CONTEMPORARY EVOLUTIONARY THEORY AS A NEW HEURISTIC MODEL FOR THE SOCIOSCIENTIFIC METHOD IN BIBLICAL STUDIES

by Robert Gnuse

Abstract. Notions of uniform and gradual evolution have been replaced in some circles by biological and paleontological models that postulate that periods of rapid change punctuate long periods of evolutionary stasis. This new theory, called *punctuated equilibria* (or PE for short), may have implications for paradigms in scholarly disciplines other than the sciences. Whereas old evolutionary models exerted great influence upon historians, sociologists, anthropologists, and students of religion for more than a century, the new model may provide heuristic paradigms for research that correlate more adequately with the current observations of scholars. We therefore provide suggestions for deployment of this new scientific paradigm in history and anthropology. In particular, this model can explain the rise of the Israelite state and the religious ethos in the Hebrew Bible, two major concerns of today's socioscientific study of biblical materials. Thus the possibility of an overarching paradigm for the social sciences is entertained.

Keywords: punctuated equilibria (PE); biblical monotheism; sociohistorical analysis of the Bible; paradigm shift; evolutionary gradualism; Israel; heuristic model.

Perceptive intellectuals have usually (if not always) attempted to ascertain the principles of reality, and to describe the processes that circumscribe phenomena. If such overarching findings could become presuppositions in the various disciplines of learning, these heuristic principles would be the common denominators for discourse in the hard and social sciences and the humanities. Indeed, the writings of Ilya Prigogine, Erich Jantsch, and Ervin Laszlo encourage us to

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think in such holistic categories (Jantsch 1980, 1-311; Laszlo 1987, 3-194; Fabel 1987, 168-77). Some authors have even encouraged the use of categories from the biological theory of evolution as paradigms (in a very general fashion) for other fields of learning (Theissen 1985, 1-174; Laszlo 1987, 75-109). For example, sociobiology has been applied to social-scientific theory vis-à-vis anthropology by Charles Lumsden and Edmund Wilson (Lumsden and Wilson 1981, 1-362).

To be sure, not all thinkers concur with such assumptions. Indeed, many would challenge the attempt to discern a heuristic paradigm that could be used throughout the academic curriculum. Were such metaprinciples to exist, say the critics, their application in both the sciences and the humanities would be impossible without forcing the humanities into reductionistic categories. Furthermore, such principles are generated most frequently in the hard sciences, then forcibly brought to bear on the more subjective humanities. Doubtless there is some truth to these objections, but too many scholars are willing to consign their endeavors to isolation from any interdisciplinary perspectives. As a result, fields of learning have become compartmentalized specializations.

Regardless of this debate and its ultimate resolution, all would admit that the theory of biological evolution has exerted far-ranging influence upon academic disciplines for more than a century. Originating as a model in the biological and geologic sciences, it has attracted theorists in all fields of social science and the humanities. The notion of progress or change that we profess today is an all-inclusive metaprinciple, inherited (in part) from the hard sciences of the nineteenth century, especially the work of Charles Darwin on the concept of evolution. This has been especially true of history, anthropology, sociology, and comparative religion. Students of religion (especially world religions) and biblical studies have used the theory for heuristic models to explain their phenomena.

In biblical studies, which are the special interest of this author, the notion of evolution has been used to perceive both the development of Israel's religious faith and its generation of social structures and accompanying sociopolitical values. Early nineteenth-century scholars, influenced by scientific notions of evolution, described Israel's faith as a gradual passage through stages of religious development toward greater sophistication and monotheism (Wellhausen [1878] 1973, 17-425; W.R. Smith [1889] 1972, 1-440). Early twentieth-century scholars, who challenged such observations and questioned the use of evolutionary models in describing Israel's faith and social values, believed a Mosaic revolution brought monotheism to the Jewish people prior to their settlement in Palestine (1200

B.C.E.) (Albright [1940] 1957, 1-403; Kaufmann (1937-56) 1972, 7-340; Wright 1950, 7-112).

More recently, biblical scholars have argued a moderate position by postulating that Israel's religious development came in several "leaps," most significantly the mono-Yahwistic revolution in the premonarchic period and the final ascendancy of consistent monotheism in the Babylonian Exile (550 B.C.E.) (M. Smith 1971, 15-56; Keel 1980, 11-183; Lang 1981, 7-113; 1983, 13-59). But these contemporary scholars do not accept heuristic models of evolution, either to utilize or to criticize them, as did their predecessors. Rather, they seem to assume that evolution as a model is germane only to the biological and geologic sciences.

Perhaps the experience of biblical scholars parallels that of social scientists. In many fields the observed phenomena attest to change and development that occur in revolutionary leaps or breakthroughs rather than by simple, gradual evolution. Hence polite avoidance of evolutionary theory is evidenced, for scholars do not want to straitjacket observations with what they consider a dogmatic theory of gradual change. No longer, therefore, is a grand, overarching metaprinciple sought by the various disciplines.

Within the last generation, however, the model of biological evolution appears to be changing, and the new model may have new significance for other disciplines. Indeed, we may be on the verge of a major paradigm shift for our models of perception, so that we view reality according to a unified principle of evolution. This, in fact, corresponds to Thomas Kuhn's observations on how intellectual development, particularly science, advances: in sudden leaps or creative bursts as heuristic paradigm shifts occur (Kuhn 1962, 1-172).

In some scientific circles, slow and gradual evolutionary models are modified by the notion that evolutionary change may progress quickly over short periods of time. As this model gains acceptance in the hard sciences, it may provoke a corresponding response among thinkers in other fields of learning (Laszlo 1987, 83-109, 113-14). In particular, religious studies experts are once more calling for scientific paradigms in our scholarly discourse: "In the present state of our knowledge and error the theory of evolution gives us an impressive picture of the unity of all reality. Behind all the phenomena we have intimations of a central reality which determines and conditions everything" (Theissen 1985, 19 and passim). To that end, this brief essay probes the implications of that model in the social sciences and humanities; it also seeks to offer a new heuristic paradigm to describe change or the process of development in social and intellectual categories. Selected examples from the social sciences

will be considered and specific evaluation of ancient Israel's development will be undertaken.

