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Darwinian Enchantment

Die Geisterwelt ist nicht verschlossen;
Dein Sinn ist zu, dein Herz ist tot!
Auf, bade, Schüler, unverdrossen
Die ird'sche Brust im Morgenrot!¹

Goethe, *Faust*

Max Weber, in his darkly elusive essay “Science as a Vocation” (*Wissenschaft als Beruf*, 1919), attempted to specify both the purpose and moral dimensions of modern science. The purpose was stark: to establish the facts of a given matter and to assess the logical and mathematical relationships among them. Science per se could not—rather, should not—attempt to demonstrate the validity of any moral precepts nor should the scientist qua scientist clothe a naked world with diverting personal values: “wherever the man of science introduces his own value judgment, there a complete understanding of the facts ceases.”² Weber went further. Modern, progressive science, grounded in intellect and reason, excluded from the natural world spiritual forces, and thus striped away the enchanting colors of a multi-dimensional universe, leaving but a bare gray framework. Weberian science was constituted by the conviction that

¹ The spirit world has not yet ceased to be./ Your mind is closed, your heart is dead./Come now, you novice, bath sans misery/ Your earthly breast in morning's hue of red.

² Max Weber, “Wissenschaft als Beruf,” in *Max Weber Schriften 1894-1922*, ed. Dirk Kaesler (Stuttgart: Kröner, 2002), p. 498.

one *could*, if one wished, learn about some matter, that, therefore, there were no mysterious, unfathomable forces at play, that one could control all things, in principle, through reasoning [*Berechnen*]. That means: the disenchantment [*Entzauberung*] of the world.³

In this essay, I wish to investigate the state of Darwin's world. His theory has been cast by both supporters and opponents as replacing a mind-graced nature with a universal mechanism bereft of moral value; his theory, they suppose, rendered the modern world disenchanted. George Bernard Shaw, in the preface to his play *Back to Methuselah* (1921), expressed his century's growing fear of the gray specter of Darwinism:

You cannot understand Moses without imagination nor Spurgeon [a famous preacher of the day] without metaphysics; but you can be a thorough going Neo-Darwinian without imagination, metaphysics, poetry, conscience, or decency. For "Natural Selection" has no moral significance: it deals with that part of evolution which has no purpose, no intelligence, and might more appropriately be called accidental selection, or better still, Un-natural Selection, since nothing is more unnatural than an accident. If it could be proved that the whole universe had been produced by such Selection, only fools and rascals could bear to live.⁴

I don't believe Shaw is correct in his assessment, and I propose to show that in the Darwinian world one can still hear the sweet birds sing. Darwinian nature, at least

³ Ibid., p. 488.

⁴ George Bernard Shaw, "Preface," *Back to Methuselah* (London: Penguin Books, [1921] 1961), p. 44.

as originally conceived by its author, was not denuded of spiritual power or moral value as both Weber and Shaw presumed it was; at least, that is what I will argue in the first part of this essay. But what about our contemporary, neo-Darwinian world? Does it orbit a dying sun and itself a dead planet where hope and moral possibility exist only as fossils of an earlier time? Contemporary religious objectors, such as those in the Intelligent Design movement, as well as their opponents among the “New Atheists,” all seem to agree with Shaw that Darwin disenchanting the world and that, if Darwinism prevails, the world will remain a bare ruined choir. I believe this also to be a mistaken judgment, and in the second part of this essay I’ll attempt to suggest why.

Whewell’s Challenge

A cursory examination of the history of Western science would seem to confirm Weber’s analysis. During the scientific revolution, the Aristotelian universe was dismantled, at least in part: Newton established gravity as the calculable force governing the operation of material bodies—a force, in his abstemious judgment, that was only a mathematical relationship among bodies. True, Newton still required God as the substrate of space and time and as a benign watchman who occasionally had to adjust the mechanisms of planetary motion. In succeeding centuries, the scope of extra-human intentional forces further diminished as the natural and social sciences advanced in power and range. Kant and Laplace found resources within Newton’s own physics by which to eliminate the need for the God hypothesis in astronomy. At the end of the eighteenth century, demons had been exorcized from dominion over the mad by the new doctors of the mind, Philippe Pinel in France and Johann Christian Reil in

Germany, who demonstrated that mental illness was amenable to medical intervention. Yet, biology, at least at the beginning of the nineteenth century, seemed resistant to the grinding gears of mechanistic science. Kant had declared that there could be no Newton of the grass blade, and the influential British Kantian, William Whewell, concurred.

In his *History of the Inductive Sciences* (1837), Whewell demanded strict separation of science from theology.⁵ Science operated on the basis of empirical evidence and rational inference, which yielded explanatory laws, whereas theology depended on revelation and hope, which succored a faith in “things not seen.” Science explored the mechanistic framework of nature and the principles of its operation; theology unveiled the spiritual forces that erected the framework and authored its laws.⁶ From Whewell’s perspective, one shared by such eminent biologists as Georges Cuvier and Louis Agassiz, biological organisms manifested teleological properties. In Cuvier’s terms, they were subject to the “conditions of existence”: internally, the parts of organisms were tightly knit together in means-ends relationships; and externally, the parts of organisms fit into their environmental stations with such precision that any significant alterations of parts—or the environment—would cause extinction of the organism and its type. Whewell agreed: clearly, organisms were purposively designed; indeed, our mind had been so molded in our interactions with the living world that we reflexively analyzed creatures employing concepts permeated with purpose.

⁵ William Whewell, *History of the Inductive Sciences, from Earliest to Present Times, 3rd ed.*, 3 vols. (London: Parker & Son, [1837] 1857). The changes in the subsequent editions are marked in separate sections. The main text is that of the 1st edition of 1837.

⁶ *Ibid.*, 3:

Nonetheless, as a Kantian, Whewell forbade a leap into the transcendent sphere to explain the designed structure of organisms. Science remained rooted in empirical observation and fixed law, and epistemological strictures confined its operations to the natural world.

