below). Darwin undoubtedly used the personification of Nature in this latter way when formulating and refining his theory of Natural Selection. This is because the parallels that he saw between *natural selection* and *artificial selection* aren't merely analogies he uses to drive the point home to his Victorian audience, but it is how *he himself stumbled across the theory* (if we believe Darwin, and we have no reason to disbelieve his words on this point).

While Nature is elevated with metaphorical agencies, Darwin's organisms stay blissfully ignorant of their role in evolutionary change. We will see that the view presented by Dawkins is quite different.

By 1976, biologists no longer needed to "soften the moral blow" of natural selection, which was generally accepted as the main mechanism that explains the evolution of species. Instead, they needed tools to navigate the complex, data- mathematics, and computation-heavy practice of the Modern Synthesis of biology. Personification was one of these tools. Thus, Dawkins states that "natural selection for selfish genes tends to favour cooperation among genes", ascribing the (anthropomorphic) quality of cooperation to genes. Dawkins responded to accusations of his anthropomorphizing genes by arguing that "no sane person thinks DNA molecules have conscious personalities". He defends his hero D.W Hamilton's decision to "attribute to the genes, temporarily,

intelligence and a certain freedom of choice" in explaining why the sterility of worker ants did not provide problems with evolution [4]. Moreover, he argues that personification of this kind is not "just a quaint didactic device" - in "Darwinian calculations of altruism and selfishness [...] it is very easy to get the wrong answer. Personifying genes, [...] often turns out to be the shortest route to rescuing a Darwinian theorist drowning in muddle". Thus, the *personification of genes* becomes an epistemic practice to short-cut the complex mathematics involved in the computation of relative gene frequencies. But Dawkins does not just personify genes; organisms get the same treatment. On page 168 of the *Selfish Gene* we find him arguing :

> As soon as a runt becomes so small and weak that his expectation of life is reduced to the point where benefit to him due to parental investment is less than half the benefit that the same investment could potentially confer on the other babies, the run should die gracefully and willingly. He can benefit his genes most by doing so.
>
> — Selfish Gene, p168

Here, Dawkins is not literally describing the internal mental state of the runt. Instead, a gene-centric theory of evolution implies that animals have been loaded with instincts which function *as-if* they were constantly maximising their chance of passing on their genes. Thus, the *personification of the organism* acts as another epistemic short-cut (just like the personification of the gene), allowing the biologist to quickly arrive results that would be impossibly laborious and error-prone to achieve with mathematical modelling. The runt's personification is really a product of the genes that it makes up, which themselves are personified, as we saw:

> A gene that gives the [runt] the instruction, "Body, if you are very much smaller than your litter-mates, give up the struggle and die" could be successful in the gene pool, because it has a 50 per cent chance of being in the body of each brother and sister saved.
>
> — Selfish Gene, p168

So, both Darwin and Dawkins use personification both as an epistemic practice as biologists and as a didactic tool for their readers. Whereas Darwin was carefully anticipating the perceived incompatibility of evolution and Victorian Morality, Dawkins does not have these sensitivities to modern-day moral objections to Darwinism: "If something is true, no amount of wishful thinking can undo it" [6].

Nevertheless, Dawkins writes that the fact[3] that genes have survived for billions of years means they are selfish, and the fact that genes are selfish means organisms are selfish too, most of the time (with some limited altruism when it aids the survival of the genes). Whereas for Darwin, natural selection places agency on the divine Nature, for Dawkins "anything that has evolved by natural selection is selfish" [6, p. 5]

Now that we have introduced personification as a key epistemic category in both Darwinian and the Neo-Darwinian paradigms, let us explain why specieshood appears to keep being essentialized despite there being no good reason from biology to do this.

