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Personification as Epistemic Practice & The Persistent Essentialisation of Specieshood

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Abstract

This essay makes two arguments. First, personification - attributing intelligence and motivation to an entity purely for the sake of analysis - was a core epistemic practice both for Charles Darwin and for 20th century sociobiologists. Second, 'specieshood' is unjustifiably essentialized - that is, treated as a 'natural category' - implicitly in general culture, and explicitly in some academic philosophy. This is surprising because biological orthodoxy since Darwin has treated 'species' as a conventional category. This essentialization begs an explanation; we propose this is caused by the perpetuation of old-fashioned biological explanations for human and animal altruism (for the 'good of the species'), combined with a philosophical or moral aversion to the orthodox, gene-centric, sociobiological explanations for it (kinship theory and reciprocity). We come to these conclusions by reading Charles Darwin's *On The Origin of Species* (1859)¹ and Richard Dawkins' *Selfish Gene*²

187 words

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Introduction

If only because they are widely considered³ the most influential biology books of the 19th and 20th centuries respectively, a close reading of Charles Darwin's *On The Origin of Species* (1859) and Richard Dawkins' *The Selfish Gene* (1976) would seem a compelling way to reveal the evolving core practices and prejudices of professional biologists.

¹We will be using the second edition, and making use of the excellent introduction by Gillian Beer [1]

²We note that this year marks this book's 50th anniversary. We will be using the 40th anniversary edition, which includes several endnotes and 21st century reflections by the author [2].

³Just to name one measure of popularity: they are placed No. 1 and No. 3 respectively on Science Direct's list of 'Top 10 Most influential popular science books' [3].

Summary of Books

Before we turn to epistemic practices, we shall first provide a brief summary of our primary sources. Darwin's *Origin of Species* argues against the immutability of species, and proposes *natural selection* as the dominant driver of species change. *Origin* was instrumental in convincing biologists of the reality of *evolution*, but it took almost five decades for them to warm up to *natural selection* as the main driver, a period with Julian Huxley has called 'the eclipse of darwinism' [4]. 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 [5]. Dawkins' *Selfish Gene* put into vivid words for a popular audience what had mostly been implicit in the mathematical modelling of gene frequencies by biologists working in this tradition. The 'selfishness' in *Selfish Gene* (1976) – an example of personification (which we shall argue is a 'way of knowing') – is due to the observation that any self-replicating entity that has survived for half a billion years would appear to be ruthlessly self-interested [2, p. 2]

Ways of Knowing Illustrated from Darwin to Dawkins

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* (explaining complex by reducing them to their simpler constituents) and *experimentation* (controlling phenomena and systematically creating novelties). 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*) [6].

We next illustrate Pickstone's ways of knowing using examples from *Origin* and *The Selfish Gene*. We start with *natural history*. A core argument in *On The Origin of Species* is the de-essentialisation of 'species'. After all, Darwin faced a steep hill of prejudice in trying to convince his Victorian audience that species are mutable. He therefore begins with the less controversial (but crucial) claim that 'specieshood' is a conventional category, not a natural one. His argument relies on *natural history* because it is based on existing plant catalogues kept by H.C Watson. He argues that the line between 'species' and 'varieties' is blurred, and in fact seems to depend on *human categorization*, rather than a divine one. Darwin begins by introducing 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 Watson's catalogue, he shows that what some naturalists have called 'real varieties', others have called 'doubtful species'. It is therefore a matter of opinion:

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

– Darwin 1859, *Origin* [7, p. 47]

The geographic range of types of organisms 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.

— [7, p. 47]

Next, we illustrate Pickstone's *experimental* way of knowing with another example from *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 (so-called "crosses"). He starts by reminding the reader of the 'standard view' among his contemporaries in natural theology, in which species are an essential category, specially endowed with intercross-infertility:

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.

— [7, p. 182]

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

two most careful experimentalists who have ever lived, have come to diametrically opposite conclusions [...] The sterility is of all degrees [...] 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.

— [7, Ch8, p. 204]

He concludes that that intercross-infertility is not a specially endowed quality. If it were, then we would expect results from hybridization experiments to be systematic. Instead, they are subject to extreme variation and seemingly inscrutable irregularities. 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 "grafted 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.

As we have seen, Darwin used *experimental* and *natural-historical* ways of knowing to arrive at a key part of his thesis: that speciousness is not a *natural kind*. Instead, they are simply varieties of organisms that happen to be different enough that we humans call them different species. This opens up a path for Darwin to argue that 'varieties' are simply 'incipient species', a key part of his argument for evolution by natural selection.

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" [6, 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 [8], 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 [9]. 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.

