Science and Evolution in the Public Eye

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Many educators have expressed surprise at the extent to which students believe sensationalistic and catastrophic explanations of the origins of cultural and biological traits. Their inclination is to ignore sensationalism as "unworthy" of serious discussion, but they are being hampered by political pressures from the sensationalists, who tend to view themselves as bearers of "true science" and as opponents of outdated scientific beliefs or orthodoxies. Thus these catastrophic and often cryptoscientific views of racial and cultural trait origins are being given increasing exposure in popular literature, on TV, in movies, and in public school and college classrooms.

Among the most notorious examples of this alarming trend are von Däniken's *Chariots of the Gods?* (1970), Barry Fell's *America B.C.* (1976), Jeffrey Goodman's *Psychic Archaeology* (1977), the "In Search of" TV series, and the current UFO mania. Organizations with blatantly racist motives, such as the Nazis and the Ku Klux Klan, who proclaim separate "origins" (or creations) for different "races," are once again growing in visibility. The "orthodoxies" of the anthropological "establishment" are being challenged by students who proclaim separate-origins explanations (a series of invasions from outer space, or "experiments" by a creator) and by some of those proclaiming a single creation.

These sensationalist views are financially supported by evangelistic grass-roots organizations. These organizations are politically active in the sense that each is "spreading the word." The various Bible research groups that hold weekly or biweekly meetings on college campuses engage in peculiar mixtures of odd-fact collecting and religious ceremony. Similarly,

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followers of Barry Fell and other popular heroes hold public meetings and "conferences" that are in some respects much like religious incantations. At a conference on so-called pre-Columbian colonizations of the New World (cf., Cook, 1978; Cole, 1978), which was held in Castleton, Vermont, in 1977, the organizers gave religious significance to every rock and mark on display in the front room. A woman clutching a copy of Fell's *America B.C.* advised a skeptical bystander that it was ridiculous to think that some of the stone structures found in the area might be colonial root cellars, as archaeologists maintain: "People would not cover root cellars with heavy slabs of rock," she said, "only shrines." "Someday," she admonished, "you, too, will believe."

Many proponents of catastrophic explanations of natural phenomena claim that these theories are well-founded in scientific fact and repeatedly express pained willingness to bear witness to their truth despite extreme antagonism from the scientific elite. Thus these movements combine proselytizing with an odd concept of "sciencing"—a "sciencing" that begins with a premise and denies any means of testing or refuting it.

In the past few years, fundamentalism, which incorporates "scientific creationism," has experienced dramatic growth. In 1978 a network news program carried a three-part report on the phenomenal growth of "born-again" Christianity in America, especially among the educated middle class. Shortly afterward *Newsweek* featured an article on "born-again" wives of national politicians. Simultaneously, courses on scientific creationism appeared in college curricula, along with courses on astrology, Atlantis, the teachings of von Däniken, and so on. Indeed, many academicians have jumped on the paranormal bandwagon.

It is a popular view that education should offer alternative paradigms as "equal but different" explanations of the same phenomena. This has been seen most clearly in recent years in the debate in California, and elsewhere, over teaching scientific creationism on an equal basis with the theory of evolution as an explanation of the similarities and differences among organisms. Unfortunately, "liberal" educators and politicians, in an effort to be "open minded," can be unwitting collaborators in spreading ultraconservative doctrines among our youth. While it is commendable to study unorthodox or unpopular issues without prejudice, the presentation of alternative explanations as "equal but different" implies that there is no way to choose between them.

More alarming, perhaps, is the political opposition to the liberal and open-minded educational programs that grew out of the 1960s. "Man: A Course of Study" (MACOS), an interdisciplinary behavioral-science project for elementary schools, came under severe attack in the United States a few years ago. Consequently, it has been banned in many localities, and its

national funding has been crippled. John Conlan, then a Republican congressman from Arizona, claimed that MACOS caused children to reject the values, beliefs, religions, and national loyalties of their parents (Smith and Knight, 1978, p. 4). Conlan singled out three of the authors of the MACOS teachers' guide for criticism. He accused Jerome Bruner of using psychological-warfare techniques, B. F. Skinner of using behaviorism, and Claude Levi-Strauss of using his allegedly dangerous leftist bias to subvert children for "one-world socialism." (Actually, the three scholars' articles were often in opposition to each other, but the guide was nevertheless withdrawn.)