The fossil evidence, according to Whewell, did indicate the extinction of ancient organisms and their replacement by progressively higher creatures. But this did not allow any inference of the sort made by Lamarck. Cuvier had shown that over long periods of time no fundamental alteration of species had occurred: mummies of humans, cats, and deer from Egyptian tombs remained recognizably the same as those living in Paris and in the woods around the city; moreover, the “conditions of existence” would have prevented fundamental species change. Both fact and theory thus argued that “*species have a real existence in nature and a transmutation from one to another does not exist.*”⁷ Since the scientist could not appeal to scripture for the needed miracles to explain the progressive replacement of species and since lawful physical causes did not avail, rational inquiry into the origin of species was forestalled. From a scientific point of view, the matter remained “shrouded in mystery, and [was] not to be approached without reverence.”⁸

Whewell thus set the problematic for the British biological disciplines in the first part of the nineteenth century: 1) organic life conformed to natural law, while also manifesting teleological, purposive structures; 2) fossil evidence indicated a progressive advance of species over time; 4) but no scientific argument employing natural laws

⁷ Ibid., 3: 478.

⁸ Ibid., p. 476.

could furnish an account of the intelligent design of organisms or their progressive appearance in the fossil record. The origin of species with their adaptive structures was thus scientifically intractable; only theology might advance a resolution of the mystery.

Darwin's Response to the Challenge

Darwin had read Whewell's *History of the Inductive Sciences* (1837) a few months after he had returned from his *Beagle* voyage, and he left significant marginalia to indicate that he had carefully considered the older scientist's articulation of the problem of a scientific approach to organic life.⁹ He undertook the challenge that Whewell had implicitly laid down. In spring of 1837, just before taking up the Whewell's *History*, the young naturalist had broached the problem of the origin of species. He believed he could construct a scientific theory that would accomplish what Whewell thought impossible, a theory that relied only on empirical fact and natural law but that nonetheless might explain the intelligent design of organisms and their progressive advance. Moreover, Darwin came to believe he could demonstrate what Whewell entirely excluded from the probing hand of biological inquiry: namely, that "man himself, with all his intellectual and moral, as well as physical privileges, has been derived from some creature of the ape or baboon tribe."¹⁰ In the *Origin of Species*, Darwin would construct a theory whose principal task was to explain "the most exalted object we are

⁹ Darwin obtained a copy of Whewell's volumes shortly after they were published in 1837. See Charles Darwin to Charles Babbage (June-September 1837), in *The Correspondence of Charles Darwin*, ed., Frederick Burkhardt et al, 17 vols. to date (Cambridge: Cambridge University Press, 1985-), 2: 22.

¹⁰ Whewell, *History of the Inductive Sciences*, 3: 480.

capable of conceiving, namely, the production of the higher animals,"¹¹ that is, human beings with their moral instincts.

The Foundations of Darwin's Theory

After he returned from his *Beagle* voyage in late 1836 and began the job of sorting and cataloguing the specimens he brought back, Darwin became convinced that what he had initially reckoned as three varieties of one species of mockingbird produced by environmental interactions were actually three separate species. Primed with knowledge of his grandfather Erasmus Darwin's transmutational views as well as those of Lamarck, he quickly became convinced that his mockingbirds had been radically transformed. In early spring of 1837, he began to construct a theory of species change. Initially he supposed that each species might have a fixed life-span and that just before one species exhausted its last another would be born from the old. He quickly came to see, however, that the more likely source of species demise was environmental change. Charles Lyell, the geologist from whom Darwin thought half his brain had come, had a roughly similar view. Lyell believed that when the environment altered significantly, it would disrupt a species' intimate relationship with its surroundings, resulting in extinction. Lyell suggested that the temporary imbalance in nature would be made good by the appearance of another, replacement species; he hinted that the scales had been readjusted by the divine hand—a suggestion that Whewell would disdainfully dismiss.¹² Lyell did not think of the replacement as an improvement on departed life; indeed, he

¹¹ Charles Darwin, *Origin of Species* (London: Murray, 1859), p. 490.

¹² Whewell, *History of the Inductive Sciences*, 3: 489.

presumed that in the course of time the same type of creatures would reappear on the earth, that the dinosaurs that Richard Owen had discovered would again roam the countryside. Darwin, by contrast, assumed that the replacement of species through geological change would be progressive. As he put it in his *E Notebook* shortly after reading Malthus and initially formulating his concept of natural selection: “My theory certainly requires progression.”¹³ But when he wrote that, his theory was mostly scattered ideas and uncertain aspirations.

Through the last half of 1837 to the fall of 1838, Darwin proposed two forces that might cause the alteration and progressive development of species: the direct effects of the environment and inherited habit. The latter device might explain, for example, how certain water-birds acquired their webbed feet: the habit of swimming out on the water to feed would, after generations of practice, become instinctual; and such instinct, in its turn, would require the stretching of the birds’ toes, which would eventually produce an extension of skin between the toes. He thus concluded: “All structures either direct effect of habit, or hereditary & combined effect of habit.”¹⁴ Darwin thought this mode of account, because it did not attribute anatomical change directly to the actions of conscious will, to have escaped the usual objections directed against Lamarck. Of course, we can recognize a good deal of protective defense in Darwin’s effort to put distance between himself and his much-maligned French counterpart.

¹³ Charles Darwin, *E Notebook* 60, in *Charles Darwin’s Notebooks, 1836-1844*, eds. Paul Barrett et al. (Ithaca: Cornell University Press, 1987), p. 414.

¹⁴ Darwin, *C Notebook* 63, in *Darwin’s Notebooks*, p. 259.