Scientific Model of Punctuated Equilibria

Darwin's model of evolution assumed the slow development of variegated life forms over countless eons as the forces of natural selection constantly weeded out certain individuals. Favored survivors passed on their genetic predispositions and, slowly, the genetic pool of a species changed and evolution thus occurred. Species were all part of a spectrum of life, each species slowly evolving into the next species, proliferating into new variations. Eventually the need to adapt to various environments would cause the wide range of phyla exhibited today. This theory has been called *phyletic gradualism,* the gradual evolution of all life's representatives. The model incorporated evidence from taxonomy, genetics, geology, and paleontology. The theory was stated in its most developed form by evolutionists in the previous generation: Theodosius Dobzhansky (1937, 1941, 3-321), Julian Huxley (1942, 7-578), Ernst Mayr (1942, 3-298), and George Gaylord Simpson (1944, 3-217). Their presentation of the theory has been called the "modern synthesis" (Eldredge 1985b, 6-83). Critical reflection upon the rise of this "synthesis" between 1936 and 1947 has been undertaken by contemporary scientists, including many of the individuals involved in the original discussions (Mayr and Provine 1980, 1-463).

Recently, however, their model of gradual evolution has been challenged. The leading critics have been paleontologists who were quick to point out that the fossil record does not evince slow, gradual change but, rather, periods of stasis interrupted by quick, evolutionary developments (Gould 1977a, 62; 1980, 182, 188; 1983, 180-81, 259; 1985, 241-42; Stanley 1981, xv, 3, and passim; Eldredge 1987, 7-11, 31). Likewise, biologists have been prone to define the integrity of species, maintaining that there is not a blur between various species; rather, species are distinct entities with a specific life history. Thus evolutionary selection occurs at a species level, not just on an individual animal or plant level (Gould 1980, 15, 204-13; Stanley 1979, 181-212; 1981, 15; Eldredge 1985a, 34, 150).

A new theory, often called *punctuated equilibria (PE),* has been proposed by a number of scientists, including Niles Eldredge, Stephen Jay Gould, Steven Stanley, and others.[1] They propose that evolution does not result from the buildup of small genetic changes gradually over long periods of time; rather, there are long periods of stasis

in the life of a species, within which there may be some genetic "drift," but no change of sufficient magnitude to initiate a new species. This long period of stasis is punctuated by a short but rapid evolutionary development in which a new species arises that may displace the ancestral species. Eldredge describes it thus: "Adaptive change is relatively rare and usually associated with speciation, thus typically rapid. Once a species appears, if it is successful at all, the fossil record shows that it will tend to hang on unchanged for vast stretches of time. . . . Organisms are sufficiently geared to suit their surroundings that as a rule they do not malleably continue to change to reflect every whim of the environment. . . . [Evolution is not] stately unfolding, but a story of homeostatic equilibria, disturbed only 'rarely' . . . by rapid and episodic events of speciation" (Eldredge 1985a, 128, 141, 193).

How does this process of quick change occur? Through *allopatric speciation*—the isolation of a species by geographic and climatic changes, with a subsequent buildup of many genetic variations in a small animal population—a new species may develop in a very short time. If such new populations (called *peripheral isolates*) are better adapted to the environment, the new species may spread into the area of the ancestor species and displace it (Eldredge and Gould 1972, 82-115, Stanley 1979, 40-74, 118-42, 272-301; 1981, 5, 50, 70, 78; Gould 1985, 444; Eldredge 1985a, 164, 183-89). As both Gould and Eldredge observe: "A new species can arise when a small segment of the ancestral population is isolated at the periphery of the ancestral range. Large stable central populations exert a strong homogenizing influence. New and favorable mutations are diluted by the sheer bulk of the population through which they must spread" (Gould 1980, 183), and "new species—new reproductive communities—tend to bud off in some isolated region from a more widely spread ancestral species. . . . Change comes in bursts, and these bursts probably represent speciation events. . . . Species arise very rapidly in small, peripherally isolated local populations" (Eldredge 1985a, 189-90, 193).

When the peripheral isolate develops into a new species, isolating mechanisms in the genetic structures prevent the reinitiation of genetic material into the genetic pool of either the ancestral or the new species. New forms can be fixed genetically since offspring in small populations tend to interbreed, thus permitting genetic stabilization. Also, animals engage in *assortative mating,* the tendency to breed with animals that resemble them. Thus a genetic change with a morphological modification will be preserved, and this principle can enable speciation even when species are sympatric with the

ancestral species—that is, living in the same environmental range (Stanley 1981, 121-22, 131, 136). The genetic mutation that causes significant transformation may result from chromosomal rearrangement, and this rearrangement may place a *regulatory gene* in a new position, thus creating a domino effect on many other genes. A regulatory gene in a new position activates—or deactivates—many other genes; indeed, most genes in a life form (80 percent) do not function: they are "switched off" by a regulatory gene. Thus a small mutation in a regulatory gene can produce a great change in a species, so that a rapid morphological change (over several generations) may be based upon a very small genetic alteration (Stanley 1979, 148-64; 1981, 127-31; Gould 1983, 177-86).

As the new species adapts to its ecological niche, morphological change continues quickly. Subpopulations may subsequently develop as the new "subspecies" proliferates to fill the environment; it may even invade new ecological territories in a nondirectional or *stochastic* fashion (that is, through multiple random explorations). If the ancestral species is encountered and the two species become territorially sympatric, even quicker morphological change may occur in the new species (for speciation requires genetic isolation until the process is complete). Species appear to obtain homeostatic genetic stability despite disturbing influences, and this stability is created by isolation on the periphery of a territorial range and by the genetic and morphological maintenance of that separate identity. Once stability is established, change is minimal, and long periods of morphological stability follow (Eldredge 1971, 156-67; 1985a, 193-223; Eldredge and Gould 1972, 82-115; Gould 1977a, 61, 118; 1980, 183, 213; Stanley 1979, 65-76, 102-8, 272, 301).

Speciation may be significant after extinction creates a "vacant" ecological niche, and evolution is rapid as many new species proliferate to repopulate the ecological niche (Stanley 1979, 65-74, 102-8; Gould 1977a, 62; 1983, 320-31; 1985, 241-42, 438-50). Such additional speciation is called *population flush,* especially when new species invade a new territory. After a catastrophe, species that survive in their original ecospace will also repopulate, but they will represent a disproportionate ratio of the ancestral species' genetic pool, thus initiating further macroevolutionary change, called *catastrophe selection* (Stanley 1979, 168). Extinctions can be local or worldwide, as were the great extinctions in the pre- and late Cambrian, late Ordovician, late Devonian, late Permian, and late Triassic ages, which enabled a wide range of new life forms to repopulate the earth (Gould 1977a, 62, 119-38; 1983, 320-31, 346; 1985, 241-42, 348-50; Eldredge 1987, 87, 202-12). Without these

extinctions, which eliminated life forms and emptied the ecological niches, new forms and significant change would have been impossible, and "life would still be confined to a primitive state somewhere on the sea bottom" (Eldredge 1987, 11).