In *Why Classify?*, Richards points out that the view of Darwin's unfinished *Natural Selection* seemed to be at odds with philosophers in the mid-twentieth century on their view of species. Mid-twentieth philosophers saw species as natural kinds, or categories that "cut nature at the joints", as it were (based on a realist ontology in which nature is really made up of various "stuff" put together

[3]Using the analogy of Chicago gangsters

somehow - a *natural kind* is a cateogyr that maps cleanly onto this "stuff") [7]. But there is no need, as Richards does, to dig through Darwin's unfinished manuscripts to understand what he thought about species. It is clear as day in *Origin*: "there is no fundamental distinction between species and varieties".

was at odds with pointed out, Darwin had a conventional view of species. Pickstone argues that it was the influence of experimentation and a shift from the 'natural history' to 'analytica' way of knowing that meant that species lost some of their 'given-ness' [1, p. 102]. Indeed, Darwin writes that is was general knowledge that species have been endowed with the property of offspring between different species being sterile:

The sterility of hybrids is especially difficult for natural selection to explain, because the sterility of an organism cannot possibly bring it any advantages to its survival and reproduction, which is a core mechanism of the theory. Darwin cites experiments done by

This challenge to species *essentialism* is indeed a focus on a reinterpretation of existing experiments in plant hybridization. But Darwin also draws on the *natural history* way of knowing by citing that in pure observational-classificatory terms (i.e without recourse to experiment), naturalists disagree over whether to use the word "species" or "varieties" in certain plants:

> "Mr. H. C. Watson has marked for me in the well-sifted London Catalogue of Plants (4th edition) 63 plants which are therein ranked as species, but which he considers as so closely allied to other species as to be of doubtful value: these 63 reputed species range on an average over 6.9 of the provinces into which Mr. Watson has divided Great Britain. Now, in this same catalogue, 53 acknowledged varieties are recorded, and these range over 77 provinces; whereas the species to which these varieties belong range over 143 provinces. So that the acknowledged varieties have very nearly the same restricted average range, as have those very closely allied forms, marked for me by Mr. Watson as doubtful species, but which are almost universally ranked by British botanists as true and good species."

Darwin was mainly trying to destroy essentialism in species. Dawkins was mainly trying to destroy the belief that altruism arises because of animal instincts that evolved because of group selection or the 'survival value for the species'. For both of them, species was a not a good analytical category.

Finally, Darwin concludes: "the facts briefly given in this chapter do not seem to me opposed to, but even rather to support the view, that there is no fundamental distinction between species and varieties". Most of these facts are about experimental hybridization, not natural history.

Key biological facts

- Species are not specially endowed with sterility of first crosses to keep them "separate" from each other.
- Essentialism vs Nominalism.

Applying Currie and Levy's typology to the Gärtner and Kölreuter hybridization experiments, as shown in Origins Ch8

Dawkins

Griffiths argues that a major shift in animal ethology in the 1970s was a foregrounding of two of Tinbergen's four research questions of animal behavior: (1) causation, (2) survival value, (3) ontogeny, and (4) evolution. It was the domination of the adaptationist programme in English-

speaking ethology that put the emphasis on (2) and (4) at the detriment of (1) and (3). The *The Selfish Gene* should be read with this in mind.

- The point of the *The Selfish Gene* is to study the examine the implications of Darwinism for "selfishness and altruism". It is an unfortunate phrase as it cemented the association of human selfishness with the "selfish gene", an issue that Dawkins himself lamented.

Topics I would like to cover

- Different biology practices culminating in Origin vs in SG
- Dawkins explains altruism through kin selection. How does Dawkins do this
- The Eclipse of Darwinism
- What Darwin actually argued and its metaphysical presuppositions / historical context and roots
- What Dawkins actually argued and its metaphysical / historical context
- Problem of evil

Similarity & Contrast

- Similarity
  - Both have been described as expounding a *cold, bleak message*
  - Both have been accused of having bleak social and philosophical implications.
- Contrasts
  - Darwin believed that most amount of competition is between similar organisms, whereas Dawkins believes in kinship-inspired altruism - this is quite a contrast
  - Darwin had the problem of dilution of inheritance, Dawkins doesn't have that by switching the unit of selection to the organism
- From reproduction to replication