In late September 1838, Darwin began reading “for amusement,” as he said, Malthus’s *Essay on the Principle of Population*.¹⁵ Malthus planted the seed of what would become Darwin’s device of natural selection. This new causal principle would push into the background his other, Lamarckian principles, though without eliminating them from his explanatory repertoire. The usual understanding of the historical development of Darwin’s conception runs as follows. Darwin had already been aware that the breeder’s “picking” could transform the structure of animals and plants, but initially he had no way of conceiving how such a process might occur in nature.¹⁶ Malthus provided the key notion of population pressure: many more offspring of organisms—whether they be daffodils or elephants—would be produced than the environment could sustain. Hence, if among the individuals so produced, any had a trait that gave them a slight advantage, they would have a better chance of reaching reproductive age and passing on this trait. Gradually, then, members of a species would change through the slow accumulation of adaptive advantages. This historical scenario is not wrong, but it overlays the deeper assumptions and motives of the theory, those hidden powers holding the theory together. Below the surface lay the still enchanted world that Darwin never quite abandoned.¹⁷

¹⁵ Charles Darwin, *The Autobiography of Charles Darwin*, ed. Nora Barlow (London: Collins, 1958), p. 120.

¹⁶ In summer of 1838, Darwin jotted in his *D Notebook*: “The Varieties of the domesticated animals must be most complicated, because they are partly local & then the local ones are taken to fresh country & breed confined to certain best individuals.—scarcely any breed but what some individuals are picked out.—in a really natural breed, not one is picked out.”

¹⁷ For a complementary conclusion, see Robert J. Richards, “Darwin’s Theory of Natural Selection and Its Moral Purpose,” in Michael Ruse and Robert J. Richards (eds.), *Cambridge Companion to Darwin’s Origin of Species* (Cambridge: Cambridge University Press, 2008), pp. 47-66.

The Purposive Structure of Nature

In the Malthus moment, when Darwin initially considered the effects of population pressure on organisms, he likened the impact to “a hundred thousand wedges trying [to] force . . . every kind of adapted structure into the gaps . . . in the oeconomy of Nature, or rather forming gaps by thrusting out weaker ones.” Immediately, though, he sought to understand the event in teleological terms, terms of the sort that Whewell had thought endemic to biological understanding. He quickly jotted: “The final cause of all this wedging, must be to sort out proper structure & adapt it to change—to do that, for form, which Malthus shows, is the final effect, (by means of volition) of this populousness on the energy of Man.”¹⁸ Thus as Darwin initially construed the operations of what would become his device of natural selection, he understood the purpose, or final cause, of population pressure to be alteration of organic form, and he suggested that such purpose might be compared to what humans intended in similar circumstances.

The appeal to a final cause here might be thought merely a *façon de parler*, something the careful historian should not take very seriously. After all, many scholars have contended that Darwin’s new theory completely banished from modern biology teleological reasoning about nature.¹⁹ It is nonetheless clear that the telic mode of consideration permeated Darwin’s early construction of his theory and, I believe,

¹⁸ Darwin, *D Notebook* 134e-135e, in *Darwin’s Notebooks*, p. 375.

¹⁹ There are those, like Michael Ghiselin, who believe Darwin’s theory left no room at all for teleology. See his *The Triumph of the Darwinian Method* (Berkeley: University of California Press, 1969), pp. 132-59. Others, like Michael Ruse, recognize what might be called “internal teleology,” that is, that traits of organisms serve a function and have been selected for that function. Ruse, though, maintains that Darwin did not assume a designer or the operations of mind: “he [Darwin] showed how to get purpose without directly invoking a designer—natural selection gets things done according to blind law without making direct mention of mind. The teleology is internal.” See Michael Ruse, *Darwin and Design: Does Evolution have a Purpose?* (Cambridge: Harvard University Press, 2003), p. 126.

shaped the expression of that theory in the *Origin of Species*. For example, when he contemplated the virtually limitless periods of time that Lyell projected for the formation of the earth's geological structures, Darwin immediately cast that fact into a purposive account: "Progressive development gives final cause for enormous periods anterior to Man."²⁰ That is to say, the great expanse of time antecedent to the present could be explained as a requirement for the progressive development of human beings with their distinctive faculties. Or in early November 1838, when tackling a problem that still intrigues biologists—why is there sexual generation instead of the more simple asexual modes—Darwin construed that too as requiring a teleological explanation:

My theory gives great final cause of sexes: for otherwise, there would be as many species, as individuals, . . . if all species, there would not be social animals . . . which as I hope to show is the foundation of all that is most beautiful in the moral sentiments of the animated beings. If man is *one* great object, for which the world was brought into present state.--& if my theory be true then the formation of sexes rigidly necessary.²¹

This passage expresses an explicitly teleological account of the antecedent presence of sexual generation: it was for the purpose of producing social animals; and social animals came to exist for the purpose of ultimately producing moral animals, namely us. At two later times, Darwin went back over this passage, inserting a qualifications on the "great final cause" of the first line. More cautiously, he remarked: "I do not wish to say only cause, but one great final cause..." And still later, perhaps when composing the

²⁰ Darwin, *B Notebook* 49, in *Darwin's Notebooks*, p. 182.

²¹ Darwin, *E Notebook* 48-49, in *Darwin's Notebooks*, p. 409.

Origin, he further qualified the “one great object” of the last sentence: “although, that it was the sole object, I will dispute, when I hear from the geologist the history, & from the Astronomer that the moon probably is uninhabited.” Despite these qualifications, the structure of teleological reasoning in Darwin’s considerations was preserved right up to the composition of the *Origin of Species*.

There were many other instances in Darwin’s notebooks when teleological analyses of particular phenomena were explicitly proffered.²² And if one added the many instances in which Darwin employed “purpose”—or its more obscure synonym “object,” as in his remark above about “one great object”—then both the notebooks and the *Origin* are rife with such language (“purpose” or “object” occurring some 63 times in the *Origin*, while “mechanical,” “mechanistic,” or any of its forms occurring only 5 times—and none modifying natural selection). The belief that Darwin’s theory banished final causes or the application of purposes appears, then, rather exaggerated.