What do paleontologists mean by a "short" time? The development of a new species may take ten to fifty thousand years, and once the species has attained a new form, it will remain stable (with only slight genetic variations) for 5 million to 10 million years (Gould 1983, 54, 259; 1985, 241-42; Eldredge 1985b, 128; 1987, 82). The process of speciation is frequent, for *some*where in the world species are always undergoing speciation in a changed ecological environment. But, given the great number of life forms in our world, there is evolutionary stability between all great periods of species' die-off in global catastrophes. Thus one could also say that "evolutionary events are few and far between, and the usual pattern is quiet, business as usual, interrupted only on odd occasions by the birth of something new" (Eldredge 1987, 31).

Evolutionary change is the function of speciation, rather than the old Darwinian model that saw speciation as a function of adaptive change. In fact, evolution occurs by significant leaps at the species level (Eldredge 1985a, 147). Darwinian advocates of the "modern synthesis" promulgated notions of inevitable phyletic gradualism premised upon natural selection. The corollaries of this assumption were that (1) species arose by transformation of an ancestral population, (2) the process was slow and regular, (3) the entire species population was involved, (4) phyletic gradualism occurred over a wide geographic range, and (5) gaps in the fossil record merely indicated the imperfections of that record. The mechanism of change was (6) genetic "drift," resulting from (7) natural selection exerted upon mutations.

However, advocates of punctuated equilibria maintain that (1) species arose by splitting lineages, (2) species developed quickly, (3) subpopulations also gave rise to new forms, (4) only a small part of a species' geographic range was involved, and (5) gaps in the fossil record reflect quick morphological change in limited and isolated geographic regions, since only a small animal or plant population was involved. The mechanism of change was (6) phylogenetic drift, resulting from (7) the directed speciation of a whole species' selection (Eldredge and Gould 1972, 82-115; Stanley 1979, 143-79; 1981, 77; Gould 1980, 194-203, 226; Eldredge 1985a, 197, 205).[2]

Theorists speak of two levels of evolution in a *nested hierarchy*. These two phenomenological levels are microevolution, or the change within a species, and macroevolution or the change in species

composition within a larger phylum (Eldredge and Cracraft 1980, 247, 277; Eldredge 1987, 232). It is on the macroevolutionary level that truly creative advance occurs. Subtle genetic changes in a species (or microevolution) may prepare the possibilities for later macroevolution, but macroevolution, or true evolution, occurs above the genetic level (on the species level) when ecological factors mitigate species selection. To project microevolution to the level of macroevolution contradicts both the observation that species are distinct entities and the paleontological record, which testifies to the stability of the species (Gould 1977b, 209–409; 1980, 15, 184; 1983, 177–86; Eldredge and Cracraft 1980, 301–26; Eldredge 1985a, 145; 1985b, 139–215). Eldredge notes: "Evolution emerges as a multilevel, or hierarchical affair. What goes on at one level may have little effect on the next higher or lower level. The comings and goings of entire species—and even larger groups—may have little to do with the normal processes of genetic change that go on from generation to generation within species" (Eldredge 1987, 232).

These modern scholars are quick to point out that their theory differs from earlier views of mega- and macroevolution, proposed by Richard Goldschmidt and others, for those theories postulated fast genetic change within a single species to obtain quick processes of evolution. Conversely, the new theory postulates change due to species selection, an activity on a higher, hierarchical level. Also, Goldschmidt thought that only the chromosome mutation permitted change, whereas the new understanding of regulatory genes perceives that singular mutations upon genes have wrought great change. Old macroevolutionary theories were merely microevolution writ large, whereas the new theory of punctuated equilibria assumes evolution on a multiple, hierarchical level (Goldschmidt 1940, 184–399; Eldredge and Cracraft 1980, 325; Stanley 1981, 135; Eldredge 1985a, 94, 1985b, 67–97, 140).

Implications for the Social Sciences The theory of punctuated equilibria significantly modifies previous Darwinian notions. Instead of gradual change, theorists may now speak of rapid change between periods of relative inactivity. Nevertheless, advocates maintain that for the past century scientists have opted for gradualism even though the data did not warrant it, perhaps reflecting a cultural bias of that age (Gould 1980, 194–203, 226). Likewise, scholars in other fields may have had a proclivity toward evolutionary gradualism because of the same cultural suppositions. Dissenters occasionally pointed to the phenomena of apparent radical revolution, quick change, or reconstruction in the course of development, which appeared to

contradict the model of gradual evolution. According to the new theory, such examples of rapid reconfiguration do *not* contradict the theory of biological evolution; they merely suggest a different mode of evolution, which augments the Darwinian explanations.

Is it now possible to use this new theory (of PE) to discuss phenomena in the social sciences and the humanities that pertain to social and intellectual development? My view is that the PE theory has heuristic value, in a limited way, and enables us to describe phenomena by a model that more or less conforms to what we observe. To this end, we might consider academic disciplines in which the model may merit attention; and in some instances its nuances have been anticipated.

This new perspective would not be based on new data so much as simply viewing the paleontological and biological records in a different fashion. Likewise in other fields of learning, the new shift of thought means viewing the same information from a different perspective, not introducing new data. Advocates of punctuated equilibria maintain that an exclusivistic view of evolutionary gradualism in all fields of learning, but especially science, was a mental construct placed upon the evidence by nineteenth-century liberal notions of progress (Gould 1980, 194–203, 226). The new perception would perceive the evolutionary data attesting to leaps, rather than a gentle incline, and such a reorientation could be called a paradigm shift (Kuhn). Proponents in fact make this claim for the theory of punctuated equilibria. When a paradigm or intellectual construct by which theorists perceive and interpret data, no longer accounts comfortably for the data, a new paradigm is generated and often sweeps the scientific community (Kuhn 1962, 1–172).[3] Indeed, the theory of punctuated equilibria appears to have influenced biologists and paleontologists in such a fashion, and it may be felt in other disciplines as well. Ervin Laszlo, who has already made such a claim for PE, believes it will become the "grand synthesis," "provid[ing] the basis for the next paradigm of contemporary science," and have equal impact in the social sciences (Laszlo 1987, 113–14).

Niles Eldredge and Stephen Jay Gould observed that the noted historian Frederick J. Teggart postulated, as early as 1918, that culture and scientific achievement have usually advanced in quantum leaps, not gradually. He was critical of Darwinian evolution and its impact upon the academic disciplines. (Indeed, Eldredge and Gould perceived that his views of history foreshadowed the biological model of punctuated equilibria.) He theorized three themes in human history: (1) stability, which is dominant; (2) gradual change, which causes only a slight modification in human affairs; and (3) real

change, which is accomplished quickly—all of which are major characteristics of punctuated equilibria (Eldredge 1985a, 143–45).

