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MOLECULAR BIOLOGY AND EVOLUTION: THE CRISIS AND THE CHALLENGE

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I. MOLECULAR BIOLOGY AND EVOLUTION

MOLECULAR BIOLOGY AND ITS CLOSELY RELATED COMPANION, MOLECULAR GENETICS, have revolutionized our thinking about living organisms. In the process, they have compelled us to rethink certain questions which until a century ago had been exclusively the province of theology. These questions include (1) the uniqueness of man vis-a-vis the rest of creation; (2) divine intervention versus purely natural (physico-chemical) processes as responsible for man; and (3) man's origin and evolution. This latter is particularly important because physico-chemical knowledge of how cells and biological organisms grow, develop, and reproduce inevitably leads to the further question of how it all began. Indeed, there is now a clear connection between molecular biology and evolutionary biology which closely parallels the connection which has emerged over the last 20 years in physical science between particle physics and cosmology. For example, molecular clocks based on DNA sequencing are used to work out evolutionary trees, analogous to the way in which knowledge of fundamental particles and their interactions is used to work out the early history of the universe. This tight integration of the theory of evolution with molecular biology, and the visibility evolution has attained in both science and the public consciousness at large, justify concentration on it as a key element in the reintegration of science and theology. But when I speak of evolution, it is in the broadest sense, including both the modern version of Darwin's theory and its theoretical underpinnings in molecular biology, molecular genetics, and related fields.

The purpose of this essay is to highlight the crisis posed by the theory of evolution, sketch six possible approaches to resolve it, and indicate their strengths and weaknesses. The essay does not attempt to solve the problem of evolution in any definitive way.

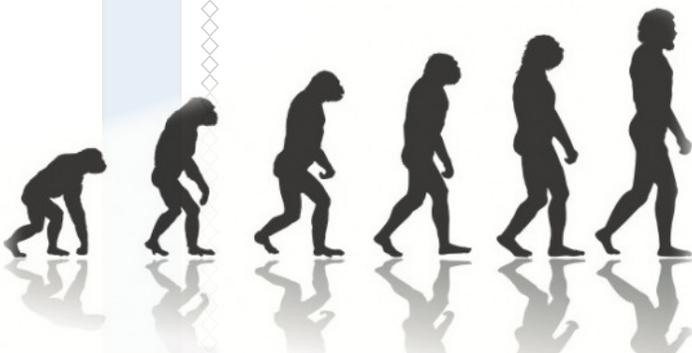
II. THE CRISIS POSED BY EVOLUTION

Christianity has had to deal with a number of major intellectual "crises" during the 2000 years of its existence, generally triggered by the appearance of some new "secular" knowledge which appeared to be at variance with a doctrine or world-view deemed at the time to be an integral part of Christian belief. Among the most famous of these crises was the introduction of Aristotle's work into the West in the twelfth century, and the development of the heliocentric theory by Copernicus, culminating with the celebrated Galileo affair in the early seventeenth century. As Gilson has documented,¹ the former crisis was of enormous magnitude because Aristotle's work represented a comprehensive view of the universe which was very compelling in its logical and empirical structure, which owed nothing to Christianity, and indeed was at variance with Christianity on some key points such as the creation of the world. The

crisis was met head-on and defused by Albertus Magnus and St. Thomas Aquinas, whose work resulted in what may loosely be termed the “Medieval Synthesis.” That synthesis, though challenged frequently, survived largely intact for about 400 years, during which time it served as the primary intellectual framework for Western thought.² Serious problems emerged due in part to the latter crisis. The heliocentric theory was a blow to Christianity for two reasons: (1) it made clear that the earth was not the center of the universe, as had been inferred from the Bible; and more importantly (2) the entire explanation schema of the heavenly bodies and their motion, based on the idea that they were “more perfect” than earthly bodies, was destroyed. This idea had deep roots in Western intellectual tradition; it was part of the Medieval Synthesis and went back to the Greeks, although its biblical foundation was perhaps rather shaky.