There is one use of “final cause” that Darwin does repudiate: when a purposive trait is ascribed to the direct action of the Deity instead of to the operations of natural law. In his *M Notebook*, Darwin observed:

This unwillingness to consider Creator as governing by laws is probably that as long as we consider each object an act of separate creation, we admire it more, because we can compare it to the standard of our own minds, which ceases to be the case when we consider the formation of

²² In addition to the passages already cited, the following employ explicit consideration of “final causes”: Darwin, *B Notebook* 5, in *Darwin’s Notebooks*, , p. 171; *C Notebook* 236, in *Darwin’s Notebooks*, p. 313; *D Notebook* 114e, in *Darwin’s Notebooks*, p. 369; *E Notebook* 146 and 147, in *Darwin’s Notebooks*, 440;

laws invoking laws. & giving rise at last even to the perception of a final cause.²³

Through the notebooks and his essays of 1842 and 1844, and into the *Big Species Book*, which would be abridged and completed as the *Origin of Species*, Darwin argued that events in nature had to be understood as occurring through natural law. That certainly was the message of Whewell's *History of the Inductive Sciences*. But how, exactly did natural law manifest itself in Darwin's theory?

Natural Selection as Natural Law

In the last paragraph of the *Origin of Species*, Darwin specified by way of summary the laws that he discriminated in his book. They included "Growth with Reproduction," "Inheritance," "Variability," "Struggle for Life," and "Natural Selection." In the *Descent of Man* he referred without hesitation to "the law of natural selection."²⁴ And in his *Autobiography*, he contrasted his law of natural selection with Paley's interventionist deity:

The old argument of design in nature, as given by Paley, which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. We can no longer argue that, for instance, the

²³ Darwin, *M Notebook 154*, in *Darwin's Notebooks*, p. 559.

²⁴ Charles Darwin, *The Descent of Man and Selection in relation to Sex*, 2 vols. (London: Murray, 1871), 1:136.

beautiful hinge of a bivalve shell must have been made by an intelligent being, like the hinge of a door by man.²⁵

In his notebooks and in the *Origin*, Darwin would contend that the creation of new species occurred by law, the law of natural selection. But what exactly did he mean by law and how did natural selection operate as law?

By law, Darwin seems to have meant causal interactions in the natural world that were fixed and of an unchangeable type. These interactions formed a network of radiating forces that governed all inorganic and organic formations. The most general physical causes, he suggested, had a determining impact on a more specific range of causes, and these in turn were translated into environmental alterations—for example, slow geological changes—that gave shape to organic adaptations. He thus could have almost agreed with the Aristotelian dictum that man was generated by man and the sun, such a hierarchical nexus did he propose. Darwin considered this conception of a network of laws shaping organisms to be quite superior to the “cramped imagination that God created (warring against those very laws he established in all organic nature) the Rhinoceros of Java & Sumatra, that since the time of the Silurian, he has made a long succession of vile Molluscous animals.”²⁶ A universe of fixed physical and organic forces precluded any idea of free human will, and Darwin was certainly not a partisan of that presumption. His conception of a universe of fixed forces determining all events and even human behavior appears to have hastened the rise of the disenchanting

²⁵ Charles Darwin, *The Autobiography of Charles Darwin, 1809-1882*, ed. Nora Barlow (New York: Norton, 1969), p. 87. Darwin was mistaken about Paley, who also thought the Creator worked through natural laws.

²⁶ Darwin, M Notebook 36-37, in *Darwin's Notebooks*, p. 343.

modern world. This impression, though, is mitigated both by his assumption concerning the ultimate cause of law itself and by his conception of the operations of the principal law of organic life, natural selection.

As the passage just quoted suggests, Darwin assumed a view of natural law quite common in the early nineteenth century, namely that law by its very nature required a mind to formulate it and provide the power to enforce it. William Paley, in his *Natural Theology*, expressed this general view:

A law presupposes an agent, for it is only the mode according to which an agent proceeds; it implies a power, for it is the order according to which that power acts. Without this agent, without this power, which are both distinct from itself, the "law" does nothing; is nothing. ²⁷

William Whewell made a comparable assumption, which for him meant that natural law could be assigned the creative process in nature; it could act as a surrogate for God. Whewell put it this way in his *Bridgewater Treatise*, in a passage that Darwin used as an epigram for the *Origin of Species*:

But with respect to the material world, we can at least go so far as this—we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general law.²⁸

²⁷ William Paley, *Natural Theology* (London: Faulder, 1809), p. 416.

²⁸ William Whewell, *Astronomy and General Physics Considered with Reference to Natural Theology* (Bridgewater Treatise) (Philadelphia: Carey, Lea & Blanchard, 1833), p. 267

Like Whewell, Darwin believed that the creative power of nature, and thus the explanatory power, lay in natural law. In the manuscript of the *Origin of Species*, he simply defined nature as “the laws ordained by God to govern the Universe.”²⁹ And as he put it to Asa Gray, a supporter in America: “I am inclined to look at everything as resulting from designed laws, with the details whether good or bad, left to the working out of what we may call chance.”³⁰ By the time he wrote Gray in spring of 1860, however, Darwin began to waiver in his conviction that natural law required an independent designing mind to provide its force. And by the end of the 1860s, he seems to have abandoned altogether the idea that God was a necessary foundation for his theory. But what he seems never to have abandoned is the ascription to natural selection itself of those properties of discrimination, power, and moral concern previously conferred on it by divine agency. These properties allowed the law of natural selection to lead to the end Darwin foresaw as the goal of the evolutionary process, an outcome that Whewell thought impossible, namely, the natural creation of man as a moral creature.

The Dual Aspect of Natural Selection

It is easy to assume that the idea of natural selection sprang from Darwin’s head full blown, with all the features we commonly attribute to it. But the evidence of his notebooks suggests a more gradual development of the idea, a development that had to

²⁹ Charles Darwin, *Charles Darwin’s Natural Selection, being the Second Part of his Big species Book* written from 1856 to 1858, ed. R. C. Stauffer (Cambridge: Cambridge University Press, 1975), p. 224.