Teggart wrote two works, *Processes of History* (1918) and *Theory of History* (1925), in which he said that history is composed of "events" or "intrusions" that are sudden, quantitative leaps in human experience. He criticized Darwin's uniform gradualism, for it perpetuated the eighteenth-century dichotomy between process and event. Eighteenth-century thinkers believed that change resulted from an urge toward progress, and discrete events were unimportant, merely accidental interference with the natural process of change. Change, Teggart believed, was *not* a natural process; singular events were the modus operandi of change, and they represented a fundamental break with previous history. Instead of slow change and inevitable, gradual progress, Teggart envisioned complementary ideas of fixity and advancement in human affairs: long periods of stability punctuated by rapid change (Teggart [1918, 1925] 1960, 148, 193, 198).

In opposition to Darwinian models of gradualism, Teggart supported a number of biologists who implied a paradigm compatible with his perceptions: Thomas Huxley, Sir William Grove, George Darwin, K. A. von Zittel, and Hugo de Vries (Teggart [1918, 1925] 1960, 148–49). They postulated that long periods of relative stability were interrupted by short periods of critical evolutionary change. Unfortunately, however, these biologists had no genetic mechanism to explain this process, as do present-day advocates of punctuated equilibria. Their nongradualistic views, expressed in the 1920s, would not prevail, for the creators of the "modern synthesis" would displace their ideas in the 1940s. The PE theory, which seeks to return (so to speak) to those earlier suggestions, provides the mode of allopatric speciation and geographic isolation as the mechanism of evolution. Teggart was simply ahead of his time.

Teggart paralleled the insights of today's advocates of punctuated equilibria in another fashion: he believed that intellectual and social progress results from the interaction of different peoples: "Human advancement is the outcome of the commingling of ideas through the contact of different groups . . . had there even been but one system of ideas common to all men, advancement would have been impossible, for progress in ideas springs from comparison" (Teggart [1918, 1925] 1960, 285–86). The idea of interplay in history is analogous to the notion of allopatric speciation and subsequent species diffusion. Cultural development in one environment proceeds differently than in another; subsequent contact may result in the extinction of one culture, or it may produce a new synthesis,

which is comparable to a proliferated set of variations in sympatric speciation.

In the general study of history the PE model may provide a helpful heuristic model for viewing human events. Teggart's concern was to find a model to bridge the gap between the sciences and the humanities, and if one shares Teggart's concern and view of the historical process, contemporary evolutionary theory has provided such a model. Today's systems analysts even suggest such a possibility for the PE model (Laszlo 1987, 107-8).

Punctuated equilibria may also provide a helpful model in the study of anthropology. To this end, Steven Stanley, Niles Eldredge, Ian Tattersall, and others have proposed a new understanding of human evolution using contemporary theory (Stanley 1981, 138-64; Eldredge and Tattersall 1982, 3-187; Laszlo 1987, 83-86). Their analysis is analogous to the biological model: "The history of the world is . . . one of fits and starts, of new breakthroughs followed by rapid development . . . patterns of cultural change tend to show stability interrupted by occasional, usually rather rapid, change, rather than linear, constant modification for the better" (Eldredge and Tattersall 1982, 3-4).

In regard to human evolution they postulate that new development, as did upright anthropoid posture, large cranial capacity, and toolmaking, appeared early (and rapidly) in the development of human species. Subsequent generations merely unfolded the potential of the initial breakthrough, and the genetic makeup of the human species remained essentially unchanged. However, geographic isolation played a decisive role in human evolution as new anthropoid species arose on the edges of the ancestral range (Stanley 1981, 138-64; Eldredge and Tattersall 1982, 8, 59-61). The various species (*Australopithecus afarensis, Australopithecus africanus, Australopithecus robustus, Australopithecus bosei,* and *Homo habilis, Homo erectus,* and *Homo sapiens*) were distinct species that arose in isolation, then displaced the previous species. Thus there was not a simple, gradual, linear, evolutionary advance. Various hominid species could have overlapped each other, particularly *Australopithecus africanus* and *Homo habilis* and *erectus* (Gould 1977a, 56-62; Stanley 1981, 149; Eldredge and Tattersall 1982, 119-59; Laszlo 1987, 83-86).

The very same pattern may also describe human cultural evolution, particularly toolmaking. If a breakthrough in the archaeological record appears, it will no doubt indicate that the anthropoids explored all possible uses of the tool very rapidly. The record then indicates a long fallow period, with little change, until the next breakthrough. Thus the Old, Middle, and New Stone Age represent

cultural leaps, followed by long periods of stability (Eldredge and Tattersall 1982, 9–11). Each hominid species had a characteristic culture; the Acheulan culture is attributed to *Homo erectus* and Mousterian culture to Neanderthal, an early *Homo sapiens*. In turn, Neanderthals were suddenly replaced by a new species of *Homo sapiens* from the periphery (perhaps Africa), which spread throughout the Neanderthal range (Stanley 1981, 159–64; Laszlo 1987, 85).

Anthropologists who made these observations extrapolated to discuss human history in general. Ancient Egypt was perceived as the best example of stasis, with little cultural "drift," which nonetheless remained essentially unchanged until the Christian era. Greece peaked early, but did not evolve in the later Hellenistic period, and Rome replaced Greece, but no real advance occurred. Even later European history may be seen to be marked by stasis, punctuated by great advances in the Renaissance and the Industrial Revolution (Eldredge and Tattersall 1982, 16–17). In similar fashion, Laszlo used punctuated equilibria to describe sociohistorical phenomena, such as the rise of agriculture, the invention of writing, and the Industrial Revolution (Laszlo 1987, 94–101). He concluded: "History's arrow of time does not fly smoothly. . . . Societies, the same as biological species, do not change at all times and in small increments. Rather, the mode of change appears saltatory and intermittent, triggered by external conquests and internal discontent and by technological revolutions that change the pattern of relations between man and man and between man and nature" (Laszlo 1987, 101).

The biological and social spheres seem similar: adaptation leads to stability and nonchange, and gradual evolution does not occur. New ideas and cultures arise in geographic isolation, then radiate into new environments. In biology, isolation causes speciation; in history, isolation creates cultural identity, and cultural contact creates innovation (Eldredge and Tattersall 1982, 177–80). Change results from cultural conflict and the radiation of new ideas into an arena where the old worldview has collapsed. "Ideas, or sets of ideas (paradigms), remain in favor for a period, during which a critical mass of anomalies build up. Suddenly the old paradigm is discarded and the new one takes its place" (Eldredge and Tattersall 1982, 65).

