Letters to the Editor

On Evolution

Dear Editor,

Since Horand Gutfeldt and Mark Carlson deal with similar issues in similar ways in their articles, I am responding to both of them in the same letter.

I will begin with Gutfeldt's "The Evolution of Life on Earth and the search of K. E. von Baer for the Ultimate Causes." Gutfeldt eloquently describes von Baer's careful, thorough study of his own scientific observations as a foundation for his philosophical conclusions about the purpose inherent in nature. Von Baer's philosophy was firmly rooted in his science, and grew out of it like a plant from the soil, drawn from it by the sunlight of a devout and reverent theism. His philosophy succeeded because he dared to allow his science to give form to it, an approach which differed greatly from that of many of his fellow nature-philosophers, who tended instead to impose the form of their philosophy on their science, to its frequent detriment. Instead of allowing the seeds of their philosophy to germinate in the soil of science, they withheld them from that soil, as if to avoid contamination, and tried to sculpt it into the likeness of a plant. (See my article, "Recapitulation Theories and Man's Place in the Universe" in *Swedenborg and His Influence*).

I appreciate Gutfeldt's introducing the term "Panentheism" into his discussion. We urgently need to integrate the concepts of Divine immanence in nature and Divine transcendence of nature in our thoughts, rather than emphasizing one at the expense of the other. I'm proud to stand with von Baer under the banner of Panentheism.

I'd like here to set the record straight about Darwin's "misuse" of von Baer's work. Contrary to popular opinion, Darwin did not subscribe to recapitulation, as S. J. Gould points out in *Ontogeny and Phylogeny*. Darwin's point that "community in embryonic structure implies community of descent," in the *Origin of Species*, is not a statement of recapitulation, but a legitimate adaptation of von Baer's principle of increasing differentiation to an evolutionary viewpoint. Although von Baer rejected Darwinian evolution, the concept of taxonomic relationship was integral to his work. Von Baer himself stated that the closer the taxonomic relationship between species, the more developmental stages they will have in common. Darwin simply added to this the idea that such a relationship implies common ancestry, which is also reflected in developmental similarity. Darwin's discussion of embryology in his *Essay of 1844* clearly stresses the similarity of embryos to each other, rather than to adult forms, although he mentions the latter idea.

The vitalism held by Hans Driesch and some of his contemporaries (based on the little I know about it) appears to be quite a different thing from the vitalist philosophy of von Baer. Biology at the turn of the century was passing through a period of crisis and intense debate as a result of new discoveries in cytology and embryology. Many biologists felt driven to make what seemed a terrible choice—between some form of preformationism and some form of vitalism. Both alternatives were uncomfortably reminiscent of the naive and fruitless speculations which in part characterized 19th-century biology. Some, I suspect, adopted Neo-vitalism specifically against the New Preformationism. The idea that each part of the egg was predestined to become a certain part of the embryo was not borne out by certain experiments (some of the most interesting by Driesch), and the embryo's demonstrated ability to organize and regulate itself had to come from somewhere. Neo-vitalism grew partly out of the lack of a scientific explanation for this feat. Although both von Baer and Driesch drew philosophical conclusions from observing embryos, von Baer's grew out of a fullness of science, while those of Driesch may have owed more to a scientific gap.

A few visionary men, like E. B. Wilson, caught the first glimmerings of a third alternative: a system of information storage in the cell which yet had no formal parity with the somatic organization which it directed. Classical genetics—a synthesis of Mendel's laws with the study of chromosome behavior—was the first step toward the solution of that dilemma, and progress in that domain continues to this day. The science of genetics helps to put vitalism in its proper context, as a complement to natural science, not a substitute for it.

Gutfeldt goes on to say that modern evolutionary theory "has become an ideology penetrated with, technically speaking, a radical metaphysical materialism, which claims that matter is the only substance of reality …" (p. 176). I think "penetrated" is too strong a word. Certainly the modern evolutionary synthesis is associated with materialism, just as Democritus' atomic theory and Copernicus' heliocentric system were associated with materialism in former times. But in none of these cases is the association inevitable or unbreakable.