We will mention another example of *analysis* from sociobiology as it will be germane to our later discussion of altruism and the essentialisation of specieshood. When you get stung by a honeybee, the bee loses its barbed stinger and dies. Why would natural selection perpetuate this trait when it is clearly terminal to the individual organism? A common explanation - a central target which the *Selfish Gene* tries to debunk, is that in this case natural selection is operating at the *species*-level: A species of bee with kamikaze fighters is more likely to survive than a species without them. But analytical tools employed by sociobiologists in the 1950s and 60s found that there is no evidence for this: mathematical proofs are employed to show that a populations of bees, in which each bee has variable altruism, are vulnerable to being overrun by less altruistic individuals (because they reap the protection of the hive without paying the cost of defense [10]). In these models, altruistic bees get *wiped out* by natural selection even when multiple groups are pitted against each other. John Maynard Smith proved that for species selection to work, species have to be so isolated and go extinct so fast that it almost never happens in nature [11]. Species selection was largely abandoned in professional biology in the 1960s [7], and yet, I argue, its deceptive simplicity and common-sense appeal is a key reason why the 'species' concept continues to be treated as a 'natural kind' in academic philosophy and popular culture. After all, if the *species concept* is an essential category for understanding such key traits as human and animal altruism, then it must be a 'natural category' - it must 'cut nature at the joints', to use Plato's phrase⁴ [12].

So, how does it work? Why are organisms altruistic. John Maynard Smith coined the term 'kin selection' to explain this. The bees, shares many genes with their hivemates. Genes which will create kamikaze like behavior in their 'vehicle bees' will more likely be passed on than genes that do not [13]. The analytical tool here is the 'coefficient of relatedness r '. An altruistic behavior is naturally selected for when $rb > c$ (b is the benefit to the recipient and c is the cost to the actor). One analytical reason why bees are the ultimate altruists is that a genetic quirk called haplodiploidy which means that they share more genetic material with their sisters than with their offspring. From a 'selfish gene' perspective, a worker bee is actually "reproducing" more effectively by dying to save three sisters ($3 \times 0.75 = 2.25$) than she would be by staying alive to have four daughters ($4 \times 0.5 = 2.0$). We reiterate that this is a Pickstonian case of *analysis* - we have reduced a complicated social relationship in a bee hive to a necessary consequence of a simple genetic regularity

Now that we have elucidated Pickstone's ways of knowing using several illustrative examples. we turn to personification. I argue that personification is not merely a literary or didactic device, but as a core part of the epistemic practice of biology both for Charles Darwin and for the neo-Darwinian 'modern synthesis' of sociobiology.

Personification as Epistemic Practice

Darwin personifies *Nature* and *natural selection*⁵. Dawkins, on the other hand, personifies *genes*⁶ and

⁴The phrase "cutting nature at its joints" comes from Plato's *Phaedrus*, often used in modern philosophy of biology to discuss whether categories like 'species' are objective features of the world or human inventions.

⁵"*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" [7, p. 199] or "*natural selection* is continually trying to economise in every part of the organisation" [7, p. 113] (emphasis mine)

⁶Calling a gene 'selfish' is an example of this, as we have seen

*organisms*⁷. That personification is used as a didactic tool to make complex ideas simpler to understand, is not in dispute. After all, both *Selfish Gene* and *Origin* are written primarily for educated general readers⁸, not professional biologists - although it is reasonable to suppose that professional biologists are overrepresented in the readership of these books. Instead, I argue that personification is used as an *analytical* way of knowing (“breaking down a complex phenomenon into a simple principle”) 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*

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 [2]

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 [1]. 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* [7, p. 64]

Nature appears to be endowed by the agency to “produce great results”. Indeed, if we are to believe Darwin’s words, the observations of human selection on animals left a deep impression on him. Reasoning from analogy with an active human selector was a key insight that led him to formulate his *natural selection theory*. It is not merely a didactic device, but a way of knowing.

By pointing out the connection between the breeding of pedigree animals for money and the emergence of Darwinian selection, Pickstone, citing Desmond and Moore’s autobiography of Darwin [17], has argued that the influence of commercially-driven experimentation was a key driver for biology in the 19th century [6, p. 30]

⁷The personification of organisms is a bit trickier to understand. We do not mean the attribution of motivations and desires that the animal *clearly already has*. So saying ‘the animal is hungry’ is not a personification in the Dawkinsian sense. Instead, we attribute to the organism the motivation of increasing the chance that her genes are promulgated

⁸We don’t shy away from saying that they are both works of popular science. However, we have to concede that, while some of *Origin of Species* has the lyricism that made the popular *Voyages of the Beagle* (1839) [14] a huge success, other sections mirror his dense technical writing in *The Structure and Distribution of Coral Reefs* (1842) [15] or the *Study of the Cirripedia* (1851) [16]

In Britain from 1750, cattle and sheep were changed radically as breeders sought marketable characteristics and faster growth. Sheep [...] were machines for turning grass into money; they could be redesigned to do so more efficiently. And that new mutability of domestic animals was well known both to Charles Darwin [...] both the theory of evolution by natural selection and Mendel's work on inheritance can be shown to have built on this shift in breeding technology.