Problem of Evil? Altruism Essentialises Specieshood

- Asa Gray considered natural selection to be the main mechanism of evolution and sought to reconcile it with natural theology. He proposed that natural selection could be a mechanism in which the problem of evil of suffering produced the greater good of adaptation.[4]
- Darwin was a nominalist. Dawkins was a nominalist. Why is Richards surprised by the nominalism, acting as if this wasn't a central argument of Origin of Species? It has to do with altruism - explanations of altruism as "group selection" acted as an essentialising force, perpetuating the idea of the "species as a natural kind". It was only the gene-centered view of evolution that cleared this up and again removed the need of the species as an important analytical ("natural" category)

Richard Dawkins gives another example of what may have essentialized specieshood

> Recently there has been a reaction against racialism and patriotism, and a tendency to substitute the whole human species as the object of our fellow feeling. This humanist broadening of the target of our altruism has an interesting corollary, which again seems to buttress the 'good of the species' idea in evolution.
>
> — Dawkins

Group Selection

Cite Wynne Edwards and Robert Audrey The Social Contract also [6, p. 9].

[4] https://en.wikipedia.org/wiki/The_eclipse_of_Darwinism

Introduction: Dawkins & Darwin Deep Dive

Explanations for Altruism post-Darwin

Before Darwin, altruism in humans did not need explaining. Dawkins points out that "anything that evolved by natural selection is selfish" [6, p. 5]. So how is it explained? Many people sought to explain it in terms of "the good of the species" but this did not work because a single selfish individual would dominate a group of altuists. Dawkins explains that a gene-centered view of evolution explains altruism as a limited form of cooperation among oranisms, for the sake of the survival of the genes - kin selection and reciprocal alstruism. So he uses *gene selfishness* to explain altuisim and selfihsness at the level or organismss.

In Defense of *Origin of Species* as a popular science book

At first it may be objected that we are unfairly comparing an original contribution to science (*Origin*), with 'merely' a popular, though influential, science book (*Sefish Gene*). But this would be a misunderstanding of both books: Despite revolutionizing the field, Darwin's *Origin* had as a target audience of both expert naturalists and a broad, educated public. As Gillian Beer writes, Darwin wanted his ideas to be "available simultaneously to Darwin's fellow-workers in science and to any educated person" [5, p. viii]. Similarly, Dawkin's *Selfish Gene* did not merely try to popularize ideas already swirling around in biology circles. He clearly targeted.

Miscellaneous notes on Darwin's origin of species

Darwin's *Origin of Species* is a work full of contradictions. It written for non-specialist readers and yet had a profound impact on biology. Although its main purpose was to explain the mechanism of natural selection and argue for its centrality in evolutionary change, the main impact of the book was to increase acceptance of species transmutation - the centrality of natural selection remained a minority view in biology until the 1930s.

Darwin's theory was pithily captured in the "Instinct" chapter

Darwin's book proposes "one general law, leading to the advancement of all organic beings", which he called "natural selection", pithily summarized as "multiply, vary, let the strongest[5] live and the weakest die." [2, p181, ch7]. It is commonly argued Dawkins applied this logic but substituted the *organism* for the *gene*. However, as Dawkins clarifies in the Introduction to the 30th anniversary edition of the Selfish Gene: "there are two kinds of units of natural selection, and there is no dispute between them. The gene is the unit in the sense of a replicator. The organism is the unit in the sense of the vehicle. Both are important. "

Introducing the Selfish Gene

The *Selfish Gene* can be understood as the most successful popular account of the Modern Evolutionary Synthesis of the 1930s and 1950s.

[5] As the rest of Darwin's writings make clear, *strongest* should be taken to mean *best adapted to its environment*, which could mean the *most camouflaged* or the *most cooperative* depending on the situation!

Naming Woes

Darwin does not need a strongly personified Nature for any explanatory reasons, but he does need them in a (failed) attempt to quell public backlash

Darwin vs Dawkins

Important differences: Dawkins was clearing up a confusion that primarily existed among high school biology level, whereas Darwin was going against a view adopted by many naturalists. Although Darwin sites even Konrad Lorenz as misunderstanding orthodox Darwinism in *On Aggression* [6, p. 11]

Commentators mistake the centrality of symbiosis to Darwin's view of life

> 'Let it be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life'

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