³⁰ Charles Darwin to Asa Gray (22 May 1860), in *The Correspondence of Charles Darwin*, eds. Frederick Burkhardt et al., 17 vols. to date (Cambridge: Cambridge University Press, 1985-), 8: 224.

overcome many conceptual obstacles, difficulties that become more apparent when we examine the two major features of the idea of natural selection: struggle leading to survival of the individual with the consequent preservation of advantageous traits; and the mating of those organisms having favorable variations and so the transmission of those traits to descendants, thus modifying species over time. Darwin had to put these two parts together, which I believe he never successfully did.

In 1842, Darwin drew up a 35-page pencil sketch of his emerging theory, and two years later he expanded this outline to over 200 pages. These two essays became the template for the *Origin of Species*.³¹ In the essays, he sought to apply the model of domestic breeding to organisms in nature. In the domestic situation, new and variable environments would have an impact on organisms, particularly on their reproductive systems. These environmental impacts would, Darwin believed, ultimately produce smaller or larger variations in the progeny of the affected breeds. Those in the wild state would also be subject to comparable environmental changes, though occurring more gradually and at a slow geological pace. “Hence we should expect every now and then a wild form to vary.”³² He contended that Malthusian population pressure would produce a struggle giving the advantage to organisms with small favorable characters. “In the course of a thousand generations infinitesimally small differences must inevitably

³¹ These essays have been transcribed by Francis Darwin, and published in *The Foundations of the Origin of Species: Two Essays Written in 1842 and 1844 by Charles Darwin* (Cambridge: Cambridge University Press, 1909).

³² Darwin, Essay of 1842, in *Foundations of the Origin of Species*, p. 5. In the *Origin of Species*, Darwin assumes that small individual variations in progeny will be constant. However, even in the book he occasionally suggests that favorable variations will occur only sporadically over great periods of time (e.g., pp. 80 and 82).

tell.”³³ The result would be the morphological change of species. Darwin yet recognized a residual problem, which he posed in his early sketch:

Is there any means of selecting those offspring which vary in the same manner, crossing them and keeping their offspring separate and thus producing selected races: otherwise as the wild animals freely cross, so must such small heterogeneous varieties be constantly counter-balanced and lost, and a uniformity of character [kept up] preserved?³⁴

The problem that Darwin recognized may be called the swamping problem: favorable variations will occur only occasionally to individual organisms; in the domestic situation, breeders will select and segregate from large flocks just those few individuals with desired traits and allow them to mate. But what selects and segregates organisms for breeding in the wild and keeps them from crossing back into the unmodified or negatively modified individuals of the group? What power brings such selected organisms together for mating and thus creates a new, transmuted line? In the domestic situation, it's the breeder who selects and segregates a few individual from a large flock and mates them. But what power performs this function in nature? In both the 1842 and 1844 essays, after Darwin had broached the problem, he introduced a model for what occurred in the wild:

Let us now suppose a Being with penetration sufficient to perceive differences in the outer and innermost organization quite imperceptible to man, and with forethought extending over future centuries to watch with

³³ Ibid., p. 8.

³⁴ Ibid., p. 5.

unerring care and select for any object the offspring of an organism produced under the foregoing circumstances; I can see no conceivable reason why he could not for a new race (or several were he to separate the stock of the original organism and work on several islands) adapted to new ends. As we assume his discrimination, and his forethought, and his steadiness of object, to be incomparably greater than those qualities in man, so we may suppose the beauty and complications of the adaptations of the new races and their difference from the original stock to be greater than in the domestic races produced by man's agency.³⁵

Darwin here has formed for himself a model of the selector operative in nature, a selector with preternatural "forethought" and "discrimination," who chooses organisms because of their "beauty and complications of adaptations," and does so with "unerring care." Like the domestic breeder, this imaginary being would segregate individuals with favorable traits and prevent back cross to the rest of the group. This same power inhabits the description of natural selection in the *Origin of Species*.

In his book, Darwin compared the discerning and penetrating actions of natural selection with the careless and superficial actions of the human breeder:

Man can act only on external and visible characters: nature cares nothing for appearances, except in so far as they may be useful to any being. She can act on every internal organ, on every shade of constitutional difference, on the whole machinery of life. Man selects only for his own

³⁵ Ibid., p. 85.

good; Nature only for that of the being which she tends. . . . Can we wonder, then, that nature's productions should be far "truer" in character than man's productions; that they should be infinitely better adapted to the most complex conditions of life, and should plainly bear the stamp of far higher workmanship?³⁶

In the *Origin*, Darwin retained the model of selection that he had formulated in the essays, that of a wise and morally concerned agent. But what was the analogue in nature for this model? It was, of course, the "struggle for existence."

Yet even the notion of "struggle for existence" was, as Darwin recognized, a metaphor. It encompassed in a literal fashion two dogs struggling over a piece of meat as well as a plant struggling for moisture at the edge of the desert. It applied to plants struggling to produce fruit that would tempt birds, as well as plants struggling with others to germinate the most seeds.³⁷ The result of these various kinds of struggle would be, as the subtitle of his work put it, "the preservation of the favored races." Yet was it the "preservation" of the fit or the "elimination" of the unfit?—a much debated question in the later part of the nineteenth century. As we understand natural selection today, no individuals are actively preserved—they simply haven't been eliminated and so live to procreate and pass on their traits. Preservation implies some active intervention by a solicitous hand. But likewise, elimination also suggests an intervening hand, a deadly one that exterminates—or at least prevents from breeding—some varieties. Even when

³⁶ Darwin, *Origin of Species*, p. 83-84.

³⁷ *Ibid.*, pp. 62-63.

Darwin attempted to characterize what the process might be in nature that his model indicated, he yet described it as if an intentional agent were at work.