– Pickstone 2004, *Ways of Knowing* [6, p. 30]

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 novel intelligible to a Victorian audience. We have to remember the moral objections that Victorian audiences had in accepting evolution by natural selection. Evolutionism was an obvious threat to the “assumption that all manifestations of nature are aspects of a relationship between God and Man” [1]. A common sentiment, which we will illustrate with a 1846 Irish newspaper article review of a pre-Darwinian book on evolution, was that it reduced “morality to a mechanical process” [18]. Personifying Nature, therefore, helped soften the moral blow by maintaining the awesomeness of creation - replacing a real, active God with a personified, metaphorical Nature.

If analogies with human selection are how Darwin stumbled upon his theory in the first place, then Beer's suggestion that Darwin's theory “needs” a more strongly personified nature than a purely metaphorical one, is spot on. Darwin's everyday practice as a biologist led him to personify Nature. 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* as we shall detail below).

While Nature is elevated with metaphorical agencies, Darwin's organisms stay blissfully ignorant of their role in evolutionary change. Darwin does not personify organisms because the motivations and intelligence he attributes to them are all real, not hypothetical. We will see that the case is different for Dawkins.

By the 1960s and 1970s biologists no longer needed to “soften the moral blow” of evolution by natural selection, as it was generally accepted as the main mechanism that explains the evolution of species. Instead, they needed tools to navigate the complex, mathematics-heavy and turn in sociobiology known as 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. Thus, he defends his 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 can be explained using kin selection [9]. 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”.

– Dawkins 1976, *The Selfish Gene* [2, Introd. p. xii]

Thus, the *personification of genes* becomes a way of knowing the answer to the complex mathematics without having to slog through probabilistic calculations involving relative gene frequencies. But Dawkins does not just personify genes; organisms get the same treatment. On page 168 of the *Selfish Gene* we find the following representative argument:

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.

– Dawkins 1977, *The Selfish Gene*, [2, p. 168]

Dawkins does not describe the *actual* mental state of the run. The runt doesn't *actually* have the motivation and intelligence to rationally calculate which course of action will increase its chances of passing on its genes. And yet, the effects of gene selection are such that we can attribute this intelligence to it for the purposes of *analysis*. 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 more laborious and error-prone to achieve with mathematical modelling. Dawkins explains:

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 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. But the practice of personification is kept because it is a key tool to making sense of the biological world.

The essentialisation of specieshood

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 for this from orthodox biology .

Biology tells us ‘species’ are conventional categories

As we have seen, Darwin has argued that species are conventional, vague, human categories. It formed a core part of his *Origin of Species*. Moreover, the very definition of a species is unclear. The most commonly taught high-school version is “groups of organisms that can mutually interbreed”, but this definition of species only applies to a small fraction of sexually reproducing life. This contestation is not problematic for biology. There is no major research program to discover “what is a species, really?”. Just like a doctor does not need an exact definition of “brain” in order to perform brain surgery, neither to biologists. A key characteristic of a conventional category is that it is an actor's category: readily understood by the actors that use it.

Philosophers insist that species are natural kinds

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 [12]. But there is no need, as Richards does, to dig through Darwin's unfinished manuscripts to understand what he thought about species. Darwin also says it explicitly: “there is no fundamental distinction between species and varieties” [7, p. 205]. In fact, as we have discussed, it is only a slight exaggeration to say it is a central thesis of *Origin*.

Popular biology insists that species are natural kinds

It is not just mid-twentieth century academic philosophy that maintains species essentialism. Public engagement of biology is still built on the reification of the species concept. In the Amsterdam Museum *Micropia*, gullible visitors are told that there are between 10million and 100million species on the planet, without any expectation that such a wild range of uncertainty might be a sign that at the level of microbes, specieshood ceases to be a useful analytical category. Calls to conservation are also guilty of reifying specieshood. Indeed it is hard to conceive of wildlife protection without a 'list of endangered species'.

Why is this happening?

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). Nevertheless, the considerable pushback from philosophers and culture at large against the Modern Synthesis as expressed by the *Selfish Gene* explains why group selection, with its essentialization of the species, is still kicking around as an alternative to orthodox, gene-centric explanations

Dawkins is given the word:

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

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