In fact, even admitting the existence of such an association, the term "radical metaphysical materialism" may be too strong as well. Even among the staunchest opponents of vitalism there exists a recognition of realities other than the purely material. Sir Julian Huxley, in his definitive work *Evolution: the Modern Synthesis*, describes himself as an atheist but not a materialist, because he believes in the non- material reality of entities like the human mind. Ernst Mayr, although he believes that living orgnisms must obey physical and chemical laws, recognizes that their function can't be reduced to those laws—biological events somehow transcend them. These two men are among the foremost shapers and proponents of the modern evolutionary synthesis. "Radical metaphysical materialism" might describe the views of people like J. B. S. Haldane and G. G. Simpson, but it may be an extreme position even among the Marxist-atheist-evolutionists. (Some of these allowed themselves to be politically maneuvered into supporting Lysenkoism, a rejection of modern genetics; this situation showed that when science, philosophy and politics are mushed together the combination can backfire disastrously.)

Mark Carlson, in "Evolution, the Limbus, and Hereditary Evil," says something in a similar vein. He implies an equivalence between evolutionary theory and "the notion that nature created itself" (p. 192) and says, "The real danger of the theory now is that even the simple-minded are affected by its sophisticated arguments against God" (p. 193). I dislike seeing evolutionary theory (or any other aspect of natural science) used as a scapegoat for the widespread atheism of today. It may now be the obvious thing to equate evolution with the beliefs of someone like Richard Dawkins, but I believe the time will come when evolution is seen as about as serious a threat to religion as the Copernican system is today—it will eventually shed the philosophical baggage it has accumulated over the years. Meanwhile I question whether the "sophisticated arguments against God" are scientific or philosophical. I don't consider them an integral part of evolutionary science. Atheists naturally use science as a peg to hang their atheism on, and if it's not evolution it will be something else.

I have much more sympathy with Carlson's evaluation of evolution on its scientific merits, although I have more confidence in the validity of the Modern Synthesis than he appears to have. (Dr. Grant Doering has finally broken me of the habit of calling the modern evolutionary synthesis Neo-Darwinism, which is a term properly applied to a turn-of- the century version of evolution, but now everyone else is referring to current evolutionary thought as Neo-Darwinism.) I am not going to answer every point he raises, but I would like to adress some of them.

Before we get into specific scientific issues I want to comment on Carlson's reference to Michael Denton's comparison of current evolutionary theory with the earth-centered Ptolemaic system of cosmology, about to be superseded by the Copernican system. If we are going to make predictions about the future direction of science (a risky undertaking), I much prefer an analogy with the effect of modern physics on the Newtonian system. I simply can't picture the modern evolutionary synthesis being swept away as completely as the Ptolemaic worldview has been. Most likely it will live on in whatever new setting arises from future discoveries, just as Newtonian principles maintain their validity in the setting of modern physics, even though (or perhaps because) in purely scientific terms 20th-century physics initiated a transformation even more profound than the shift from the geocentric to the heliocentric system.

One attractive thing about this analogy is the way the modern evolutionary synthesis evokes the Newtonian one. In each case two disciplines are united into a coherent whole which has eluded the grasp of previous thinkers who sought after it. Galileo's mastery of earthly motion and Kepler's penetration of heavenly motion enabled Newton to encompass motion in general with his scheme. Classical genetics addressed one of the greatest weaknesses in Darwin's theory by demonstrating that variation is preserved even when characters are blended by interbreeding, and this recognition led to the science of population genetics which is the heart of the Modern Synthesis. (However, neither synthesis amounted to the last word on the subject.) Major paradigm shifts can strengthen as well as weaken existing theories.

Now to get down to scientific specifics. I cannot solve the problems posed by the fossil record, and I agree that certain avenues of investigation indicate the possibility of some form of Neo-Lamarckism. (I too read Taylor's *The Great Evolution Mystery*, and it shook me up a bit.) The probability problem, as expressed by the "Mathematical Challenges" conference which Carlson mentions on pp. 198-199, deserves comment. Gutfeldt raises this point in his article too, and I'm going to discuss it in some depth, because it is an issue which confronts all thinking people when they encounter evolutionary theory.