In the *Origin*, Darwin noted that successful breeders kept large flocks, which would increase the chance of favorable variations appearing.³⁸ He argued analogously for what occurred in the state of nature: natural selection would operate more swiftly and powerfully in large open areas where “there [will] be a better chance of favourable variations arising from the large number of individuals of the same species.”³⁹ Under those conditions the discerning eye of natural selection might pick out favored organisms. What Darwin simply assumed was that natural selection, just as the attentive human breeder, would segregate such individuals for mating. Most current biologists recognize that large numbers of a species would only exacerbate the swamping problem. That is why today most ecologically minded scientists believe evolution under selection will occur more rapidly in small geographically isolated spaces—on islands, mountain sides, lands sequestered by natural barriers—where only a small number of individuals might dwell. Darwin asserted the advantages of sympatric speciation because of his *agential* view of natural selection; contemporary biologists think allopatric speciation to be required, because of their interpretation of natural selection as a *mechanical* process of change.

The Moral Character of Natural Selection

³⁸ Ibid., p. 41

³⁹ Ibid., p. 105. Darwin frequently reiterated the need for large number of individuals for selection to work most efficiently; see pp. 41, 70, 110, 125, 177, and 179.

The power of Darwin's model of natural selection as discerning mind can be assessed in light of another feature of his analysis. This mind, as Darwin characterized it in the essays and in the *Origin of Species*, cared for the organisms that it tended:

It may be said that natural selection is daily and hourly scrutinizing, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all this is good; silently and insensibly working whenever and wherever opportunity offers, at the improvement of each organic being.⁴⁰

Darwin here asserted that natural selection worked for "the improvement of each organic being." Immediately following that passage he reiterated: "natural selection can act only through and for the good of each being."⁴¹ In the penultimate paragraph of the *Origin*, he again affirmed the moral concern that natural selection evinced: "And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection."⁴² These are not slips of the pen, since he made the same assertion several other times in the *Origin*.⁴³ But, of course, from our perspective, natural selection does not work for the good of each being; it eliminates most beings, it destroys them. I believe Darwin's conception of a benevolent mind operating in nature had such deep roots in his theory it overcame what appears to be, at least for us, an obvious consequence of the actions of natural

⁴⁰ Ibid., p. 84.

⁴¹ Darwin, *Origin of Species*, p. 84.

⁴² Ibid., p. 489.

⁴³ In addition to the passages mentioned, see also *ibid.*, pp. 83, 149, 194, and 201.

selection. In those brief moments when the patent logic of the situation did hit him, he found ways to assuage the consequences:

When we reflect on this struggle, we may console ourselves with the full belief, that the war of nature is not incessant, that no fear is felt, that death is generally prompt, and that the vigorous, the healthy, and the happy survive and multiply.⁴⁴

Even here, Darwin suppressed what he had otherwise maintained, that natural selection is “daily and hourly scrutinizing throughout the world every variation”—natural selection did act constantly; the war of nature was incessant.⁴⁵

Not only did nature, in the form of natural selection, exhibit moral concern, it had the goal of producing moral animals, that is, human beings as the “*one* great object for which the world was brought into present state,” as Darwin put it in early November of 1838.⁴⁶ It was then incumbent on him to work out just how a moral sense might have evolved in man, which is what he set out to do in early October of 1838, when he began a new notebook devoted to morals and mind, his *N Notebook*.⁴⁷ That human beings were “one great object” explained for Darwin, as we have already seen, why sexual generation came into the world: sexual generation produced social animals, which were the only sort that could have social instincts and social instincts were, he believed, the foundation of moral behavior. In his *N Notebook* and in associated loose notes, he initially presumed that social habits of parental care, solicitude for offspring, and

⁴⁴ Ibid., p. 78.

⁴⁵ Ibid., p. 84.

⁴⁶ Darwin, *E Notebook* 49, in *Darwin's Notebooks*, p. 409; see above for the full quotation.

⁴⁷ Darwin began his *N Notebook* on October 2, 1838 and completed it in spring of 1839. He also kept a series of loose notes on morality and mind, which he labeled “Old and Useless Notes,” which date roughly from summer of 1838 through early 1840.

cooperation among group members would gradually alter brain structures rendering such habits instinctual. Thus Darwin looked upon moral impulses, ultimately, as acquired during the course of animal development—not implanted in a soul by God. And just as gravity was a force intrinsic to matter, so “it might with equal propriety be said that the living brain perceived, thought, remembered &c.”⁴⁸ Yet, as he considered the subject, he judged that his kind of materialism did not imply “atheism,” a charge made against Lamarck’s comparable theory. Darwin cast his materialism in an ennobling teleological framework:

This Materialism does not tend to Atheism. Inutility of so high a mind without further end just same argument. Without indeed we are step towards some final end.—production of higher animals—perhaps, say attribute of such *higher* animals may be looking back. Therefore consciousness, therefore reward in good life.⁴⁹

Darwin here contended that his view of brain-mind did not lead to atheism because the sort of material that produced mind had the final purpose of generating the higher animals, that is organisms with consciousness, moral standing, and thus the capacity for leading a good life with its (eternal?) reward. As he put it a few years later, in his essay of 1844, the developmental process he traced led to “the most exalted end which we are capable of conceiving, namely the creation of the higher animals.”⁵⁰ That, of

⁴⁸ Darwin, Old & Useless Notes 39, in Charles Darwin’s Notebooks, p. 616.

⁴⁹ Darwin, Old & Useless Notes 37, in Charles Darwin’s Notebooks, p. 614.

⁵⁰ Darwin, “Essay of 1844,” in *Foundation of the Origin of Species*, p. 254. This line, of course, occurs with slight alteration both in the essay of 1842 and in the *Origin of Species*.

course, was also the expressed goal he specified in the last paragraph of the *Origin of Species*.

