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DISCUSSION PAPER

on

Gerhard Vollmer's

DARWINIAN AND NON-DARWINIAN PRINCIPLES IN EVOLUTION

by

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Discussion Paper

WHAT EVOLUTIONARY PRINCIPLES ARE APPROPRIATELY CALLED DARWINIAN?

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Although Charles Darwin's evolutionary theory was unitary, it was not monolithic. Darwin made it possible for us to conceive of all the phenomena of life and mind from a single, comprehensive point of view. Living creatures are connected by descent with modification. So too are such cultural objects as languages. Likewise there are a limited number of basic mechanisms and fundamental principles that apply to a wide range of evolving objects. Darwin invoked several explanations for evolution, among which was natural selection, which he considered "the main but not exclusive means of modification."

We might define a "Darwinian" theory as one that emphasizes natural selection and perhaps certain other mechanism including the ones that Darwin himself invoked. "Non-Darwinian" mechanisms might be all sorts of things --ones that he rejected, ones that he did not know about, or ones that were not original with him. What we mean then becomes rather vague. "Non-Darwinian" also has been used for mechanisms that Darwin himself advocated and even for ones that were more or less original with him, and also for ones that would not change his theory much when added to it.

"Non-Darwinian" sometimes really means "non-neo-Darwinian" in the particular sense of contradicting one contemporary form of supposedly modernized Darwinism. "Neo-Darwinism" originally meant any theory that rejected mechanisms other than natural selection, but it came to be associated with the views of August Weismann, who, unlike Darwin, rejected the inheritance of acquired characteristics. Virtually nobody has been a "neo-Darwinist" in the sense of considering natural selection to be the <u>exclusive</u> cause of evolution, but the term applies well to

those who consider all other mechanisms to be of trifling importance. What are these mechanisms?

In Darwin's theory, natural selection is but one of several selective mechanisms. All of these depend upon differential reproduction of individuals within a larger group. The term "individual" must here be understood in a technical, metaphysical sense. It does not mean just an organism, but rather any concrete particular thing -- including such supra-organismal wholes as biological families and even biological species. According to modern evolutionary ontology, only individuals can participate in any process whatsoever, but not all individuals are able to participate in a given process, and some cannot participate in any processes. Organisms copulate, species speciate, but genera do nothing whatsoever.

Darwin recognized three selective mechanisms that depend upon the differential reproductive success of individual organisms within species and other reproductive populations. These are artificial selection, natural selection, and sexual selection. In artificial selection the breeder decides to what extent a given organism will reproduce. In natural selection the environmental circumstances in a competitive natural economy have the same effect. In sexual selection, the organisms within a species compete so as to maximize reproductive success pure and simple -- usually by the males acting so as to monopolize the opportunities for mating. (As when stags fight during the rutting season.) Selection theory in general predicts things that the theory of natural selection does not -- therefore sexual

selection provides a critical test. It shows how what gets maximized is not the capacity to survive, or "fitness" somehow defined in a metaphysically odious fashion, but whatever favors reproductive success. And it shows how what is maladaptive from the point of view of the species is adaptive from the point of view of some of the organisms -- males are potentially able to care for their offspring but expend their resources in a copulation contest instead.

When and only when organisms are integrated so as to form families or other supra-organismal individuals various kinds of what is sometimes called "group selection" may be effectual. Darwin clearly recognized that the family functions as an individual in the evolution of neuter castes in social insects. He invoked such supra-organismal selection to explain the moral behavior of our own species. Both he and most of us moderns treat the differential reproduction of local populations and entire species as playing at best a subsidiary role in evolution, though it is widely held that selection works most effectively when the population is broken up into genetically heterogeneous local units. Because genera and larger groups share nothing more than common ancestry (they are branches of a family tree) they play no role in evolutionary processes, even though, being single things and definitely restricted in place and time they qualify as individuals.