It is indeed unbelievable that all existing organic diversity arose by the accumulation of single point-mutations in genetic material. To that extent I agree with the statements of Medawar and Murray, as cited by Carlson (p. 199). However, the outlook for evolutionary change isn't quite as bleak as that. In the course of my recent studies I came across Britten and Davidson's article "Repetitive and Non-Repetitive DNA Sequences and a Speculation on the Origins of Evolutionary Novelty" (*QRB* June 1971), which offers a striking new perspective on the problem. Let me stress that I don't consider this the one and only solution, but the beginning of a transformation in viewpoint which is still in progress.

Britten and Davidson combine their model of gene regulation, involving an ordered hierarchy of gene operation, with the evidence culled from various animal genomes for relatively sudden, massive DNA-copying events in the course of evolution, and come up with a theory about how sudden major changes in patterns of gene regulation (and thus somatic form and function) could come about. In their model of gene regulation (presented in *QRB* in 1969), repeated DNA sequences scattered throughout the genome play a major role, as a way of integrating batteries of structural genes into functional harmony for different stages of development and maintenance of the organism. The same structural (protein-producing) genes come into play at different times and in different functional contexts, and presumably other genes integrate their functions by selectively "turning them on," using common DNA sequences to sign-post different members of a single battery of genes. (My apologies to

Britten and Davidson for the distortion involved in compressing their ideas so drastically.)

One aspect of their theory involves the discovery that many organisms contain significant amounts of genetic material not involved in their development or function at all; during cell division this extra DNA goes along for the ride, but is never expressed in the lifetime of the organism. Much of this DNA consists of repeated sequences—sometimes duplicated thousands of times. Britten and Davidson postulate a mechanism which universally inhibits gene expression except when specific activators override the block. Under these circumstances much genetic change and increase could take place without affecting the phenotypes (somatic characteristics) of organisms, simply because they are not integrated into the higher-level patterns of gene interaction. Shielded from expression and thus from natural selection (remember: genes vary, individuals are selected, populations evolve) the new DNA could gradually be dispersed throughout the genome by sequence rearrangement. A subsequent, relatively small mutation, perhaps combined with unusual environmental stress, could trigger a whole new pattern of gene regulation resulting in major phenotypic change using lower-level patterns already established. Thus major genotypic change and major phenotypic change may not always occur simultaneously. Britten and Davidson believe that such an ability to "experiment" with regulation patterns, resulting from a blanket gene- inhibiting mechanism, is characteristic of eukaryotes (organisms with nucleated cells), and is the main factor explaining their great diversity. They further believe that simple changes in structural genes are not likely to result in true novelty, although they may account for variations within populations. (To support this they cite the high percentage of enzymes common to prokaryotes and mammals.)

I've probably lost most of my readers by now, but if any of you are left, the implication for the probability problem is this: evolutionary change doesn't have to start from scratch, from the ground up. Since it can incorporate lower-level patterns of gene interaction which are already present, the result is more likely to "make sense" than change which has no basis in prior order. There might still be many more failures than successes, but the ratio might not be prohibitively high. This insight would change the famous thought-experiment where a bunch of chimps are placed in a room with a bunch of typewriters to find out how long it would take for one of them to crank out Darwin's "Origin of Species" as a result of random keystrokes. In an alternate scenario the chimps would be allowed knowledge (even if only by rote) of vocabulary, spelling, and perhaps even sentence structure, and the goal would be not to reproduce something already written (evolution doesn't demand independent duplication—not total, anyway), but simply something that makes sense.