Darwin's Moral Theory

Darwin's construction of a theory of morality remained, in these early years, fairly rudimentary. Other regarding behavior would be the result of inherited habit. Initially, he did not see his way clear to applying natural selection to behavior. And when he tried to do so in the 1840s, he met a severe obstacle. While reading in the literature of instinct, he recognized that colonies of ants and bees had workers with distinctive behaviors and anatomical structures; some species of ant, for instance, might exhibit three different castes of workers distinguished by their instincts. Natural selection operated on individuals that had advantageous traits to promote their survival and allow them to pass those traits to offspring. But workers in social insect colonies were neuters; they produced no offspring. Darwin hit upon this problem in the 1840s, and found no easy way to bring instinctual behavior under the aegis of natural selection. Indeed, he thought this problem might be "fatal" to his whole theory.⁵¹

Darwin did find a solution even as he worked on the "instinct" chapter of the *Origin of Species*. Natural selection would operate on the whole nest or colony, giving the advantage to those groups that had by chance individuals that acted cooperatively or protectively. This opened up the possibility to consider how moral behavior, which is usually directed to the advantage of another instead of self, might have evolved. And in

⁵¹ In the *Origin of Species* (p. 236), Darwin mentioned that the problem initially seemed fatal to my whole theory." I have discussed this problem in greater detail in my *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (Chicago: University of Chicago Press, 1987), pp. 142-52.

the last part of the 1860s, he constructed a well-articulated theory of the evolution of the moral sense in man. Like the social insect species, proto-humans, Darwin supposed, began their trajectory toward full humanity in small tribal groups and clans. As he said in the *Descent of Man*, those individuals that had

many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy, were always ready to give aid to each other and to sacrifice themselves for the common good, would be victorious over most other tribes, and this would be natural selection.⁵²

Darwin proposed two other principles by which to understand how the altruistic sense might have arisen and have been preserved in communities. He supposed that praise and blame would discipline miscreants from taking advantage of the good will of their more altruistic brethren; reciprocal altruism would also serve to punish non-cooperators. But these latter two principles, Darwin thought, would constitute “low motives” for moral behavior.⁵³ Community selection, by contrast, would instill an authentic morality in a group. He thus judged his theory to have avoided the charge of “selfishness,” a charge to which the utilitarian view was liable.⁵⁴ He also believed that a progressive intelligence and accumulated learning would be instrumental in teaching individuals that their community extended beyond the narrow tribal group. So that as civilization

⁵² Darwin, *Descent of Man*, 1: 166.

⁵³ *Ibid.*, p. 163.

⁵⁴ *Ibid.*, pp. 97-98.

matured, all men would be looked upon as brothers, members of the same community and thus objects of moral concern.⁵⁵

The Enchanting Darwinian Legacy: Mind in Nature

Darwin's moral theory, while not protected from the suspicious eye of philosopher's in our day, nonetheless provides the grounds, I believe, for an ethics that meets the standards for a normative system. Moreover, empirical work in psychology and anthropology suggests that the evolution of altruistic response might well constitute the foundation of modes of ethical behavior displayed by the different nationalities of mankind. That is, Darwin may be understood as having established a universal moral grammar—comparable to Chomsky's notion of a universal linguistic grammar—that grounds all particular moral systems and thus allows us to recognize them precisely as *moral* systems. These, I believe are defensible propositions, but need to be argued for in another venue.⁵⁶ Here I would like to consider what might be the deeper roots for Darwin's conception of the operations of mind in nature.

Darwin acquiesced in the presumption of his contemporaries that natural law implied a law giver. His own personal religious beliefs supported that presumption. He had remained a Christian until around 1850, at least that is what he mentioned to

⁵⁵ Ibid., pp. 100-101.

⁵⁶ I have suggested a few amendments to Darwin's moral theory to defend it against many of the usual objects brought against evolutionary ethics. See, for example, appendix 2 of my *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*. For an empirical investigation of the notion of a "moral grammar," see Marc Hauser, *Moral Minds* (Cambridge: Harvard University Press, 2005). For further empirical confirmation that individuals do act with authentic altruism, see Ernst Fehr and Urs Fischbacher, "The Economics of Strong Reciprocity," in *Moral Sentiments and Material Interests*, ed. Herbert Gintis et al. (Cambridge: MIT Press, 2005), pp. 151-92.

Edward Aveling and Ludwig Büchner, who visited him in 1881.⁵⁷ And his *Autobiography*, written in the mid 1860s, testifies that when the *Origin of Species* was published he still believed in “a First Cause having an intelligent mind in some degree analogous to that of man.”⁵⁸ So during the construction of his theory, Darwin had not abandoned the enchanted sphere; his theory had its foundations well sunk into that ground. Later, in the mid 1860s, when his belief in a supernatural entity slipped to such an extent that he chose to call himself an agnostic, he had not altered the basic structure of his theory to accommodate his release from traditional religion. Alfred Russel Wallace chided him in 1866 for the terms “natural selection” since they suggested “an intelligent chooser was necessary.”⁵⁹ Wallace proposed in its stead Spencer’s locution “survival of the fittest,” which did not carry the unwanted implication. But Darwin was reluctant to give up his terms, though in the fifth edition of the *Origin* (1869), he did title Chapter 4 “Natural Selection; or the Survival of the Fittest.”⁶⁰ So by the mid 1860s, Darwin had relinquished the notion that law required a law-giver; yet the law of natural selection still retained the capacities that had been transferred to it by reason of its original issuance. Natural selection yet cast the shadow of an intelligent agent. Let me now summarize those capacities that I have already noted and indicate

⁵⁷ Aveling, the consort of Karl Marx’s daughter, published this account in a little tract just after Darwin’s death. He quotes Darwin as saying: “I never gave up Christianity until I was forty years of age,” which would have been around 1850. See E. B. Aveling, *The Religious Views of Charles Darwin* (London: Freethought Publishing Co., 1883), p. 5. Francis Darwin confirmed Aveling’s account in Francis Darwin (ed.), *Life and Letters of Charles Darwin*, 3 vols. (London: Murray, 1887), 1:317n.