"The consequence of Conlan's attacks on MACOS and Senator Proxmire's criticism of 'those damn fool projects in the behavioral sciences,' which helped prepare the ground for attacking MACOS, was that National Science Foundation funding for MACOS, and all other federally funded curriculum projects, was stopped pending a review by various congressional committees" (Smith and Knight, 1978, p. 5). Smith and Knight document the banning of MACOS in Queensland, Australia, by crusaders using the American experience as a guide. The authors demonstrate by content analysis of the issues raised and key words in the literature that the anti-MACOS and fundamentalist movements are characterized by dogmatism, acceptance of authoritarianism, and totalitarian values that stress state and community control over the individual. On the other hand, according to their analysis, pro-MACOS and pro-evolution literature stresses relativism, freedom of thought, and critical analysis. Anti-MACOS propaganda was found to be high in "coercion" (as opposed to choice) and characterized by high degrees of censorship, ethnocentrism, aggression, and violence (p. 10).

In an article entitled "Public Appreciation of Science," Amitai Etzioni and Clyde Nunn (1974) cite evidence that educated people tend to be less authoritarian than uneducated people and that people who "distrust science" are likely to be more authoritarian. "There is also evidence linking authoritarianism with unscientific beliefs, even though *all* authoritarians are not anti-science" (p. 199). They cite another study showing a correlation between authoritarianism and superstition, pseudoscientific attitudes, and racial intolerance.

What creationists and other sensationalists have in common is the division of the world into true believers heading for salvation and all others heading for damnation. The "saved" group may exclude members of certain racial minorities, social classes, or political factions (socialists or communists), or homosexuals, or evolutionists.

The recent partial disaffection from science of an apparently significant portion of the educated segment of society can be seen as a potentially

dangerous outcome of the conservative political climate of the 1970s. Increasing numbers of educated people are accepting, even demanding, simple explanations of complex phenomena. Thus fixed-species explanations have become respectable alternative paradigms whose inclusion in the educational system is receiving increasing legal support. In considering a challenge to the teaching of Darwinism, an article in the *Yale Law Journal* (Bird, 1978) makes a political-legal statement regarding what might be taught as respectable alternatives to Darwinian evolution. Western society may soon witness court rulings on "proper science" similar to legal maneuvers regarding "proper literature" as opposed to pornography. Creationists are advertising new programs to teach scientific creationism at such universities as Michigan State, Wichita State, and the University of West Virginia.[1] Legal arguments advocating laws, court orders, and school policies requiring the teaching of creationism as coequal with evolutionism (such as those summarized by Bird, 1978) are blatant attempts to define "proper science" according to political guidelines and without reference to either predictive advantage or rational explanation. Unfortunately, while scientific creationism is very poor science, most people are ill equipped to evaluate it as such. Many, like Wendell Bird, see the issue as a political struggle between proponents of "equal but opposite" dogmas. The question of what is a good or a poor explanation of similarities and differences in form among organisms in space and time is rarely, if ever, raised.

It is even difficult for evolutionary biologists, who are most cognizant of the data that evolutionary biology attempts to explain, to debate scientific creationism effectively. These difficulties are based on a number of factors, not all of which are easily remedied:

1. Creationist challenges to evolutionary biology bear the earmark of irrationality—they are not simply the presentation of "facts" that are not facts, but they are illogical leaps to conclusions that do not follow from the premises—a kind of "Aha!" complex. For example:
   —There is an error term in carbon-14 dating. Conclusion: Aha! (This is supposed to prove that there are no old fossils, or that there can be no supposition of great antiquity.)
   —Scientists have *not been able to trace the origin* of many suids (pigs) through fossils. Conclusion: Aha! (This is supposed to suggest that extant suids share no common ancestry.)
   What is the use of scientists introducing probability theory or information about kinds of systematic errors in the context of a public debate? The issues are far more complex than the creationists would have the public believe.
2. Creationists tend to appeal to authority—to neat, easy solutions to

complex questions. Such arguments tend to be attractive to the frustrated, the needful, and the alienated.

3. Many people in Western society are ambivalent toward science. Polls show wide, though declining, respect for "science" (Etzioni and Nunn, 1974; Bainbridge, 1978), but they do not define science or test their subjects' understanding of what they say they respect. Respect for authority is *not* respect for science. Creationism, like other simplistic cults, affords people a way of rejecting scientific elitism without seeming to reject science. Indeed, its proponents believe themselves to be the true bearers of scientific facts. They are often more convinced of their righteousness than the "elitist" scientists they accuse of being close-minded. They are convinced that they alone possess the "truth" and they *define* science as that truth. Clearly, there is a basic difference between what scientists understand as science and what creationists understand as science.
4. Scientific creationism is based in large part upon fallacious premises—a misunderstanding of what evolutionary biology is about.