Britten and Davidson's theory does not completely solve the problem of probability, but I consider it a mighty good start. And if it applies specifically to the eukaryotes it may shed some light on the reason why prokaryotes hung out for two billion years before getting on with it and giving rise to that evolutionary pinnacle, the eukaryotic cell, whose entire (and much more interesting) history spans a mere 1.5 billion years, according to current estimates. I find it interesting that Britten and Davidson's article came out four years after the "Mathematical Challenges" conference mentioned above. Obviously those mathematicians were unable to take it into account in evaluating the probability of evolutionary events. (I don't mean to imply that no inkling of gene regulation patterns existed before B & D came along.)

An unfortunate tendency to deify natural selection has, I admit, characterized much of 20th-century evolutionary thinking. But I sense a growing trend to take into account other potent forces, such as developmental constraints and pure luck (I'll get to that in a minute). Computer tournaments have demonstrated the survival value of cooperative, rather than competitive, behavior (see Hofstadter's *Metamagical Themas*). There seems to be some division of opinion about whether these insights exist outside the Modern Synthesis or within it. The core of the Modern Synthesis is well-defined but its boundaries are not. A lot of people seem to think of it as whatever evolutionary knowledges and theories are current. In any case the Modern Synthesis is certainly growing and changing.

Both Gutfeldt and Carlson repeatedly use phrases such as "blind chance," "blind hazard," "blind accident," and "random chance." Well, I guess everybody does. But it seems to me that the blindness of chance depends to a great extent on whether or not there is a God. Wouldn't a thoroughgoing Panentheist see God as present in chance just as He is in other manifestations of natural order, and regard chance as a medium of

Divine Providence? And if there is no God, how could chance be other than blind? This sounds ridiculously simplistic perhaps, but looking for the ultimate source of order is a philosophical, not a scientific, pursuit. Anyone who wants to know how people can have rationality and purpose in a universe with none had better apply to Henri Bergson, whose life force principle operates accidentally on purpose, or by accidental purpose.

Although I could say much more, I will conclude with a few thoughts on Mark Carlson's presentation of the Hypothesis of Formative Causation. I am much more open to the idea that Sheldrake's "morphogenetic fields" might have a connection with the New Church doctrine of the Limbus than I am to the use of it for addressing scientific shortcomings in evolutionary theory. As a philosophical perspective from which to view evolution, the concept of morphogenetic fields may have value; but as long as it is outside the realm of natural science, (which may not always be the case) it is not the right stuff for plugging holes in science. It certainly does not let us off the hook in terms of pursuing investigations on a purely scientific level—philosophy never has—even if it does offer a new perspective for doing so.

Carlson's mention of Hugo Odhner's idea that "the 'limbus' might be a structure of wave patterns" (p. 214) is interesting. In fact, the idea that wave-patterns might contribute to biological organization goes back to the birth of modern physics. The biologist William Bateson came up with his "vibratory theory of repetition of parts" at least 100 years ago. Nils Roll-Hansen, in his article "Drosophila Genetics: A Redutionist Research Program" (*Journal of the History of Biology*, 1978), describes Bateson's theory in these words: "patterns, segmentation, and repetition of parts are results of standing waves, and such vibratory states are inherited by one generation from the preceding one." Bateson had no hard evidence for his theory and it was swept aside by classical genetics. However, genes might be expressed through wave-patterns. When I read the article "Developmental Constraints and Evolution" (Smith et al., *QRB* 1985), the following passage caught my eye:

> …[A] series of banding patterns on gastropod shells…can readily be interpreted as the results of standing or traveling waves of pigment formation in the mantle. Geometrically similar pigment

> patterns occur on feathers and on the coats of mammals…Looking at such patterns, it is easy to conclude that we are seeing the solution to a wave equation, even if it is hard to say what was waving" (p. 269).

Pigment distributions are not the only biological phenomena to suggest wave-patterns. Deeper studies of gene function may turn up more along these lines, which may relate to non-material forces.

I want to express my appreciation to Revs. Gutfeldt and Carlson for writing such provocative articles. And I owe more than I can say to the stimulus of Dr. Grant Doering's college course on evolution, which prodded me into acquiring exactly the information I needed to write this letter. Bibliographical information is available on request.

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