Letters

Evolution and the Fossil Record

As the evolution-creation debate heats up, the amount of misinformation passed back and forth increases. An important example of general interest is contained in the letter by Robert Root-Bernstein (26 June, p. 1446). In discussing the power of evolutionary theory, Root-Bernstein says: "In the absence of evolutionary theories, any chronological ordering of the fossil record would seem to be a possibility, and no means would exist to choose one order over another." This statement expresses the common misconception that paleontologists arrange fossils in a theoretically reasonable order and then use this order to construct a chronology. In fact, no evolutionary theory at all is required to use fossils for geochronology. The best evidence is that the geological time scale in its modern form was fully developed by about 1840—before Darwin's *Origin of Species*. The time scale based on fossils was built by geologists who were creationists. Since 1840, many details have been filled in, but the basic sequence has remained unchanged.

So, the geological time scale and the basic facts of biological change over time are totally independent of evolutionary theory. It follows that the documentation of evolution does not depend on Darwinian theory or any other theory. Darwinian theory is just one of several biological mechanisms proposed to explain the evolution we observe to have happened.

This is part of a more general problem. A large number of well-trained scientists outside of evolutionary biology and paleontology have unfortunately gotten the idea that the fossil record is far more Darwinian than it is. This probably comes from the oversimplification inevitable in secondary sources: low-level textbooks, semipopular articles, and so on. Also, there is probably some wishful thinking involved. In the years after Darwin, his advocates hoped to find predictable progressions. In general, these have not been found—yet the optimism has died hard, and some pure fantasy has crept into textbooks. This is illustrated by other statements in the Root-Bernstein letter, such as: "Evolution postdicts certain immutable trends of progressive change that can be falsified." This is simply not the case! In the fossil record, we are faced with many sequences of change: modifications over time from A to B to C to D can be documented and a plausible Darwinian interpretation can often be made after seeing the sequence. But the predictive (or postdictive) power of theory in these cases is almost nil. The problem faced by the evolutionary paleontologist is not unlike that of the stock market analyst. Both the stock market record and the fossil record are complex Markovian time series wherein causal interpretations after the fact are often possible but the predictive value of theory is weak to nonexistent. In fact, the technical market analyst probably has a better record than the paleontologist. This does not disqualify evolutionary theory; it simply illustrates the difficulty of applying any statistical theory to actual cases.

One of the ironies of the evolution-creation debate is that the creationists have accepted the mistaken notion that the fossil record shows a detailed and orderly progression and they have gone to great lengths to accommodate this "fact" in their Flood geology.

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Achievements in Social Science

Sociologist Allan Mazur (Letters, 22 May, p. 875) unduly minimizes the contribution of his own (and my own) discipline. Even if it were true that "we [social scientists] do not have any theories that allow us to predict events with more accuracy than intelligent laymen," this argument loses much of its force when one considers that "intelligent laymen" *become* "intelligent" in dealing with social matters largely by absorbing concepts and findings in social science. And comparing "random samples of sociologists, physicists, and journalists" to see which group comes up with the best solutions to social problems appears quite irrelevant. One evaluates physics not by what randomly selected physicists can do but by what Newton and Einstein did. The social sciences should similarly be evaluated in terms of their best rather than their average performances, even if Newtons and Einsteins have not (yet) emerged among us.

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A publication of the National Science Foundation (NSF) (*1*) reports briefly on 14 "unanticipated benefits from basic research." Of the 14, three resulted from research in the social sciences, an excellent proportion given the distribution of funding over all the sciences. A later publication (*2*) catalogs a number of specific benefits resulting from one of the three projects the NSF reports on.

Mazur asks, "What . . . has been contributed by professional social scientists?" and answers "little" and "hard to find." Yet almost any member of the large U.S. adult deaf population would reply that study of the language and culture of the American deaf community (begun with NSF funding in 1960) by a growing number of linguists, psychologists, sociologists, and anthropologists has led directly to more and better jobs for deaf persons, to improved educational programs, to worldwide recognition of sign language art forms in dance and drama, and to a 180-degree reversal in public attitude toward deaf people's signing.

In the social sciences, as elsewhere, low expectations lead to lower contributions. . . .

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References

1. *Unanticipated Benefits from Basic Research.* (National Science Foundation. Washington, D.C., February 1979).
2. W. C. Stokoe, in *Language in Public Life*, J. E. Alatis and G. R. Tucker, Eds. (Georgetown Univ. Press, Washington, D.C., 1979).

Mazur complains that social scientists do not perform much better as social analysts than do intelligent laymen. He is right but has no cause for complaint. The results of social science investigation are usually written in a language most people can understand and diffuse rapidly to the intelligent and literate public. Unhappily, the mistakes also propagate rapidly.