The latter two problems are the most frustrating because they speak more directly to the failure of the educational system to teach rational problem-solving. Not everyone need be well versed in evolutionary biology or anthropological analysis of human biological and cultural variation, but people should be able to recognize sloppy arguments and to choose tentatively between alternative explanations. The fact is that the educated American public is surprisingly unable to cope with even the simplest incorrect premises or illogical, particularistic arguments emanating from scientific creationists and others.

Popular perceptions of evolution, when surveyed directly and indirectly through an analysis of contemporary popular and educational literature, reveal a startling misunderstanding of the basic concepts of Darwinian evolution. Creationists describe evolution as a kind of accidental creationism; despite their allusion to its slow pace, they perceive evolution to be clearly catastrophic. They are degenerationists debating an anthropocentric Doctrine of Progress, which modern evolutionism is *not*. Yet their perception of what modern evolutionism *is*, is not far from that of the general educated public. It is not surprising that educated people are poorly equipped to handle these challenges and succumb easily to political pressures from proselytizing lobbyists.

Numerous popular writers, philosophers, and educators are proclaiming the death of natural selection: "Nobody takes natural selection seriously anymore," "Natural selection is tautological" (cf., Baum, 1975; Bethell, 1976, 1978; Flew, 1967; Himmelfarb, 1968; King, 1972; Koestler,

1. Natural Selection was Darwin's main idea as to how evolution happened. The fittest survive and the unfit perish. Fine! But where is evolution in this? Because a certain rabbit can run faster or hop higher and therefore may live longer and reproduce more rabbits in no way implies that the rabbit (or its offspring) would be more fit for survival if it were evolving into some other animal. In fact, the opposite is true. Any alteration in a rabbit's physical or mental characteristics would make it *less fit, not more fit for survival. Natural* selection cannot explain evolution. Nothing can explain how evolution happened, because **it never happened!** That is a fact and anybody who says it isn't is being an **unscientific fanatic.**

2. Students, how many times have you seen and heard the idea that scientists have proof for evolution in the **fossil** record, in the bones? Here is the truth; let any scientist come forward and deny it if he can: There is not one bone in the entire world that shows one animal evolving into another. All the pictures in your books which are there to convince you that man evolved from apelike creatures (Java Man, Neanderthal Man, Nebraska Man) have all been proven not to be missing links. They have all been proven to be either apes or men, not apes changing into men. (So-called Nebraska Man was built up on the evidence of one tooth which turned out to be the tooth of an extinct pig!) There are no ape-men because evolution is a great deception. The supposed evolution of the horse, eohippus, which is in your science book, no doubt, has been proven impossible. Check your science book for other misleading so-called evidences for evolution. Is the peppered moth there? It's still a moth, isn't it? Is Haeckel's embryological chart there? Your book doesn't tell *you Haeckel was kicked out of the university for misrepresenting* the truth about embryos, does it? Your book doubtless mentions the fruitfly *Drosophila Melanogaster*. But does it tell you that exhaustive experiments prove beyond any question that mutations can never explain evolution? Ask your science teacher to tell you about these great deceptions which cannot be carried on under the name of science. Fossils all show complete specimens. They were not changing into anything. The true scientist must look at the vast fossil record and admit that it proves one thing beyond question, namely that no fossil has ever been uncovered which shows one animal changing into another.

3. Two basic laws of Physics (the Law of Conservation of Matter / Energy, and the Law of Increasing Entropy) *flatly* contradict the theory of evolution. Everything science knows tells it that these laws are unbendable. They are scientific laws. They are not hypotheses. They are not theories. Yet, evolution theory demands that these iron laws be broken and laid aside. Energy itself does not produce complex, functioning systems. That takes planning and a Planner! Great periods of time do not cause things to improve (get better, become more complex) as evolution theory demands. On the contrary great periods of time cause decay and degeneration, the very opposite of evolution! The First and Second Laws of Thermodynamics prove evolution to be *impossible. There is no getting around* this truth.