I mention these two crises because the development of the theory of evolution and associated work in other disciplines, such as geology and paleontology, has triggered a new crisis for Christianity (and other religions as well) which shares some of the same traits but differs from the earlier crises in key ways. It is like the medieval situation in that the theory of evolution, combined with other branches of science, represents a world view which seems to owe nothing to Christianity, is very compelling, and is - or claims to be - at variance with Christianity on many points. It is like the heliocentric theory crisis in that long-held views of man and the world which were thought to have solid biblical foundation, in particular the chronology in chapter I of Genesis, have been undermined. Destroyed at the same time was an explanation schema of how we got here: we (and the animals and the sun, moon, and stars) were the result of distinct creative acts of God which took place at a fixed time in the not too distant past.

The new crisis is different for two reasons. First, the theory of evolution is much more comprehensive than Aristotle’s work, since it can account for the origin and development of all things. As a result, it has acquired a far-reaching extra-scientific status.



To quote Mary Midgely’s fine book, *Evolution as a Religion*:

Evolution is the creation myth of our age. By telling us our origins, it shapes our views of what we are. It influences not just our thought, but our feelings and actions too, in a way which goes far beyond its official function as a biological theory... a surprising number of the elements which used to belong to traditional religion have regrouped themselves under the heading of science, mainly around the concept of evolution.³

Indeed, the surrogate religion that evolution has become often wants to “loot and plunder” orthodox religion, i.e., to divert the “spiritual assets” of religion to the service of science; these include the zeal of its members, their willingness to sacrifice for it, and the presentation of science as humanity’s ultimate quest (the Holy Grail).

The crisis is different for a second reason as well, and that is the widespread - almost universal - knowledge of evolution by the public, and specifically their knowledge of it as a “crisis” for religion. The analogous situation clearly did not obtain in the Middle Ages, and was much less of a problem in the Renaissance. Now to be sure, the general public’s knowledge of details and mechanisms of evolution is weak; but their knowledge that evolution “explains” the origin of man and other living creatures, coupled with their knowledge that other branches of science have “explained” the origin of the solar system and universe, has seriously undermined their belief in the Bible and religious authority generally. This, of course, is due to the fact that these sources are perceived to have been wrong on so many matters of fact. The situation has been exacerbated by highly publicized affairs such as the famous debate between Thomas Huxley and about us. So if one wishes to interpret a doctrine, dogma, or biblical passage in such a way that it has definite empirical content, such as the creation of the world in seven days, the flood narrative, or the nature of man as an essentially spiritual being, one will be making statements which fall under the competence of some branch of empirical science; and thus the truth of Christianity will become contingent upon the truth or falsity of particular scientific theories. Or at least it will if one has an *a priori* understanding of what those interpretations must be. Creationism rather vividly exemplifies this situation: the creationists (to their credit) clearly state what they think one must believe in order to be a Christian, and

among them is the literal truth of Bible passages such as those of chapter I of Genesis. The result, of course, is a direct contradiction of not just evolution, but large parts of geology, geophysics, astronomy, cosmology, and numerous other branches of science.

But even if one wishes to dismiss the creationists' approach as too naive, the problem does not go away; it just surfaces at another level. Is there something unique about man as a spiritual being? If so, is there some point in the sequence of hominids at which natural processes are insufficient to lead to the next member? Or at the level of molecular biology, when a sperm fertilizes an ovum, is there something in that or subsequent development processes which is not explainable by science? Or is there something in the behavior of man which is not reducible to physico-chemical processes in his brain or elsewhere in his body? If the answer is no, then reductionism's triumph would seem to be complete; if the answer is yes, then there should be an empirical test at some point.

One can, of course, restrict interpretation of theological and biblical statements to the level of metaphor and symbol, stripping them of direct empirical content; there would then be no possible collision with science. But as I see it there are problems with such an approach: (1) it would confirm the reductionists' claim that religion is essentially useless and unnecessary because it doesn't really say anything; (2) it would be at variance with the traditional understanding of Christian doctrine and belief as being about what goes on in the world - certainly one of its principal sources of strength; and (3) it would negate the true symbolic meaning of things such as the Cross, which are important as symbols precisely because they refer to events which actually occurred.

