# Letters

## Accuracy and Truth

Daniel E. Koshland, Jr.'s, assertion that no more than one in a million scientific papers departs significantly from accuracy and truth (Editorial, 9 Jan., p. 141) might have been made by Pollyanna. The idea that we scientists are ethically 99.9999% pure is not only ridiculous but also obviously self-serving.

Besides the actual falsifications of data, which probably pollute two orders of magnitude more reports than Koshland imagines, less direct deceits are abundant. I would estimate that over 10% and perhaps even a majority of all published works contain one or more of these deceits:

1) Omission of negative results from corollary experiments.

2) Presentation of statistical analyses where mathematically required conditions are not met, or discussed.

3) Failure to mention equally simple hypotheses that were untested or are untestable.

4) Citation of work as proving a point, which it does not.

5) Citation of work as supporting a point, which it does not.

Scientists routinely try to make their work look more significant than it is. This is natural and human, but it does distort the published product. Editors are certainly aware that this is so, and act to limit the distortion, although not effectively enough.

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*Response:* I did not state that scientists are ethically 99.9999% pure. What I stated was that I believe that proportion is not far off with regard to the correct data placed in the literature. Scientists are human and there will be both error and fraud, but it is as irresponsible to exaggerate these deviations as to ignore them. The errors listed by White all occur, but I would disagree strongly with regard to their frequency. I looked at one journal, the *Journal of Biological Chemistry*, which published 17,000 pages in 1986. Using a rough estimate of 50 pieces of data per page, one gets close to 1 million bits of information for one journal in one year. There are hundreds of journals in biochemistry alone and hundreds more in such diverse fields as physics, geology, psychiatry, and so forth. Yet, only one or two cases of fraud are exposed per year. My guess is that very few of the data in all these articles contain significant errors, let alone deceitful ones. Reading that a value is 10.1 in a table but that in the text it is 10.3 may be annoying, but anyone who has written a manuscript knows how easy it is to create such an error by the usual rounding off of data. Omitting negative results is not necessarily either deceitful or incorrect. There are standard procedures for omitting negative results, such as when subsequent positive results reveal the source of the initial error, or where statistically appropriate replications indicate that an unexplained deviation is beyond statistical significance. Statistical analyses are also a source of error, and that is why *Science* hires a consultant statistician. Scientists usually like to state alternative hypotheses, but lack of imagination or referees who say "don't speculate" can be reasons for leaving them out as well as deliberate deceit. Poor citations are probably the most prevalent of the ills listed, but the most important error in that regard is usually lack of scholarship, that is, a tendency to use a conventional citation without rereading the work or to choose one citation to illustrate a field when more than one paper is relevant. Failure to cite competitors can be deceitful or an excess of self-delusion.

Despite these deviations, which I believe will always be with us, the biological literature does, to an incredibly high degree, reflect accurate data on incredibly rapidly advancing frontiers. There is no error-free world. Perfection is the goal, but if we wait until we achieve it, progress will be very slow.—DANIEL E. KOSHLAND, JR.

## Universe Creation

As a psychologist who consistently strives to keep up with developments in other scientific disciplines, I was particularly excited to learn that mathematical tools are now available to create a universe in the basement (Research News, 20 Feb., p. 845). I was indeed able to locate an empty room in the basement of Hunter College, and I approached several colleagues about the possibility of joining me in creating a new universe during Dean's hours on a Wednesday afternoon. By the end of the first planning session, we encountered numerous theoretical problems, and I enumerate a few of them here just in case others have similar plans.

1) Hunter College has barely enough space for its faculty. Since the newly created universe is expected to expand exponentially, the problem of space (office, laboratory, as well as intergalactic) must first be discussed with the administration.

2) Who will be Dean of the universe, and will it be run on hard or soft money?

3) What if new life emerges within this universe? Hunter College is unionized, and it would be very difficult not to grant tenure to any new life-form, regardless of its chemical basis.

4) What precautions must be taken to prevent the new universe from being composed of antimatter? It would be just my dumb luck to have such a universe expand out of the basement, up to the sixth floor, and annihilate the psychology department. Isn't it enough to have to worry about perishing for lack of publishing?

Our conclusion is that it is currently much too dangerous to attempt the creation of a new universe in the basement. If at all possible, we recommend the roof instead.

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## Basic Research Funding

Erich Bloch lauds the Administration in his editorial of 6 February (p. 621) for its commitment to multiyear planned budget growth for the National Science Foundation, thereby making possible "the formulation and support of long-term strategies, projects, and programs."

The need for such a commitment is clear. However, this same Administration plays an annual game with the budget of the National Institutes of Health that makes any planning, much less long-term planning, impossible. Each year, Congress appropriates a growth budget and the Administration freezes a portion of that appropriation. Even now, noncompeting renewals are being cut by 15 to 20% and fewer awards are being made than the appropriation will support. Eventually, Congress will force the Administration to spend the full appropriation, but this annual game makes hash of multiyear plans and sends a signal to students that a career in basic research is risky, at best.

Is this how the Administration makes a national commitment to basic research? Is this the way to keep the best minds in our laboratories? The tragedy is that eventually the money is provided, but without the benefit of the carefully planned strategy Erich Bloch notes is so vital for keeping the nation in the technological and economic forefront.

If the Administration is so wise with the NSF budget, why is it so blind with the NIH budget?

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## *Response*: Accuracy and Truth

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