Efforts to find evidence for the existence of adapted species or of supra-specific individuals that evolve as units have signally failed. It is now clear that species are not ecological units in the sense that cells and organs are

components of organisms. At most species are reproductive communities that provide their constituent organisms with access to a store of potential genetic variability. Otherwise all they do is evolve: they speciate and become transformed. Organisms of different species do form economic units, and this leads to the coevolution of species as in flowering plants and their pollinators. Likewise there is reason to believe that cultural individuals coevolve to some extent with genetical populations. It seems likely that the existence of language has exerted a selection pressure in favor of the capacity to use it on the part of us human beings. But this does not imply that there is a close linkage between a particular language and a particular group of genetic determinants. Likewise there is no reason to invoke complex social instincts in man, such dispositions as incest avoidance not withstanding. At most we find the sort of inherited differences in temperament that we find among domesticated breeds of animals -- and not so highly developed ones as that. Cosmic schemes that attempt to place human civilization upon a genetical foundation are the products of wishful thinking and not much else.

Variation, which Darwin conceived of as change in developmental processes is now thought of as largely something that goes on in the chromosomes -- mutation, and genetical recombination together with gene flow. These modern accretions are best considered as refinements upon Darwin's ideas. Darwin argued at great length to show how the epigenetic system constrains evolution along certain lines. He invoked what he

called "correlated variation," which roughly corresponds to our "pleiotropic effects." A gene with two effects might get favored by selection if the advantages of one such effect outweighed the other.

Especially in small populations gene frequencies fluctuate at random. The result is what we call "sampling error," "drift," and "founder effects." Darwin never heard of these phenomena but they would not have affected his theory very much. Isolation he did consider as a factor, and discounted it, but his views on this topic changed through time. Another possibility he considered was "macromutation" -- evolution by large jumps. Thomas Henry Huxley argued for macromutations in a review of The Origin of Species. Darwin had already refuted this notion on the basis of empirical evidence in the manuscript he was writing when Wallace's manuscript interrupted him; therefore the rebuttal was delayed until the publication of The Variation of Animals and Plants under Domestication in 1868. There is a question of how "big" a change constitutes a macromutation, and the decision tends to be a rather subjective one. A non-issue here is variable evolutionary rates, and "punctuated equilibria," which has been thought of as "non-Darwinian" thanks to media hype. Whether "orthogenesis" is "non-Darwinian" depends upon what version one is talking about. Darwin thought that developmental mechanisms predispose organisms to evolve in some ways more often than others. But he rejected the notion that all features of organisms are the product of laws analogous to those of physics and chemistry and that evolution is like crystallization. He also rejected the versions of orthogenesis that are modeled upon

preformationist embryology -- in which everything would be pre-ordained from the origin of life and the environment could have no influence.

Many putative alternatives to Darwinism turn out to be founded upon metaphysical confusion. A good example is the notion of "internal selection" to which Vollmer refers. Such notions have been suggested repeatedly in the past. We have an example of a class of fallacies that result from treating natural selection as if it were an "agent." How can natural selection act upon the inside of the body? Does it act upon the genotype of the phenotype, the gene or the organism? The answer is altogether simple. Natural selection, not being an agent, cannot possibly act upon anything whatsoever. Consider the analogy of taking some clothes off. I undress. I (an agent) act upon my clothing, and affect myself. But what does undressing do? Does undressing act upon my clothes, or upon me? Of course not -- that would be nonsense pure and simple.

As to use and disuse and the inheritance of acquired characters, Darwin was never sure how important these were. Darwin's grandfather, Erasmus Darwin, was well known for having published a Lamarckian theory of evolution before Lamarck did. Quasi-Lamarckian mechanisms that give the superficial appearance of acquired characters becoming inherited are widely accepted today -- as in the so-called Baldwin effect. Darwin considered behavioral changes to have an important role in producing structural ones. And it was he who first applied such important principles as preadaptation and shift in function to concrete

problems in evolutionary biology. Indeed it is most impressive to see how much of what evolutionary biologists do these days owes its inception to Darwin.