Traditionally there has been a mix of the two alternatives in most religious belief systems, so that some doctrines are interpreted literally and others symbolically or metaphorically, with particular items being moved from one category (usually the first) to the other as necessary. Thus the belief that the earth is the center of the universe, and that God created the world in seven days, which at one time were universally held to be "empirical," are now almost universally held to be symbolic or metaphorical. The problem with this procedure, of course, is that it appears to be backtracking, and if done too often, the faithful will begin to doubt whether any of their doctrines are safe. Since as a rule religion is strong only when it deals in absolutes, this perception can undermine the

faith of many, as I believe it has already done in the West, especially as a consequence of the evolution controversy.

Ideally, then, one would like to resolve the problem once and for all by determining where the dividing line between the two lies, and suitably interpreting the doctrines with empirical content so that they retain their religious meaning but are not going to be in conflict with scientific developments. Truth, after all, should be one. We shall next consider some possible approaches to accomplish this.



IV APPROACHES TO THE PROBLEMS POSED BY THE THEORY OF EVOLUTION

As I see it, there are basically six approaches to the theological problems outlined above.

(1) *Science is incomplete with respect to man.* Stated positively, this approach maintains that there is some fact about man which cannot be explained by science. There is no contradiction with any physical law; only a fundamental incompleteness which could be manifested as the occurrence of a long series of extremely improbable events, or a type of indeterminism which precludes prediction of subsequent events. An example would be the forces of evolution leading to a certain point of hominid development, beyond which they could not go of themselves. Zubiri's very profound meditation on evolution encompasses this approach:

The human psychic constitution is *determined* in its evolutionary origin by the germinal transformations, but it is not produced by them only. Here the causal determination is not effectuation. Mere sensation cannot produce of itself an intelligence: there exists between the two an essential, not a gradual, difference. No matter how complicated the mere stimuli and their form of apprehension are, they can never arrive at constituting stimulating realities and intellectual apprehension. At this point the appearance of an intellectual psyche is not only a matter of degree but is essentially something new.⁴

For Zubiri, the hallmark of intelligence is the ability to apprehend things as realities, and respond to them as such, not as mere stimuli. This, in his view, is the unbridgeable gap, which required an external cause:

... the psyche of the first hominized is essentially distinct from the animal psyche of the hominid ancestor of man. As such, the human psyche is *determined* by the transformation (by the germinal changes) of the mere hominid into man but is not *brought about* by the transformation. Because of this it can only be an effect of the first cause, just as at its time the appearance of matter was: it is the effect of a creation *ex nihilo*.⁵

It should be noted, however, that this first cause does not operate here by some type of insufflation of “spirit” into matter; rather, the creation in question is a type of causal “mechanism” intrinsic to evolution. This general approach has received a boost in recent years from the recognition that the forces of natural selection as envisioned by Darwin may be inadequate to explain the course, rate, and other features of evolution. It corresponds to a view of evolution somewhere between what I have elsewhere⁶ termed “Weak Darwinian evolution” and “Strong Darwinian evolution.”

(2) *The problem is not correctly in focus.* That is, we are not looking at it in the proper way because we have d la Descartes assumed a dichotomy between “spiritual” and “material” realms which in fact does not exist. Thus we seek some illusory break between the animal ancestors of man and man himself, *Homo sapiens*. This might be styled the “Eastern approach,” because of its affinity with certain ideas of Eastern religions.

An analogy may perhaps clarify the position. Considering space, for example, one might ask if it is infinite or finite, i.e., Does space have an “end”? There should be a yes-or-no answer. Or should there? Note that the question as framed assumes a flat Euclidean space; if space is curved in an appropriate way, it can be both finite yet not have an “end.” So the question may not be appropriate because it is based on a fundamental underlying assumption which is gratuitous. In a similar way, if one’s notion of “matter” is suitably modified, the problem of man evolving from lower animals may not really be a “problem” at all, because that “matter” already has “spiritual” characteristics built-in.