Whereas Stanley, Eldredge, Tattersall, and Laszlo consciously used the PE paradigm to discuss human cultural evolution, other anthropologists seem to be unconsciously moving in this direction. This is evident among theorists who especially discuss the origins of the state or governmental structures in human culture.

Colin Renfrew, who has investigated the social-cultural development of preclassical Greece, ancient Britain, pre-Iron Age Europe, and pre-Vedic India, postulated several models by which to understand state formation (Renfrew 1972, 3-504; 1973, 15-270; 1979, 3-506; 1987, 3-418). Some of his models closely parallel contemporary evolutionary thought. To explain the rapid emergence of civilization, for example, Renfrew speaks of the "multiplier effect," the interaction of several social factors, such as technology, food surplus, and increased population, which by their codevelopment cause a rapid increase in cultural evolution (Renfrew 1972, 27-44; 1987, 258-308). In fact, Renfrew notes that societies will resist change ("innate conservative homeostasis") and maintain "equilibrium" until a matrix of social factors produces the multiplier effect and causes a sudden leap. Otherwise, a few unassociated social factors may only cause "small random drift" in the social history of a culture (Renfrew 1972, 43, 487-88). The interaction of social factors "lie[s] at the root of all growth and development within the culture" (Renfrew 1972, 488). This interaction of numerous social forces appears to be comparable to the genetic reconfiguration in biological species; the rapid emergence of cultural developments is like the breakthrough of a new species into the ecosystem; and social homeostasis parallels the fixity of a species once equilibrium is attained.

Another ancient-times historian and social anthropologist, Michael Hoffman, used basic scientific evolutionary language in his assessment of the development of the state in ancient, predynastic Egypt (Hoffman 1979, 80-82, 305-47). He described the cultural diversity of predynastic Egypt as a "gene pool," which provided varied traits to enable a species, biological or cultural, to survive (Hoffman 1979, 82). These diverse cultures lived in a "relationship known to biologists as 'sympatric' in which members of the same or clearly related species live in the same large territory but manage to exploit different ecological niches" (Hoffman 1979, 82). Finally, Hoffman's description of the rise of Menes's state reminds us of punctuated equilibria's characterization of a breakthrough: "Over the years a number of propensities develop within a social system which predispose it to a really major transformation. When that transformation does occur, it is so thorough as to convey the impression of crossing a critical threshold. The rise of Menes's state and Dynastic culture can, I believe, be understood through such an analogy" (Hoffman 1979, 305). Thus Hoffman represents a social anthropologist whose paradigms and very language strongly remind us of the model of punctuated equilibria.

Eli Sagan provides us with another good example. While detailing the cultural experiences of Melanesian and African societies of recent times, he attempts to describe the evolution of the state. He believes societies evolve through several stages: primitive societies, early complex societies, later complex societies, and archaic societies (Sagan 1985, 376–80 and passim).[4] For Sagan, quantum leaps occur between stages of human social development that require a degree of energy not necessary for the gradual evolutionary process. This latter movement, according to punctuated equilibria, would equate with simple genetic drift, which produces no true evolutionary advance. Sagan suggests that slow change may occur within each of the stages of human societal development, but quantum leaps require much more energy—"universal bursts of energy . . . fuel the advance to the next stage" (Sagan 1985, 378). Thus Sagan, too, parallels the model proposed by advocates of the biological theory.

Other scholars who study the process of state formation have delineated an evolutionary advance stimulated by dynamics that cause rapid social development. Experiences such as war, internal civil strife, class struggle, kin-group struggle, redistribution of wealth, agricultural intensification, resource management, and so on have been suggested as individual factors or as factors in tension with each other, but they all imply rapid social development brought about by some need or crisis (Flannery 1972, 399–426; Service 1978, 21–34). Karl Butzer even generated a hierarchy of terms to describe the modes of human cultural change in response to such dynamic forces: (1) *adaptive transformation* describes radical cultural morphogenesis such as the urban revolution in the Neolithic Age and the more recent Industrial Revolution; (2) *adaptive modification* characterizes the phenomena of agricultural intensification, demographic expansion, and state formation in Egypt, Mesopotamia, and Mesoamerica; and (3) *adaptive adjustment* reflects a short-term, limited response of cultures to natural disasters, wars, and dynastic change (Butzer 1982, 290). Throughout, the assumption is that cultural change is not perceived as gradual, but as a punctuated break in the general course of human affairs. Thus, consciously or unconsciously, social anthropologists appear to assume a model of human development in cultural matters remarkably similar to the biological theory of punctuated equilibria.

It thus appears that contemporary evolutionary theory might provide a heuristic paradigm for the disciplines of history, anthropology, sociology, and the social sciences in general. But let us now consider some suggestions for the application of this model in areas of study germane to this author's field of expertise.

Implications for Ancient Near Eastern and Biblical Social-Historical Development

As noted in the introduction, there have been two methodological approaches to Israel's emergence. One assumed evolutionary gradualism and traced Israelite faith and social development through various stages of growth; the other denied evolution as a working paradigm and postulated full national identity and monotheism at the beginning of the Israelite experience (1200 B.C.E.). The punctuated equilibria model may lead to a perception between these two extremes. Both Israelite identity and religious belief may be seen to evolve, but they do so in quantum leaps in response to social crises. With the aid of this new model, biblical scholars and historians may once more utilize interdisciplinary paradigms in their discussion of Israel's development. Reflective scholars have called for a renewed attentiveness to scientific theories of evolution in their discussion of the biblical materials (Theissen 1985, 1-174), and contemporary evolutionary models may enable that to occur.

The use of this model for envisioning cultural development may not only be helpful in understanding Israel, but it may be applicable to a discussion of ancient Near Eastern history and culture, a field of study significantly related to biblical studies. Ancient Near Eastern history is divided into four distinct periods by the textbooks: Early Bronze Age, Middle Bronze Age, Late Bronze Age, and Iron Age. Between each of these eras is some form of social unrest and even political-economic collapse over much of the ancient world, particularly in the so-called Dark Ages prior to the Iron Age (1200 B.C.E.). Such observations correlate nicely with the model of punctuated equilibria, especially the aspect of local or mass extinction that opens ecological niches to permit new species proliferation and adaptive radiation. The end of the Bronze Age saw the demise of urban centers, trade, and unified social control. Out of the chaos arose new societies, created by the influx of new peoples and by the reconfiguration of old groups of people in the Near East and Greece who had a seemingly new set of social, economic, political, and technological values garnered from the old Bronze Age cultures, but these values were now reconstructed into a new social-cultural matrix. Paramount were the new social-cultural entities in Assyria, Israel, Persia, and Greece over the ensuing centuries of the Iron Age.