⁵⁸ Darwin, *Autobiography*, pp. 92-93.

⁵⁹ Alfred Russel Wallace to Darwin (2 July 1866), in *Correspondence of Charles Darwin*, 14: 228.

⁶⁰ See Darwin to Alfred Russel Wallace (5 July 1866), in *ibid.*, p. 236.

how they differentiate Darwin's principle from our contemporary understanding of natural selection?

First, Darwin's natural selection operates as a *single force*, since it is the outcome of a particular causal law, at least that is the way Darwin expressed its action. Today we would not likely portray natural selection as a law. Moreover, we would not regard it as a singular force, but as the summation of a multitude of different causal forces continuously operating on an organism. Second, Darwin's model of the actions of selection rendered it as an *agent*. The intentional power, as he originally conceived it, came from God; but after he abandoned the assumption of divinity, the causal action of selection still retained those features that allowed the discernment of traits with a refinement that simply could not be equaled by any nineteenth-century machine. In the present day, biologists refer reflexively to "the mechanism of natural selection"—a phrase that never crossed Darwin's lips. Third, natural selection as expressing intentional power not only selected individuals having advantageous traits, it prevented those individuals from crossing back into the general population. Contemporary biologists have different means of handling the problem of back-crosses (aided, of course, by a different understanding of heredity). Fourth, natural selection's intentional character, in Darwin's conception, allowed it the kind of moral solicitude—acting for the good of each creature—that is antithetic to the operations of the modern principle. Fifth, Darwin's device was capable of producing moral creatures, those that might act unselfishly with authentic altruistic impulse. Today both biologists and philosophers tend to be quit suspicious of claims that nature might produce truly altruistic creatures—that judgment, however, is beginning to change. Sixth, natural selection as evincing

purpose might produce general progress in evolutionary development. As Darwin put it in the penultimate paragraph of his book: “And as natural selection works by and for the good of each being, all corporeal and mental endowments will tend to progress toward perfection.”⁶¹ Most present biologists deny that evolution is progressive. Finally, the progress produced by natural selection had as its goal “the most exalted object we are capable of conceiving, namely, the production of the higher animals”—that is, human beings with their moral sentiments. This kind of global teleology is rejected utterly by virtually every evolutionary biologist writing today. The theory issued by Darwin, the theory that forms the foundation of modern biology, had not exorcised the lingering spirit of an enchanted nature.

In this historical account, I have argued that Darwin constructed his theory on the assumption that mind was at work in nature. A salient question remains: Does this history have any implications for our contemporary understanding of living nature? I believe that it does. My considerations will perhaps sound a bit too metaphysical for some, but I think they are the result of the soundest commonsense, at least if you have been schooled in the works of Kant, or for that matter, William James.

It is quite obvious that human mind formulates the theories that articulate and characterize nature. But more than that. Our daily commerce with the phenomenal world of nature, with its variegated colors, sounds, tactile feelings—these all vanish when human mind disappears. The beauty of nature, its delights and terrors—these too must be the result of mind active in the world. The moral character of human beings, as

⁶¹ Darwin, *Origin of Species*, p. 489.

well, can only be a function of human mind. These conclusions not only derive from the Kantian perspective, they are the general assumptions of modern bio-psychology and anthropology. The world as we immediately experience it is in large part a product of mind.⁶² Thus the very ground upon which scientific theorizing rests is already one that is, partly at least, constructed by mind. The scientific depiction of the world, from the Greeks through the accomplishments of the twenty-first century has changed dramatically. The uncuttable particles of Leucippus and Democritus have been replaced by contemporary theories of the atom, an entity that is entirely cuttable, even down to vanishing mathematical constituents of a sort that Zeno would have delighted in. Despite the changes in the world image, we assume the physical world itself, in its basic structures, has remained the same. It is human mind that has changed, and with it the world as we know and interact with it. Our modern world is still inhabited by mind. Shorn of mind our world ceases to exist.

Little wonder, then, that we still think of organisms and their parts in terms of purposes, of ends. Only mind can hold the past and present together and thus come to understand the activities of organisms in terms of the aims that they display. A flower may achieve its goal in producing the nectar that attracts insects in order that its pollen may be spread to other flowers, but only a mind can come to understand the presence of nectar in the flower in relation to its typical end. What modern biologist would deny that the lens of the eye is designed for the purpose of casting a coherent image on the retina? We now understand such designs as the result ultimately of natural selection.

⁶² There is every good reason to believe, as well, that a world comparable to our own can be found as the productive result of the interactions of the higher animals in the world.

Darwin, though, brought us to discern the capacities of selection because of the original model of mind in nature according to which he conceived the activities of natural selection. Now, particularly as the result of the work of William James, Donald Campbell, and others, we have made the reciprocal analysis: we now conceive mind as if it were a natural selection device.⁶³ That is, in the effort to solve any problem, we imaginatively fling out variations, possible solutions, until one seems to work—or work sufficient well for the moment. This kind of blind variation and selective retention grounds most of our inventive efforts at thinking through problems. Darwin may have been moved to construe natural selection in terms of mind, because mind, in fact, works like natural selection. For anyone who investigates the process by which Darwin came to construct his theories is well aware that he proceeded by imaginatively trying out this variation and that variation, running down blind allies until some one of those avenues advanced his progress. He may well have been dimly aware of his own typical activity in this respect. Thus at a very deep level his own mind may have served as the template for understanding nature. The world remains an enchanted place, though the source of that enchantment may be other than often supposed.

⁶³ James had recruited the concept of natural selection to discuss the activities of consciousness in decision making. See my discussion in *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*, pp. 430-35. For Donald Campbell's use of the concept, see his "Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes," *Psychological Review* 67 (1960): 380-400; and "Blind Variation and Selective Retention in Socio-Cultural Evolution," in *Social Change in Developing Areas*, ed. H. Barringer, G. Blanksten, and R. Mack (Cambridge, Mass.: Schenkman, 1965).