LETTERS

University Research and DOD

The anticipated increase in funding of research in universities by the Department of Defense (DOD) (News and Comment, 29 May, p. 1003) is very disturbing. There are three critical issues for the university and scientific communities as well as for the whole nation which ought to be addressed.

The first is the increasing dependence of universities on federal funding. The questions raised by Kenneth Brown (*1*) are relevant and deserve serious consideration and widespread discussion. The immediate budget crisis prompted by the reduction of grant money is also an opportunity for universities to lessen their vulnerability to events beyond their control and to find more secure, stable, and independent financial resources. The rush of university presidents to the DOD breadline is unseemly at best and dangerous at worst.

The second issue is the appropriateness of DOD funding nonmilitary research altogether. Universities are rightly wary of any restrictions on the dissemination of research results. As citizens, scientists, and advocates for our institutions we should question why basic research is funded by DOD and not by nonmilitary agencies of the government. We should heed the warning of George Kistiakowsky who said recently, "I am very upset about this militarization of the country. I think, as President Eisenhower said in his farewell address, it is destroying our democracy" (*2*).

The final issue is the most important of all. That is our obligation to question the need and even the morality of *increasing* defense spending. George Kennan has just called for a 50 percent reduction in our nuclear stockpile. Kistiakowsky says our nuclear overkill capability is "beyond all concepts of common sense militarily" (*2*). It is narrow-minded and self-serving of universities to take their begging bowls to the Pentagon. The scientific community ought to be using its authority to speak out on the threat of nuclear holocaust and its expertise to help the human race back out of the blind alley of self-destruction into which it is rushing.

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References

1. K. T. Brown, *Science* **212**, 411 (1981).
2. R. Cooke, Boston *Globe*, 25 May 1981, p. 2.

Views on Evolution, Theory, and Science

R. E. Kofahl, in his letter (22 May, p. 873), tells us that Darwin "intensely hated" the dual concepts of divine intervention and special creation. Intense hatred was not known to be one of Darwin's cultural traits. Kofahl does not tell us he himself has written that "Bible-believing students of the biological sciences possess a guide for their interpretation of the available data, the biblical record of divine creation contained in Genesis" (*1*). Kofahl's discussion of Popper's ideas should be viewed in the light of Kofahl's own fixations.

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1. R. E. Kofahl and K. L. Segraves, *The Creation Explanation* (Shaw, Wheaton, Ill., 1975), p. 69.

It is becoming increasingly clear that the principal issue in the evolutionist-creationist debates is not scientific, but philosophical and historical. Yet one would think from recent discussions in *Science* (News and Comment, 20 Mar., p. 1331; Letters, 17 Apr., p. 281, and 15 May, p. 737) and elsewhere (*1*) that Sir Karl Popper is the only philosopher or historian of science in the world with anything to say on the matter. Creationists and evolutionists alike argue as if the validity of evolution by natural selection is to be decided upon the basis of Popper's pronouncements. Popper is not, however, an expert in the biological sciences or their history. His conclusions concerning evolutionary theory have been explicitly contradicted by Morton Beckner (*2*), who has specialized in the study of the philosophy of biology. Other philosophers and scientists have argued that a single philosophy of science based, as is Popper's, upon the study of the physical sciences is, in any case, untenable (*3*). Biological and historical reasoning are different from physical reasoning, these men argue. Thus, what Popper has to say about physical theories does not necessarily apply to biological ones.

The constant citation of Popper hides a more disturbing issue than just the validity of his remarks on evolutionism. Science is based upon skepticism, not authoritarianism. No matter how great Popper's authority, and no matter what Popper says—rightly or wrongly—about the issues raised by creationism, the resolution must come through independent, skeptical thinking on the part of each individual involved in the debates.

In the first place, there is a great deal of confusion as to whether evolutionary theories can make any predictions or postdictions that can be falsified. In short, can postulated evolutionary mechanisms be tested? Kofahl (Letters, 22 May, p. 873) of the Creation-Science Research Center says no, quoting Popper's statement that "Darwinism is not a testable scientific theory." This conclusion is obviously false. Evolution postdicts certain immutable trends of progressive change that can be falsified. For example, the discovery of human bones in geological strata bearing the remains of dinosaurs would most certainly falsify the concept of evolution. So would the discovery of bird fossils in ages preceding the advent of fishes. Indeed, any inversion of the so-called "tree of life" that puts a large branch onto a twig or causes a clear discontinuity of development would clearly cause tremendous difficulties for evolutionary explanations of life. On the other hand, without such a theory, there would be no reason to consider such anomalies and discontinuities as anything other than obvious possibilities. 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.

Theories must not only be predictive (or postdictive) and falsifiable; they must also limit what data are possible a priori. Evolutionism is a theory according to these criteria. It could be falsified by evidence that its predictions indicate should not exist. Yet, in more than 100 years of research, no such data have been discovered. Thus, the validity of the theory has been established by its historical record. It is this historical record of research, in turn, that gives the theory its important epistemological status in science.

Theories must do even more than predict and limit, however; they must also provide criteria for the evaluation of data. As any scientist knows, not all observed data are valid. Some can be interpreted as factual (that is, they fit the theory); some are artifactual (that is, the result of secondary or accidental influences not covered by the theory); and some are anomalies (that is, demonstrably not due to secondary influences, but also at odds with predictions from theory). Evolutionism provides such criteria for data evaluation. A perfect example is the case of Piltdown "man." Evolutionary theory predicted a "missing link" between the apes and man. Piltdown "man" was thought at first to be