Biblical historians can likewise look to the settlement process in Palestine as a time of creative readaptation of new values with a new society arising in the highlands. With the collapse of the Bronze Age city-states, people withdrew to the highlands and merged with

pastoralists already living there. Here they reconstituted themselves with new social-economic structures, and they retribalized to become Israel (de Vaux 1978, 532–680; Gottwald 1979, 3–709; Soggin 1984, 138–71; Frick 1985, 13–204; Hopkins 1985, 15–275; Ahlström 1986, 1–118). A variation of this theory views the Israelites as pastoralists who had inhabited the highlands for centuries (separate from the Canaanites though culturally interacting with them), who evolved into a new cultural entity as they had to settle the highlands and engage in agriculture following the collapse of the urban centers, which provided them agricultural commodities through trade (Lemche 1985, 1–435; 1988, 75–117; Fritz 1987, 84–100; Hopkins 1987, 191; Coote and Whitelam 1987, 7–188; Finkelstein 1988, 295–356). Either way, the Israelites arose as a separate entity in the marginal periphery of the ecosystem of Palestine after drawing heavily upon the cultural values of their predecessors.

Israelites generated social structures built around old kinship models of pastoral society (Gottwald 1979, 655–63; Freedman and Graf 1983, 1–103; Frick 1985, 13–204; Hopkins 1985, 15–275). With this kinship mode of relationship, separate highland groups gradually coalesced to form a unified identity. At first the Israelites were a pastoral herding society, but agricultural intensification arose to support the increased population. Eventually, after a couple centuries, extensive use of lime-coated cisterns, iron-tipped plows, and agriculture by means of terracing permitted sustained cultivation of the rocky highlands (these technological innovations actually arose in the Bronze Age, but were never used extensively until the Iron Age, in the tenth century B.C.E.).

Passage through the pastoralist herding stage of social development affected the development of the Israelite ethos. Macrosociologists have noted that such societies are not in the mainstream of social development, but remain an offshoot of or reaction against early agrarian and advanced agrarian societies. Often such societies have a great deal of equality and tend to become monotheistic (Lenski and Lenski 1978, 237–38). Once agricultural settlement arose in the highlands, the Israelites slowly reorganized their social norms in isolation from the valley culture of the old Canaanite centers (Marfoe 1979, 32–35; Frick 1985, 138). Eventually the Israelites spread, by sheer demographic expansion, back into the valleys and interacted with the old agrarian Canaanite society and the latter's values, until the Israelites displaced the Canaanites in an ideological and social struggle that lasted centuries. This conflict ultimately gave rise to the Yahwistic movement and its eventual triumph in the Babylonian

Exile, with the adherence of all Jewry to this belief system (586–539 B.C.E.).

Once established in Palestine as a political entity (1000 B.C.E.), the Israelite social-cultural experience began to slowly diverge from and assert itself against Canaanite and ancient Near Eastern values for the duration of its national existence (1000–586 B.C.E.). The Yahwistic minority spearheaded this ideological separation and could accomplish its goals only because Israel was a peripheral society. Social historians as early as Max Weber observed that since Israel was not an old river-valley civilization, it did not have the fixed social and economic structures of a highly organized and bureaucratic state. Egypt and Mesopotamia required authoritarian structures to maintain sophisticated irrigation systems for food production and to organize large numbers of people who lived in very limited arable territory. Because Israel, as a peripheral highland society, lacked such highly developed sociopolitical structures and the corresponding need for them, it could permit more freedom for individuals within its society and, subsequently, encourage an ethos of radical social and economic equality. But as a peripheral society it still had access to the technological, political, and social contributions of its neighbors, and it could fashion ideas together in a new matrix (Weber (1917–19) 1952, xvii–xix, 7–8, 252–63).[5] This dynamic might explain similar phenomena among the earlier Hittite culture in Asia Minor (1700–1200 B.C.E.) and the later classical Greeks (Frankfort 1949, 237–63). All these cultures were at the edge of older civilizations from which they could absorb great ideas and forge them into a new synthesis.

Intellectual historians have described the later Iron Age as an "axial age" in human history in which the great ideas of our culture were generated. Axial-age societies often had seminomadic or pastoralist origins, existed in proximity to high cultures, experienced quick social change, had a core of intelligentsia generating a new ethos, and were stimulated by contact with an imperial state (Kulke 1986, 390–91). Such a description aptly fits Israel. Its people were newly emerged from the decrepit Bronze Age city-state system who settled in the highlands of Palestine. They lived between the Mesopotamian and Egyptian cultural spheres, absorbed ideas via Canaanite mediation, and reshaped these foreign ideas. Their intelligentsia—the prophets, Levites, and priests—articulated political and theological ideals that were galvanized by the expansion of the Assyrian, Chaldean, Babylonian, and Persian empires, with their respective imperialistic value systems. The survival of this new ideology was made possible by the assumption of these values by the greater bulk

of the population during and after the Babylonian Exile (Frick 1985, 140–41 and passim; Ahlström 1986, 1–118). Israel created nothing new; it was a fresh beginning with old ideas in a peripheral region of the world, forged under harsh conditions.

This entire social-political process reminds us of the model of punctuated equilibria in several ways. First, Israel reconstructed social and ideational values, some of which were very ancient, in much the same way that a new species recombines genetic material in a new way, sometimes using latent or recessive genes to produce new and rapid morphological change. Second, Israel's withdrawal and/or isolation in the highlands of Palestine parallels the way a new species arises as a geographic isolate on the periphery of the ancestral species' territory. Third, Israel expanded into the area of the old Canaanite culture, and eventually displaced it, in the same way that a new species may return to live sympatrically with the ancestral species and then displace it. Fourth, just as the collapse of old Bronze Age city-states facilitated the spread of the Israelite ethos, species extinction will encourage adaptive radiation of a new species and further species proliferation. Fifth, as a new species, Israel adapted to the ecological niche in Palestine between the great civilizations of Egypt and Mesopotamia and survived, eventually to pass social and religious values to later European society through its descendant, Christianity. Sixth, Israel's new ethos was created under political pressures, just as a new species arises and spreads most successfully under the challenge of stressful changes in the ecological and geographic environment. The analogy between biological and social systems has value in terms of accentuating the clarity of the process, and these categories may help clarify our understanding of how Israel came into existence.

Implications for Religious Development in the Biblical Tradition

From a different perspective, one might also discuss religious developments in Israel with this model, particularly the rise of monotheism. In the nineteenth century, scholars articulated gradual evolution to explain the dynamics of the biblical tradition. These models described a slow and gradual intellectual development that brought Israelites through the progressive stages of animism, polydemonism, polytheism, henotheism, monolatry, and finally full monotheism (Wellhausen [1878] 1973, 17–425; W. R. Smith [1889] 1972, 1–440). This process paralleled Darwinian biological evolution —slow, gradual movement toward increased complexity and better

adaptability—so that progress became an inevitable part of the religious experience of this or any people.

