Letters

Relevance of Science during Times of Social Stress

The New York *Times* editorial which *Science* reprinted (21 July, p. 295) attacked the appropriation of national funds for a 200-billion electron volt accelerator by stressing the "irrelevance of this accelerator to any real present national problem." It stated that "It is a distortion of national priorities to commit many millions now to this interesting but unnecessary scientific luxury."

This is such a serious attack against the essence of basic science in general that it should not remain unchallenged in a magazine devoted to the advancement of science. It represents a way of thinking which is most tempting during a period of social and economic stress. Obviously, far too few funds are devoted to the dire needs of a considerable section of our population in respect to housing, education, and medical care. In times of stress it is of utmost importance never to forget the aims of our civilization and the ideas which made our epoch uniquely distinguished and great. Certainly basic science plays an essential part in this. The United States took over the lead in this great development, it is today the country in which science is most active and vigorous. This leading position is threatened by an overzealous trend to cut these efforts in the present national emergency. Shall we relinquish this position because we are now living through a time of increased strain? The total expenses for basic science in the United States, including the planned giant particle accelerator, amount to less than one-third of a percent of the gross national product. Little would be gained for other purposes by giving up new projects which will keep us in the front line of research, but much would be lost. Projects such as the new accelerator might appear irrelevant to our immediate national problems. However, our scientific effort has a more enduring meaning. It is part of our cultural heritage which makes our lives worth living; it is the basis and precondition for technological inventiveness and industrial progress; it belongs to those activities in which we hope more and more people can and will participate through a better and more democratic system of education.

The troubles of today are, to a large extent, caused by our insufficient efforts to create a society in which more people can partake in a life which is worthwhile, interesting and significant. These efforts would become senseless if we begin to sacrifice some of the most active parts of our cultural life. In these difficult days, we must, more than ever, continue to support all that is positive and valuable in our civilization.

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Vague Identities Exasperate

Scientific journals should refuse to accept reports recording experiments on animals which are vaguely identified or only by a common name. Binomial nomenclature has been standard practice for more than two centuries, and the time of indefinite identification of an animal as the frog, the shark, the rat, the monkey should be past. One doubts that many experimenters are so vague about their research that they are unaware of the identity of the animal in hand, but too many do not care enough about such vital information to transmit that datum in print for the benefit of others.

My general exasperation at this unfortunate but widespread practice is brought to the point by the report (30 June, p. 1765) on short-term memory in monkeys which had had the cortex of the frontal lobes of the cerebrum removed. Nothing in the article gives a clue as to the kind of monkey involved, yet the common word "monkey" covers two groups (Ceboidea and Cercopithecoidea) which are quite different phylogenetically, anatomically, and behaviorally, and undoubtedly are biochemically different as well. The New World group (Ceboidea) had phylogenetic origins from North American early Tertiary prosimians, an evolutionary sequence undoubtedly different, and probably later by some millions of years, from that involved in the phylogeny of the Old World monkeys from a different prosimian group. The two groups of monkeys thus have had independent adaptive radiations. The Ceboidea are divergent enough among themselves to be separated into two families, of which the various genera and species vary considerably from one another so that experiments performed after frontal ablation on one might well produce results quite different from the same experiments performed on another; similarly the cercopithecids, although included within a single family, represent an extremely diverse group anatomically and behaviorally, and the numerous taxa are adapted to a variety of environments. Thus, whether comparisons are to be made of experiments performed upon animals of the same or of different families (all in this case being given the lay term, "monkey"), scientific confusion results unless the animals are accurately identified as to genus and species.

In a further article in the same issue (30 June, p. 1772), there is mention of a genus and species, here presented as *M. mulatta*, which, by common usage, should be translated to read *Mulatta mulatta*. No such animal exists but not everyone may know this. Furthermore, in the same article, we find the Animal Kingdom divided for convenience into humans, nonhuman primates, and "lower animals." The first two categories are clear, but the latter seems not to mean the logical assumption—all animals other than the Primates—but instead only non-Primate mammals (presumably therian mammals, or should we exclude the marsupials here?) used in laboratory experiments. Even if we ignore the unnatural narrowing of the non-Primate portion of the Animal Kingdom to that meagre part denoted by the lingo of the laboratory experimenter, I must still ask why *Canis familiaris* or *Tursiops truncatus* are "lower" than *Lemur catta* or *Nycticebus*

coucang? Can it be that, in the latter half of the 20th century, we are still on Aristotle's *Scala Naturae*?

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I have noted that in the recent literature on immunology there is a tendency to replace the word antigenic by immunogenic. May I suggest that this is a mistake. Immunogenic surely implies that the substance referred to will make animals immune. But not all antigens produce immunity; in fact, some produce hypersensitivity, more or less the reverse of immunity. Would it not be better to retain the older and more general term, or if the word immunogenic is to be used at all, to restrict it to organisms or substances that actually produce immunity?

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Early Vision of Public Education

Recent development of the State University Center in Albany ("News and Comment," 24 Mar., p. 1521) reminded me that Theodoric Romeyn Beck proposed such a center over 100 years ago. His remarks before the Literary Convention and the New York State Legislature on 30 March 1854 urged the state to establish the university center as an alternative to the proposed National University in Washington, which he believed would not be built. He was right. The following excerpts from his statement proved him to be over 100 years ahead of his time:

> I beg to say the plan presented by our respected president is one which meets my hearty approbation. It includes many of the subjects required to be taught in the proposed University—all of them called for by the wants of the times and of the country. . . . What shall be the system of instruction? Are the Latin and Greek languages to be taught? Certainly not. . . . We have already in this state alone, some 160 academies, some 7 or 8 colleges, in which the study of these is pursued. And if the teachers are competent, we do not need a University for that purpose. But it is desirable to have professors who are perfect masters of these languages. . . . You cannot expect that they will be attended by large classes, and this renders it more imperative to endow professorships for them.

Beck went on to say that the future of transportation, building, and such depended upon knowledge of physical and chemical composition of materials. He suggested an independent professorship on *Iron*, its chemical characteristics, its manufacture and its application. He mentioned microscopy, which was "already successfully applied to the development of the intimate structure of man and of the inferior animals." He suggested a professor of physical geography and meteorology, justifying it by the needs of navigation. "It has been asserted of late years, that a ship can outride a storm. Certainly we know, that if the barometer was generally studied, many dangers might be avoided."

He also proposed professorships of public hygiene, medical jurisprudence, statistics, comparative law and legislation, and physical astronomy and pleaded for "a number of free seats" to be made available for students in order to meet the "wants of the masses" to study in such an institution, it being understood that "the necessity of increase in knowledge is recognized in every right minded man until the day of death."

Beck was a physician-educator in Albany during the first half of the 19th century. He was principal of the Albany Boys Academy for almost 50 years, professor of medical jurisprudence at the College of Physicians and Surgeons at Fairfield, New York, 1816–39 and professor of physics at the Albany Medical College 1840–54. The State of New York is now developing, hopefully, an outstanding graduate school. Although different chairs from those proposed by Beck might be more appropriate now, his principles are still sound.

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CB Weapons: Powder Keg or Deterrent?

It seems to me that the letters (9 June) on moral issues of chemical and biological warfare have missed the main point which is that the vast majority of the earth's population regards science and technology as an increasingly mortal threat to their lives; they feel powerless at the mercy of a few, as if they were on the operating table in the hands, not of healers, but of