With this approach, man’s somatic structures are

an exigent cause of his consciousness, which is thus a part of the “material” world; or if one prefers, the material world is an extension of the “spiritual” world. This general approach has received a boost in the twentieth century from an unexpected corner: modern physics. The development of quantum mechanics has shown that matter is much different than the atomic spheres of nineteenth century determinism; indeed, in many ways it behaves in distinctly “un-materialistic” fashion, to the degree that many people have seen distinct parallels between modern physics and Eastern religious and philosophical thought (e.g. *The Tao of Physics*)⁷.

Whether such an approach can be successfully integrated into Christian thought is not clear, however. The language of the New Testament often speaks of a clear distinction between matter and spirit, e.g. Mt 28:41, “The spirit indeed is willing, but the flesh is weak,” and Jn 3:6, “That which is born of the flesh is flesh, and that which is born of the Spirit is spirit.” There is, moreover, the problem of understanding the immortality of the soul when a clear distinction between matter and spirit is lacking. (3) *Existence of or evolution toward man would violate physical laws.* This is an approach much favored by the creationists, who typically center their critique of evolution on the second law of thermodynamics, claiming that it forbids the type of order seen in biological organisms from arising naturally. However, as I have discussed at length elsewhere,⁸ the proponents of this view invariably seem to misunderstand and misinterpret the scientific laws and principles to which they appeal. As a result they set up a strawman to knock down which bears no relation to the true laws and the physical reality they describe. Nonetheless if one could demonstrate that man (or living creatures generally) violated some physical law; or that any type of evolution would violate such a law, then at one stroke reductionism would be discredited and religion would score a triumphant victory. This type of “silver bullet” approach to complex intellectual problems rarely succeeds, however.

(4) *Physical laws have been misinterpreted and misapplied.* This is another creationist approach, encompassing their “flood geology” theory. According to this approach, evolution did not occur, established geological history is incorrect, and everything happened in accordance with physical laws as “correctly” applied and in accordance with a literal reading of the Bible. Thus the world was created 6000 years ago, the flood of Noah’s time accounts for observed deposits of fossils, and so

forth. The problem with such an approach is twofold: (1) as Kitcher⁹ has pointed out, the creationists' theories have no predictive value; and (2) it compels them to declare war not just on the theory of evolution, but on scientific disciplines such as astrophysics, geophysics, and now even particle physics, all of which are irrevocably committed to time spans of billions of years. Modern science is a tightly interlocked intellectual system with extremely wide-ranging empirical confirmation and explanatory power; the flick of a light switch and the passing of an automobile exemplify the same laws used in working out the chronology of the universe. It cannot be dismantled and ad hoc substitutions made as advocated in this approach. Every attempt in the past to make science conform to preestablished conclusions has failed; there is no reason to assume this one will fare any better. And ironically it is being advocated at a time when many of the major findings of science are in fact quite favorable to Christianity, such as the development of the Big Band theory and the dethroning of strictly deterministic hypotheses about the universe.

5) *Reinterpret Controversial Doctrines as Metaphorical or Symbolic.*

Included here are theories such as Dobzhansky's, that science deals with fact and religion with meaning. To be sure, symbols play an important part in our lives, and we could scarcely have a functioning society without them; the flag as a symbol of our country is a perfect example. However as discussed above, religious symbols - at least in Catholicism - have meaning precisely because they refer to events which actually took place; consider, for example, the Eucharist. To paraphrase St. Paul, if Christ did not physically die on the Cross for our sins, then the Eucharist loses all meaning except perhaps as a gesture of friendship, as a metaphor of Christ's friendship with us perhaps. Therefore if one is going to attribute only symbolic or metaphorical meaning to any doctrine or dogma which causes problems, there will be a real danger of emptying religion of its deepest meaning, that which stems from events which actually took place in the world. On the other hand if the reinterpretation is selective, it may well leave us with the same problem, viz. how to integrate those statements having empirical content with scientific knowledge. The

reinterpretation approach therefore may not be capable of resolving the evolution problem without eviscerating the very religion it is supposed to serve. Specifically with regard to evolution and Genesis, if one wishes to claim that accounts in the Bible are symbolic or metaphorical, and that science tells us what really happened, then one is left with a suite of problems: the uniqueness of man (is he different than the animals?), the immortality of the soul (also a metaphor?), and God's care for us as individuals (a metaphor for Mother Nature?), just to name a few. The reinterpretation approach may be a useful adjunct to theology, but does not seem capable of entirely solving the evolution problem.