In the early twentieth century certain biblical scholars expressed stern reservations about this evolutionary perception and affirmed that religious values appeared upon the scene more as dramatic irruptions into the course of human affairs. William Foxwell Albright, Yehezkal Kaufmann, George Ernest Wright, and others preferred to attribute more to the Mosaic period (1250 B.C.E.) than to a later evolutionary process (Albright [1940] 1957, 1-403; Kaufmann [1937-56] 1972, 7-340; Wright 1950, 7-112; Zeitlin 1984, 1-290). The faith of the Mosaic period became the norm for the faith in all later interactions with Canaanite beliefs. Prophets (750-400 B.C.E.), who sought to restore the old faith, were not the innovators of the religion, as assumed by nineteenth-century scholars. The faith of Moses was perceived as not too entirely different than that of the later rabbis (100-600 A.D.). Albright further questioned the presuppositions of the model that undergirded such grand schemes of development, and he sharply criticized Hegelian philosophical values and related evolutionary paradigms, which he assumed functioned together in the writings of earlier scholars whom he critiqued (Albright [1940] 1957, 82-126). Although his attempt to refute these overarching presuppositions did not convince the majority of scholars in his field, his portrayal of Israel's breakthrough remained the standard pedagogical fare in textbooks for the ensuing generation.

The Albrightian view was an overstatement as much as the evolutionary paradigm that preceded it. Modern scholars, who tend to fluctuate between these two extreme positions, perceive that something significant happened or was begun in the early period (1200-1050 B.C.E.) as the Israelite identity slowly diverged from its milieu, but ideational development continued over the succeeding centuries, and fully developed Yahwism arose only after the Exile.

Contemporary scholarship has brought two perceptions to bear upon the nature of Israel's development. Sociohistorical scholars in the past generation have observed that the early settlement process was in an era of social upheaval. Initially, they stressed that emerging Israelite communities resulted from violent revolution against Canaanite urban centers (Mendenhall 1973, 1-226; Gottwald 1979, 3-709); but more recently the emphasis is upon a more peaceful process of withdrawal or pastoral sedentarization (Lemche 1985, 1-435; Frick 1985, 13-204; Hopkins 1985, 15-275; 1987, 178-91; Ahlström 1986, 1-118; Fritz 1987, 84-100; Coote and Whitelam 1987, 7-188; Finkelstein 1988, 295-396). Either way, this initial

experience was significant for the ultimate development of Israelite religion.

On the other hand, students of Israelite religion have sensed that monotheism and normative Yahwism arose very late in Israelite history. The national catastrophe of exile in Babylon was a crystallizing experience that brought monotheism from its minority status to become the value system of all Jews, and the chief cause for their survival. Even then, the emergence of this minority Yahwistic movement was manifested fairly late in the history of the monarchy, with the classical prophets and the Deuteronomic reform movement (Smith 1971, 15-56; Keel 1980, 11-183; Lang 1981, 7-113; 1983, 13-59; Theissen 1985, 45-81).

These two trajectories of scholarly discussion need not be mutually exclusive. The process described by the former reflects the rise of social-political-economic values concomitant with some very basic religious values (mono-Yahwism) among the greater highland population of Palestine, which need not have been monotheistic. The latter group of scholars describes the rise of a more consistent and systematic religious value system (monotheism) that evolves or unfolds out of that earlier highland movement, to become a minority pre-exilic religious expression and, finally, the postexilic faith of all Jews.

Israelite religion evolved quite slowly out of the old Canaanite religious belief system. Particular themes in the Canaanite religion (e.g., the graciousness of El) were isolated by the Israelite communities as central ideas and subsequently underwent metamorphosis to gradually create the Israelite religion (Lemche [1985, 434, and 1988, 209-57] even tried to recreate these early themes hypothetically). Israelite isolation in the highlands may have helped generate the initial divergence from old Canaanite beliefs (again, like a peripheral isolate among biological species). Over the years a dual process ensued: Yahwism moved to encompass the wider population, and the religious values generated and unfolded out of the initial social values that had originally served to motivate and unite the highland communities. In any revolution it takes time for its ideals to manifest themselves in their full application among the people. Thus Yahwism began during the era of the settlement, in conjunction with social and political motivations, then struggled to develop its identity during the monarchy, received impetus from the "prophetic" proclamations, was partially implemented by officials or nationalistic kings such as Hezekiah (700 B.C.E.) and Josiah (620 B.C.E.), and fully emerged during the Babylonian Exile with all its religious perspectives developed after these many years of ideological and cultural growth.

Some scholars have begun to consciously introduce current scientific, evolutionary jargon in the description of this process. Theissen views the rise of monotheism in the pre-exilic period as a revolutionary "mutation," enabling people to better cope with reality. This worldview gradually obtained the commitment of increasing numbers of Israelites/Jews until its postexilic triumph (Theissen 1985, 64–81). Again, this language reminds us of the way a new species displaces the ancestral species.

Overall, the model of Israel's religious development is analogous to the model of punctuated equilibria in several ways. First, there is an initial breakthrough in the early stages of the developmental process, where significant social and ideational factors are reconstructed. Second, this breakthrough occurs in a period of social upheaval, when the generation and spread of a new form is possible. Third, the new entity assumes its identity in relative isolation and stabilizes. Fourth, the religious value system interacts with the value system out of which it was born and must fight to survive. Fifth, the full implications of the initial breakthrough gradually unfold over the years as further adaptations to the environment are made—but essentially, much was implicit in the process from the beginning. Sixth, the new intellectual movement supplants its predecessor and survives to pass on its heritage to succeeding generations.

Ultimately, of course, the mode of transmission for these ideas would be Christianity, a later development out of Judaism. Likewise, one might describe the rise of Christianity as another species mutation that spread from its peripheral locale (Galilee) outward to inspire Western culture. Indeed, Theissen describes Jesus as a revolutionary mutation in the greater process of human cultural evolution (Theissen 1985, 85–128).