4. Mathematics proves evolution impossible. Computers prove evolution impossible. Charles Eugene Guye, a Swiss mathematician, has calculated the chances of a single molecule of a protein-like substance being formed by accident at 10^{320} to 1. That means that the odds against even one molecule evolving would be one in 100,000,000,
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Another mathematician, Dr. Meuller, estimated the probability of the evolution of one horse at one chance in one **followed by a million zeroes!** (This figure would require 1500 pages just to print!) Then Mrs. Horse had to evolve at just the right time and right place, didn't she? What are the odds on that? Then what about the rest of the whole plant and animal kingdoms? Do you begin to see how incredible (without credibility) evolution theory is? Evolution is just plain **impossible**. No matter how deeply ingrained the theory is in the world, a person has to deny all science and all logic to believe that evolution theory can explain life on earth.

FIGURE 1. These four anti-evolutionist arguments, taken from a Fair Education Foundation flyer, were used in the questionnaire.

1978; Macbeth, 1971). Their arguments are based on misunderstandings of concepts of neo-Darwinian evolutionary theory—most notably the concept of "fitness" (cf., Dobzhansky, Ayala, Stebbins and Valentine, 1977; Gould, 1977, for discussions of some of the problems). Such widespread misunderstanding of the *basis* of Darwinian evolutionary theory demonstrates most forcefully that there is no general public understanding of Darwinian evolutionary theory as a predictive science (but, cf., Bock and von Wahlert, 1965; Gould, 1970; Godfrey, in press). Clearly, also, the evolutionary theory of many introductory classrooms is little more explanatory than the creationist doctrine it proposes to replace. Students are exposed to a smattering of evolutionary theory and a smattering of "examples" of "well-adapted" organisms. The idea that evolution somehow *produces* well-adapted organisms fosters an image of a static present in which only "well-adapted" organisms have survived. The concept of adaptation is often poorly defined or wrongly equated with "that which has survived" in the present time slice. Students are rarely taught the *data* being explained by evolutionary theory, and they emerge with little or no predictive ability.

For example, when college students with some background in biology, anthropology, and earth science were asked to analyze four specific antievolutionary arguments published by the fundamentalist Fair Education Foundation, of Clermont, Florida (see Figure 1), many were unable to do so with any degree of sophistication. The students were given an open-ended questionnaire that instructed them to state their agreement, disagreement, or uncertainty regarding each of the four arguments presented, and then to discuss them on logical, theoretical and/or substantive grounds.

Here are some comments from one class ($n = 40$) in the survey. Some general reactions:

> I don't understand, so can't argue. This is new to me.
>
> I agree with these arguments. Evolution has too many impossibilities and I don't believe in it.
>
> Look, I can't answer these questions. Sorry I can't help you out, but this is beyond me.
>
> This is a farce. I believe we evolved, but I don't exactly know how.

Replies to specific statements included:

> Number 1 is convincing because of the number of species.
>
> Number 2 seems very reasonable, but who do I believe—you or them? It all sounds good. But ape and man seem linked in some way—I don't know how. Number 3 sounds good—so why do people still talk about evolution? Isn't the public getting the evidence from the scientists? It's their job to keep us informed.
>
> Number 1 is a bad argument. Number 2 is a good argument if all the statements are true. Number 3—another good argument if the guy isn't lying. Number 4—the last three arguments taken together form an excellent argument against evolution.
>
> Number 2 sounds reasonable. It sounds O.K. Actually, I have no idea if it's right or wrong.
>
> Number 4: If these calculations are valid, perhaps "evolution" as a theory should be reconsidered.
>
> Number 2: The logic is good—uncovering deceptions and farces. But there must be some way to explain one animal evolving into another. Somebody must have offered an explanation sometime. Number 3: What is "decay" to one person (or one period) might be "improvement" to another.

> Number 2 is convincing. An individual could not dispute such an argument. Number 4 would raise doubts in anyone's head.
>
> Number 1: There are many examples. They make you think about each idea, as they seem reasonable. Convincing and logical, but too forceful.
>
> Number 4: Probability is right—it says it could happen and it *did*. A male horse arrived at the right time.