(6) *Evolution occurred as described by science.* This may also be termed the theory of *fundamental wholeness*. According to this approach, physical laws and initial conditions on planet Earth were sufficient to produce man after 5 billion years of evolution, assuming natural selection and possibly other (natural) forces at work. God's

governance and creative power are always present, sustaining life. This approach can be similar or even identical to the previous one, or it can be quite different. For example, one can assume that since God created the universe and the laws operative in it, He therefore created the earth and caused it - through secondary causes, the laws of nature - "to bring forth vegetation ... to bring forth living creatures," in the words of Genesis. In favor of this approach, it should be recognized that Genesis, written 3000 years ago, could not possi-

bly have told the story of the creation of the universe and the earth and the development of life as we currently understand those things because the underlying concepts were completely unknown. Consider a sentence such as, "Amino acids in the primordial oceans 5 billion years ago were combined through energy provided by sunlight into proteins, and some of the proteins spontaneously formed DNA through reactions favored by entropy." This sentence would have been unintelligible to someone in Europe or America a hundred years ago; it most certainly could not have been expressed in ancient Hebrew because neither the words nor the requisite conceptual infrastructure existed at that time. Any attempt to explain


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cosmology, astrophysics, paleontology, or evolutionary biology to the Hebrews would have been regarded as total gibberish. Therefore we cannot possibly expect the Bible to tell the story of creation in the terms to which our science has accustomed us; it is equally absurd to expect the Bible to serve as a scientific textbook.

On the other hand, this approach to the evolution question does pose many problems, among them the following: (1) By Ockham's razor, religious explanations of the world and man should be discarded because we have at least one good explanation, the scientific one; i.e., has too much been conceded to the reductionists? (2) Does this approach sufficiently differentiate man from other creatures; i.e., is he sufficiently unique? (3) Is God too remote? Too Deistic? Does He only operate the universe by remote control, so to speak? (4) Is there enough interaction of God with the world? How do Christ and the incarnation fit in? (5) What about miracles? Do they really occur? and (6) What becomes of the soul and its immortality?

These problems need to be resolved before this approach can be made viable, but that may well be pos-

sible.

V. THE FUTURE

Resolution of the crisis stemming from developments in molecular biology and the theory of evolution will likely require a substantial investment of time and effort, and will probably come as part of a new world view, one that is more comprehensive and subtle than what we currently possess, and perhaps more dynamic in some ways as well. I suspect that it will be a combination of some of the foregoing approaches, especially in view of the fact that they are not all mutually exclusive. But there is unfortunately no guarantee that the current state of science will permit us to devise such a world view. Nonetheless the goal is clear: to preserve the empirical content of important religious doctrines, give science free reign to continue exploring the world accessible to it, and permit us to understand how the two interact and yield one version of the truth. This is a rather tall order I admit, but one to which I believe we are all committed and which will no doubt be one of the great legacies of our time.



NOTES

1Etienne Gilson, *Reason and Revelation in the Middle Ages* (New York: Scribners, 1938).

2E. J. Dijkterhuis, *The Mechanization of the World Picture*, tr. by C. Dikshoorn (Princeton: Princeton University Press, 1986), passim.

3Mary Midgley, *Evolution as a Religion* (New York: Methuen & Company, 1985), pp. 30-31.

4Xavier Zubiri, "The Origin of Man" in *Contemporary Spanish Philosophy*, ed. by A. R. Caponigri (Notre Dame: Univ. of Notre Dame Press, 1967), pp. 65-66.

5Ibid., p. 66.

6Thomas Fowler, "Thermodynamics and Evolution: Contradiction, Constraint, or Cooperation?" in *Faith & Reason*, Vol. X, No. 2, pp. 101-148.

7F. Capra, *The Tao of Physics* (Boston: Shambhala Publications, 1975).

8Fowler, op. cit.

9Philip Kitcher, *Abusing Science, The Case Against Creationism* (Cambridge: MIT Press, 1982).