This new perception also addressed another debate among biblical scholars: over the nature of ancient Israel's *intellectual* worldview—a debate that has oscillated between two extremes in the past forty years. Salvation-history theologians have emphasized the radical uniqueness of significant differences of Israel's worldview, in contrast to ancient Near Eastern values, while more recently ancient Near Eastern historians and critically minded biblical scholars and theologians have stressed Israel's continuity with predecessor cultures (Gnuse [1988, 1–169] reviews these scholars). Punctuated equilibria may provide an answer to the debate, for this heuristic model supplies a conceptualization that concedes the cogency of both viewpoints. The characteristics of Israelite belief were gleaned from the ancient world, implying continuity, but the reconstruction of those values produced a radical departure from previous belief

systems. Just as in the biological sphere the creation of a new species occurs rapidly in a period of thousands of years, to endure almost unchanged for millions of years, one might observe in Israel's history that the six hundred-year development from settlement to exile is likewise a short time in relation to all of human cultural evolution. Israelite beliefs arose from previous values, in much the same way as genetic material that produces a new species. But the rearticulation of values on the periphery of the ancient world produced a new entity, which established itself and reinvaded the territory of its predecessor culture to displace it. As we study Israel's belief system, we see both the similarity and the radical differences from what had existed previously in the ancient world; and both perceptions are essentially correct, for such is the nature of the evolutionary process.

That Israel reconstructed the values of the ancient world is an increasingly common theme among biblical theologians. Many speak of Israel's inheriting its values, then moving beyond the ancient Near East in terms of quality (Malamat 1955, 1; Koch 1962, 112–14; Cross 1973, 143; Frick 1985, 193–94; Miller 1985, 207; Eisenstadt 1986, 127–34). Some scholars have attributed this so-called inheritance to Israel's "coming late" into the ancient world as a people, but aware of its origins in a particular period of human events, thereby giving rise to protohistoric or linear ways of perceiving reality (Hayes 1971, 136; Porter 1979, 131). In this way, according to such theorists as Norman Gottwald and Walter Brueggemann, the evolution of Israel's worldview was a conscious transformation: both a reaction *against,* and reconstruction *of,* older values (Gottwald 1983a, 32–33; 1983b, 7; Brueggemann 1985, 28–46). Their language, throughout their expositions, is reminiscent not only of biological and genetic models, but the addition of a conscious, transformative agency that coincides with the observations of anthropologists on consciousness as the chief factor in human evolution (Eldredge and Tattersall 1982, 8–11).

Because this model enables us to speak of Israel's ethos in a more nuanced fashion, we may regard the ancient Near East in more sympathetic ways, for its ideas contributed significantly to the Israelite ethos. As subordinate ideas became dominant in its matrix, Israel evolved above the ancient world by its quantum leap of intellectual reconstruction. Because Israel's monotheism is not contrasted with Near Eastern polytheism, we can more readily admit monolatrous tendencies in the ancient world, such as the worship of Ptah in Egypt (2800 B.C.E.), Marduk in Babylon (1800–1200 B.C.E.), Aknaton in Egypt (1370 B.C.E.), Seth in Egypt (1200–1100 B.C.E.), and Ashur and Ninurta in Assyria (850–600 B.C.E.). Israel's mono-

theism drew upon those earlier forms of worship and integrated their religious and social aspects for the development of a new religious value system. Furthermore, Israel's monotheism can be seen not as a breakthrough, but as an uneven and difficult struggle over six centuries. A Yahwistic minority in the pre-exilic period would eventually prevail, by the time of the Babylonian Exile, and create the literature from oral traditions that interpreted the past from a monotheistic viewpoint (Smith 1971, 15–56; Hartmann 1980, 49–79; Hornung 1980, 83–96; Lang 1981, 13–59). Our new heuristic model permits us to view this process as a revolutionary reconstruction of ideas that blossomed slowly in the history of Israel.

CONCLUSION

It is possible, we believe, that a universal paradigm may provide analogues for all disciplines of the social sciences and humanities, thanks to developments in paleontology and biology. Evolution has been seen as solely a gradual and inevitable process, and biological theory has exerted this perceptual impact upon other academic fields. The view of punctuated equilibria perceives much of the advance of life in quantum leaps, produced by the reconstruction of genetic material in a new way, in geographically isolated regions, under the stress of new ecological conditions. Such leaps are followed by periods of stasis and stability, until a new crisis forces another alteration of the process.

The paradigm appears to be a more adequate way of describing the dynamics in not only biological but also human evolution, cultural evolution, historical development, and the basic trends in society observed by anthropologists and sociologists. In particular, we suggest that the model may be helpful in the discussion of ancient Near Eastern and Israelite development. Vis-à-vis the latter, both the social and religious dynamics of Israel's development may be elucidated. The old question of Israel's ethos, in terms of gradual evolution or radical breakthrough, may be resolved by a moderate position that sees the process as punctuated evolution. Israel's identity evolved out of ancient Near Eastern values, but in several quantum leaps—most notably the settlement and the exile—rather than as a gradual, uniform process over several centuries. This methodological approach may align our theoretical perspectives more closely with the observed data.

The apparent cogency of this thesis in terms of its value for the social sciences and humanities cannot be validated in one short essay. Nor can the author speak with expertise in fields other than his own.

The true cogency of the thesis must be tested by scholars in other fields. We have merely provided a few suggestions and implications for the new evolutionary model.

NOTES

1. The most significant works for promulgation of the theory seem to have been Eldredge 1971, 156-67; Eldredge and Gould 1972, 82-115; 1977, 115-51; Stanley 1979, 1-301; and Eldredge and Cracraft 1980, 1-326. The central tenets of the theory have been popularly presented by Gould in short essays: 1977a, 56-62; 1980, 179-93, 204-13; 1983, 253-62; and 1985, 230-45. Their ideas were foreshadowed by Mayr (1963, 1-662), who advocated "punctuational" models that, according to Stanley (1981, 49, 77-78), received little attention. A very fine summary of this model and its development is found in Bowler (1984, 322-26).

2. Stanley (1981, 72-109) lists a number of instances from the paleontological record that imply the presence of "rapid speciation" and "adaptive radiation" of particular species.

3. Kuhn's observations have been critiqued by philosophers and social scientists (Gutting 1980, 1-320; Barnes 1982, 1-126), but the cogency of many of his views has been acknowledged.

4. Sagan's categories correspond to those proposed by macrosociologists Gerhard and Jean Lenski (1978, 107-89), who delineated hunting and gathering, horticultural, and simple agrarian societies, which correlate to Sagan's primitive, complex, and archaic societies respectively.

5. Karl Wittfogel (1957, 1-449) would agree with Weber, for he analyzed ancient Near Eastern cultures as "hydraulic economies" in which authoritarianism developed to control water resources. William Davisson and James Harper (1972, 30-85) described ancient Near Eastern economic systems as "status-distributive" or "storehouse" economies, and indicated that Israel was the first society to break from this pattern. And T. F. Carney (1973, 20-21) described the ancient Near Eastern system as a class-oriented redistributive economy.

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