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Information for Contributors appears on pages 40–42 of the 1 January 1993 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. **Science Telephone:** 202-326-6500, TDD 202-408-7770. **Other AAAS Programs:** 202-326-6400.

LETTERS

Asteroid or Volcano: Have the Volcanists Been Heard?

In the great Cretaceous-Tertiary (K-T) extinctions debate about whether an asteroid impact or volcanism killed the dinosaurs, which in the past decade has become one of the most exciting controversies in the history of science, *Science* has served as a forum. However, has *Science* given both sides of the debate, the asteroid majority and the volcanist minority, equal opportunity to be heard by the reader? The record indicates not. The record seems to be one of indefensible favoritism toward the asteroid and virtual censorship of the volcano extinction theory.

Since 1980, *Science* has published 45 pro-impact manuscripts and Research News articles and four strictly nonimpact items. Since 15 November 1989, *Science* has published eight pro-impact manuscripts and none that is provolcanism. In the same time period, eight Research News articles were pro-impact, and one hinted at the possibility of volcanic influence in the K-T extinctions.

Science, with its prestige and vast readership, has been perhaps the major force in shaping public and scientific perception of the K-T debate for the past decade, yet it has hurt the volcanists in the scientific marketplace. The First Amendment was designed to prevent repression by the majority. One might argue that *Science* has helped an asteroid majority repress a volcanist minority.

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Response: Debates about the interpretation of incomplete or equivocal data occur in many areas of science. Our objective at *Science* is to publish reports of major advances and new data that bear on these questions. On average, the publication of new research reflects the number and quality of submissions and the pace of research. In our news coverage of such advances, we take into account the weight of the evidence and the balance of scientific opinion. Our news writers go beyond simple accounts of the statements of the various sides in a debate and provide context and close scrutiny to help our readers understand developments in a field.

For our peer-reviewed papers, however, "freedom of speech" cannot mean "equal space" for all points of view. Papers are evaluated by reviewers on the basis of scientific credibility and importance and are accepted by *Science* on that basis. Therefore, providing equal space for opposing interpretations in any major debate is neither a goal nor a necessary outcome of our selection process or our news reporting, but we do provide a variety of formats—review articles, policy forums, letters, and technical comments—in which dissenting points of view can be presented.

As McLean states, the K-T debate has been an exciting and important controversy, but *Science*, in my opinion, has been impeccably fair and has accepted papers from both volcanists and those in favor of the impact hypothesis. If, over a period of time, the balance has shifted, that is because of the new data that have come in. The news coverage has necessarily reflected this shift.—**Daniel E. Koshland, Jr.**

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Basic Research and Society

Congressman George E. Brown, Jr. (D–CA), states (Policy Forum, 9 Oct., p. 200)

> It may be true that certain basic research done today will enable some future application or innovation, but it is commonly argued that we cannot foresee these innovations and should support basic research on faith. This argument ironically exempts the very process of basic research from rigorous scientific analysis.

Later, he says

> The scientific community must accept the inconvenient fact that freedom of scientific inquiry can flourish only within a larger system of often chaotic and seemingly irrational pluralistic government.

Brown appears to be saying that politicians of necessity function chaotically (as we all know from observing the political process) but that scientists do not and are required to function under a hierarchy of orderly and pragmatic rules and constraints.

Proof resides in logic, but the creative process (perhaps like creative politics) does not. It is one thing to say that we should analyze the genesis of basic research and its innovations and quite another to say that they must follow prescriptions and a planned agenda. Scientists need pluralism and freedom just as much as politicians do.

What Congress can and should do to

govern the direction of science and to produce socially useful innovation is to choose whether it will fund biomedical research or Star Wars and a bloated and now unnecessary military establishment.

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The central reason that U.S. accomplishments in basic science are the envy of the world is the existence of a strong synergy between research and higher education in this country, which is unique in the world. Although much has been said in recent years about the shortcomings of the U.S. primary and secondary educational system, at the higher levels in the natural sciences our system has been the envy of the world since World War II.

This synergy is important because people and their motivations make the difference between success and failure of any enterprise, and science is no exception. A large fraction of those talented people who are responsible for the success of the scientific enterprise owe their opportunities for education and training to government support of basic research. This support results in large part from the recognition by the government agencies of the strong interdependence of research and education. It has taken the form of grants and contracts to the nation's universities and the provision of education and training opportunities at the national laboratories.

Research is inseparable from education. The most esoteric research can provide education and training in fundamental principles and methods that may be applied to a broad range of technical problems. There is about a 50% chance that even students trained in an esoteric field like high energy physics will end up in industrial or other jobs unrelated to their original research. Because tomorrow's science and development enterprise will be in the hands of those who are being educated today, this relationship among research, education, and training must be kept in mind in setting plans for the future.

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Correction: A Li-Fraumeni Syndrome p53 Mutation

In the Research Article "Germ line p53 mutations in a familial syndrome of breast cancer, sarcomas, and other neoplasms" (30 Nov. 1990, p. 1233) (*1*), we reported that an individual, III-1 in family 5, had a germ line p53 mutation at codon 252. We performed additional sequencing reactions for this individual's cells, and it is clear that there is no mutation at this position. Instead, we detected a deletion of a thymidine at the third nucleotide of codon 184, which results in a shift in the open reading frame so that a novel stop signal occurs at codon 246. We have found the codon 184 deletion repeatedly in many samples from separate polymerase chain reaction amplifications and also by the single-strand conformational polymorphic technique. We have also reexamined samples from the other four families and have found the mutations to be as we described in our paper. Because the affected members tested in all five families have germ line p53 mutations, the scientific message of the original work, that germ line p53 mutations can be found in affected members of some families with Li-Fraumeni syndrome, remains intact. As we (*2*) and others (*3*) reported subsequently, these mutations do not appear to be restricted to missense mutations in exon 7, and such mutations appear to be associated with certain cancers outside the classic Li-Fraumeni syndrome.

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1. D. Malkin, F. P. Li, L. C. Strong, J. F. Fraumeni, Jr., C. E. Nelson, D. H. Kim, J. Kassel, M. A. Gryka, F. Z. Bischoff, M. A. Tainsky, S. H. Friend, *Science* **250**, 1233 (1990).
2. D. Malkin *et al.*, *N. Engl. J. Med.* **326**, 1309 (1992).
3. J. Toguchida *et al.*, *ibid.*, p. 1301.

Corrections and Clarifications

David H. Freedman's Research News article "Drawing a bead on superdense data storage" (6 Mar. 1992, p. 1213) incorrectly implied that Stephen Arnold, at Polytechnic University in Brooklyn, New York, was the first to detect ultra-narrow resonances in microparticles. That discovery was made by Arthur Ashkin at Bell Laboratories. Arnold's work was also inspired, in part, by work on excitation spectroscopy of fluorescent fibers by Richard Chang and his group at Yale University.

The name of the Hale & Dorr lawyer quoted in the News & Comment article "Top HHS lawyer seeks to block NIH" by Leslie Roberts (9 Oct., p. 209) was misspelled. It should have been Henry Wixon, not Wixum.