LETTERS

Science and Religion

I agree with W. H. Hildemann's view (Letters, 5 Mar., p. 1182) on the possible complementarity of "evolutionism" and "creationism" in personal philosophies, yet he misses a major point of evolutionary scientists, the American Civil Liberties Union, and Judge Overton relative to the immediate source of the controversy, Arkansas Act 590. That point is the nature of the difference between science and religion and the corollary about how science should be taught. Contrary to Hildemann's suggested textbook statement, scientists (when they are behaving scientifically—that is, not all the time) do not "believe in" anything except their ability to gather reasonably objective information about the universe. Rather, they tentatively accept propositions they are unable to reject using available information. Despite our increasing uncertainty about events at progressively greater removes in time, the origins of life and the origins of the universe can be and are being explored scientifically (see the Gordon Research Conferences announcement, 5 Mar., p. 1275). At some point, all persons come up against questions they are not prepared to treat scientifically, for reasons of knowledge, psychology, or taste. Then they use other modes, including religion.

When we teach science, however, our goal should be to specify correctly what the scientific approach is and to develop in our students the ability to recognize it, to use it in at least some areas of their lives, and to understand when it is being invoked inappropriately. If we are successful, they will be able to think scientifically about problems they did not consider in school.

Science and religion provide different ways of knowing. Scientific assessments of truth cannot be mixed with religious beliefs and remain scientific. Making *that* point in science classes would also assure those assuming otherwise that science is not "anti-God" because it cannot be used to address anything supernatural at all. As individuals we may mix scientific assessments of natural phenomena with supernatural beliefs into a happy whole, but one of the main lessons of Act 590 is how dangerous to freedom of inquiry it can be if we cannot tell the difference between the two.

JAMES C. HICKMAN
Jepson Herbarium, Department of Botany, University of California, Berkeley 94720

Hildemann suggests that elementary textbooks introduce the subject of evolution with a statement: "A few scientists believe in a relatively recent inception of the earth and living organisms by sudden creation of the universe, energy, and life from nothing." The suggestion is not new. An attorney for the defense in the recent trial of *McLean* v. *Arkansas Board of Education* made essentially the same suggestion in his cross-examination of a science teacher who was a witness for the prosecution (*1*). The attorney asked why a statement in the teacher's chemistry text, which attributed great age to fossil fuels, could not be modified by insertion of a sentence, "Some scientists, however, believe that fossil fuels are relatively young." The teacher replied that such a sentence could be inserted in mechanical compliance with the Balanced Treatment Act of Arkansas (ruled unconstitutional on 5 January 1982), but that, as a conscientious teacher, he could not do it because "balanced treatment" must mean "equal dignity," and that he would have to justify the insertion. He added that he could not do this because he had heard no valid evidence to support such a position.

Are we prepared to sacrifice the integrity of teachers on the altar of religious zeal?

ROBERT M. JOYCE
Rural Delivery 1, Box 86, Hockessin, Delaware 19707

References

1. S. J. Gould, *Nat. Hist.* **91**, 4 (March 1982).

Science Advice

It seems somewhat foreboding that, of the panel of 13 scientists named to advise George A. Keyworth, director of the Office of Science and Technology Policy and science adviser to President Reagan, all are male, most of them are physicists, and none is identified with science in the humanities (News and Comment, 5 Mar., p. 1214). What an irony it is that this panel, the highest-level scientific advisory committee in the federal government, should be a pale shadow of the old President's Science Advisory Committee established by President Eisenhower and abolished by President Nixon.

As it is, the federal departments and their administrators, including the President, appear to be unaware that there is a combination of disciplines devoted to the scientific study of mankind; that anthropologists, ethnologists, sociologists, and psychologists analyze intergroup relationships and communication, perceive disharmony and harmony alike, and probe their genesis. These scientists at least know something about how groups of mankind live and relate to one another. If they are to be heard from, and consulted, they will have to command attention. If they succeed, and have counterparts abroad, it is just possible that the superpowers can work fast and efficiently to develop a realistic program for coexistence in this world before ignorance, suspicion, greed, and power combine to destroy much of civilization.

JOHN L. COTTER
University Museum, University of Pennsylvania, Thirty-Third and Spruce Streets, Philadelphia 19104

Damascus Steel

The ironic thing about Thomas H. Maugh II's article "A metallurgical tale of irony" (Research News, 8 Jan., p. 153) is its reading of history: It should have emphasized the really important new process of treating steel to yield a microscopically uniform dispersion of micron-sized particles of iron carbide that confers "superplastic" properties on high-strength steel of very high carbon content.

This excellent achievement of the Stanford metallurgists is *not*, however, a rediscovery of the supposed secret of that beautiful and effective weapon, the Damascus sword. Giambattista della Porta wrote (*1*) in 1589 of the importance of temperature in treating *wootz*—"too much heat makes it crumble," and Joseph Moxon (*2*) in 1677 specifically cautioned against forging it above a blood-red heat. He remarked that "when it is wrought it takes the finest and keeps the strongest edge of any other steel. Workmen set an almost inestimable value on it, to make Punches . . . of." The more subtle explanation of its properties in terms of composition and structure was slower to develop. The French metallurgist Bréant published in 1823 (*3*) a most important paper in which, for the first time, the origin of the pattern was traced to the microconstituents that today we call cementite, austenite, and ferrite, and he showed how the texture changed with variations in composition, temperature, and mechanical deformation. He saw that a good structure originated in the very coarse duplex crystals formed by slow solidification from the liquid state, and this was contorted by subsequently