The problem extends beyond a general misunderstanding of "fitness" and "natural selection." (Fitness is *not* survival; natural selection is *not* the result of random or accidental, and therefore unpredictable, differential survival or reproduction.) The term *evolution* is itself commonly misunderstood. Biological evolution refers to change in the genetic composition of populations over time. Many people (not merely fundamentalists, but also the popular press and pro-evolution scientists) ignore genetic commonality and continuity when writing about biological evolution. For them, biological evolution means change, and the mechanisms need not be genetic. For many, "evolution" is imbued with an almost mystical directionality—an inevitable progressionism. But while evolutionary biologists recognize that changes in the genetic composition of populations *occasionally* give rise to greater developmental complexity of organisms, or to more complex interactions between organisms and their environments, neither "progress" nor "directionality" are central to the concept of biological evolution. In this context, however, it is interesting to compare definitions of biological evolution culled from fundamentalist tracts, the popular press, and science writers.

A flier from the Fair Education Foundation, quoting the Bible-Science Association of Western Pennsylvania, said:

> Evolution is here defined as a real, natural, self-caused continuing uphill process—in energy, structure and information—which goes from disorganized to organized, from random order to ordered, from lower to higher, from simple to complex, from atom to amoeba, from molecules to man.

A writer for the *Houston Post* (Aug. 23, 1964) said:

> Evolution, in very simple terms, means that life progressed from one-celled organisms to its highest state, the human being, by means of a series of biological changes taking place over millions of years.

This definition is cited in *Did Man Get Here by Evolution or Creation?* (Anonymous, 1967), a book distributed by Jehovah's Witnesses. *The Penguin Dictionary of Archaeology* (Bray and Trump, 1970) defines evolution as:

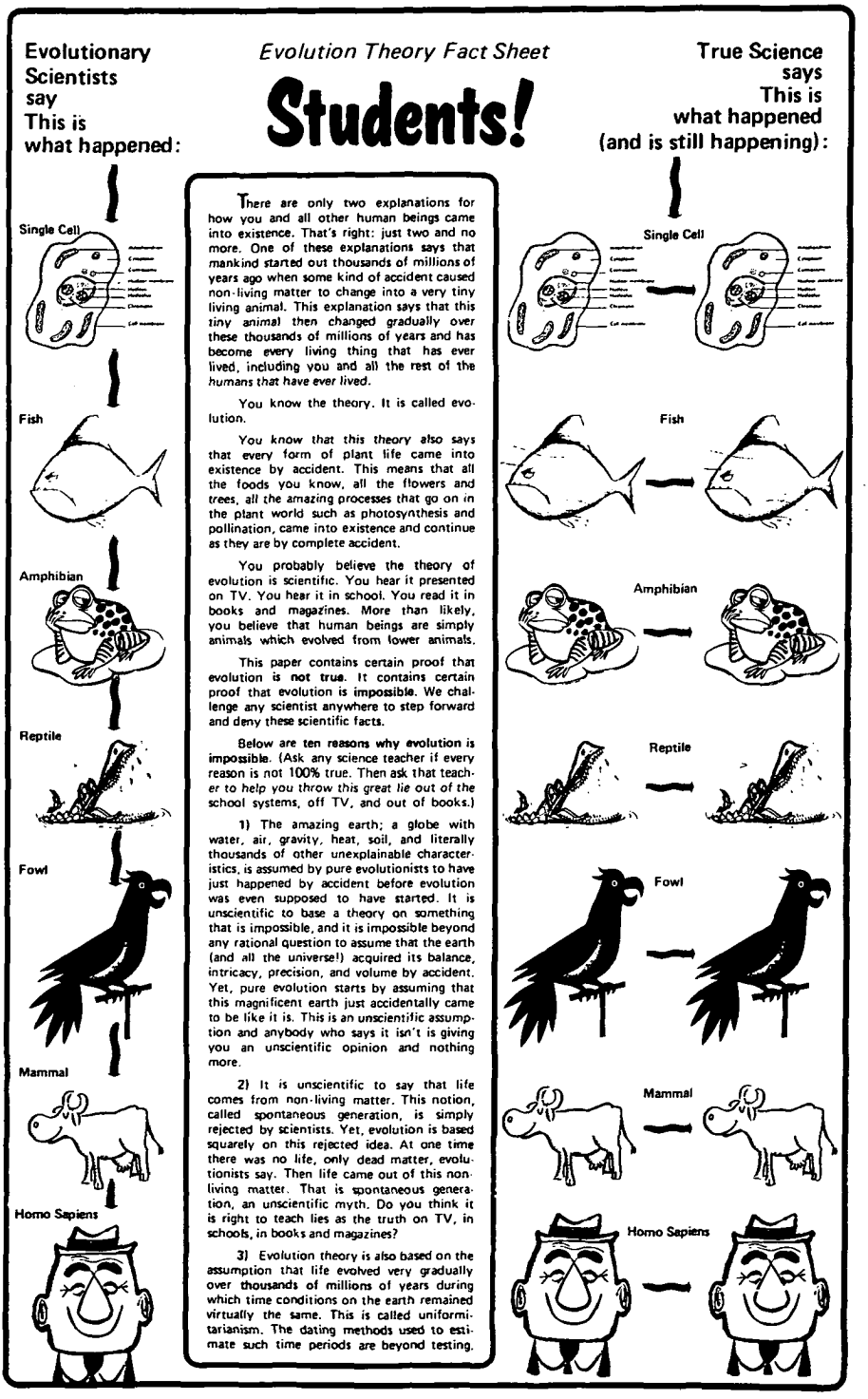

FIGURE 2. From an anti-evolutionist group's "fact sheet" poster.

> The gradual change of form of living organisms throughout time, usually... towards complexity and functional improvement.

The similarity of these definitions to each other is more striking than their similarity to modern biological theory. Fundamentalists are not the only ones who ignore the concepts of genetic commonality and continuity. Consider the following statement made to *Penthouse* magazine by Robert Jastrow, director of NASA's Goddard Institute for Space Studies and a member of the Institute for Advanced Studies:

> We are on the way to being living fossils. But the history of life indicates that man is likely to be the rootstock out of which a higher form will evolve. It will not be a more intelligent man—man *is Homo sapiens*—but rather a new form, something beyond man. The question now is whether this new form will be a biological entity having puny limbs and a big head to accommodate the progression of intelligence. Will the brain of man continue to be housed in some hollow shell of bones, fed by blood vessels, from a model developed by the fishes 300 million years ago? Or will it be something different? I say that computers, as we call them, are a newly emerging form of life, one made of silicon rather than carbon. (Anonymous, 1978)

Freeman Dyson, a leading theoretical physicist, also at the Institute for Advanced Studies, makes explicit a miracle explanation of human evolution:

> For apes to come out of the trees, and change in the direction of being able to write down Maxwell's equations... I don't think you can explain that by natural selection at all. It's just a miracle. (Davis, 1978)

Antievolutionists can find sympathetic scientists to quote. Dr. Louis Bounoure, Director of Research of the National Center for Science Research in France, is quoted in one tract (Kutsch, 1978:6) as saying, "Evolutionism is a fairytale for grown-ups. The theory has helped nothing in the progress of science. It is useless." Similar quotations abound in scientific creationist literature.

There is a serious need for innovative approaches to the teaching of the evolution of complex adaptations. It should not be reserved for graduate courses, and it need not be. To be able to deal with actual data, make sophisticated predictions, and test hypotheses is not beyond the ability of the average student, and these are skills useful in everyday life—not just in theoretical biology. Science should be neither worshipped nor feared. People practice it daily as they solve problems and cope with reality, and it seems reasonable to hope that they can be helped to acquire the tools to do it as well as they can.

Too few people can apply the concept of predictive advantage when dealing with formal sciences, where it should be most explicit, let alone apply it (or other aspects of scientific analysis) to their own worlds. Too often science is simply a fact list in the classroom rather than an example of organized rational thinking.

Educators have a responsibility to resist political pressures urging them to bastardize the educational process by pretending that "all ideas are equal." Indeed, they have a responsibility to *improve* the teaching of sciences such as evolutionary biology at the introductory level in the hopes that educated people will be better prepared to handle the socio-political onslaught of modern life. Evangelists asking for belief in authority should not monopolize the mass media, whether they be creationists or evolutionists. Belief systems affect socio-political decisions, and creationism and other cult movements promising salvation to a select few are urging people to join, hold hands, and wait for miraculous solutions in the face of real economic hardship. Aside from the possible threat of a resurgence of racism and authority-based political oppression, the Western world is faced with the immediate threat of further debasement of the educational system. Can the critical problems facing humanity today be solved by cultists? Much though holding hands may have its psychological rewards, the material-world results may be oppressive.

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Note

1. Wichita State University professor Paul D. Ackerman, president of the Creation Social Science and Humanities Society, informs me that there is no official creationist program at WSU; his proposal for a creation-science undergraduate or graduate major under the new independent field major program has had no takers so far. But in the future, independent field major programs may be *the* important vehicle for advancing creationist views at universities; so the serious issue remains, regardless of immediate political contingencies. •