Letters

Good Science

During the past year, much has been written drawing invidious comparisons between "big science" and "small science." An implication has been made that "big" is bad and "small" is necessarily better. Not true. There can be good science or bad science—big or small. Every branch of "big" science has evolved from "small" science, led by scientists who found that their research demanded larger instruments and new approaches that simply did not fit into the environment in which research could be done by a single individual who could plan and carry out a project from conception to publication.

Elementary particle physicists are not alone in making the jump from small to big science. Materials scientists, nuclear physicists, and biologists are also participating in large and expensive projects. Some of the publications of experiments on the new superconductors already bear the names of more than 20 collaborators. The space telescope, exclusive of launching costs, will have a price comparable to that of the Superconducting Super Collider. Big as the current generation of particle colliders may be, the basic group that actually carries out the design of a subset of equipment and the data analysis and interpretation of results is not substantially different from what it is in "small" science—a professor, a "post-doc," and a graduate student, or some reasonable variation thereof.

Standards of scientific quality must remain high and they must not be established by nostalgia. Scientists from every field should encourage their colleagues to adapt to the most pressing demands of their science. It is essential for graduate students to have access, no matter how inconvenient, to the facilities, equipment, and techniques of the day. Convenient access to obsolescent equipment is no substitute.

The argument that must be made, and can convincingly be made, is that science has been very good to this country. Its contributions to our culture, intellectual vigor, educational system, economy, competitiveness, and to our military strength are mind-boggling. A few decades ago we led the world in investment in research—an investment in our own future. At that time we had no need to be concerned about our competitiveness. Now our competitors have learned the benefits of a vigorous research program. They are investing more heavily than are we, and they are reaping the rewards. It is time to stop quibbling about which good science should be pursued. If the science is good, the costs will be far outweighed by the benefits.

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"The Bride Is Too Beautiful"

The complaints by the "apparatchiks" of the Department of Health and Human Services about the superb performance by Edwin Becker of the National Institutes of Health reminds one of an old Jewish proverb to the effect that "the bride is too beautiful." As described by William Booth (News & Comment, 13 May, p. 869), the "DELPRO" (delegated procurement system) used by Becker sounds like an answer to any working scientist's prayer: "The clerk takes the order, makes a few phone calls, *and within days, the supplies arrive directly at the door of the lab.* No muss, no fuss. No lead times, no delays, and no central purchasing office" (emphasis mine).

Such a simple system is essential for programs in any research laboratory, particularly in biomedical laboratories where the availability of supplies must match the particular requirements of a biomedical or biochemical experiment. Apart from the fact that such a direct purchasing system best meets the needs of particular experiments, such a system, in the long run, is also the least expensive and the least time-consuming, and time-wasting.

In 1960 I was involved in a research project at the Yale University School of Medicine. When we needed any item, all we had to do was to phone the treasurer and tell him what we wanted and when. If the order was within the framework of our available funds, the supplies would generally arrive within a few days. After we came to a large university, in order to secure even a very inexpensive, locally available item, we were required to type a requisition, which would first go to the office of the dean of our college and then to the various officers of the research foundation. Eventually, we might receive the item (or sometimes a useless substitute), often long after our experimental design required the item. Moreover, the entire procedure was much more expensive, since this involved the maintenance of a purchasing department and of cumbersome storage facilities where the item we ordered would be delivered, often days before we would receive it in our laboratory.

Gorbachev seems to understand the inefficiencies of a cumbersome bureaucratic centralized system. Why not try to learn from the mistakes made by the pre-Gorbachev bureaucrats? Why not present to Becker an award for meritorious service to the American biomedical science community and to the welfare of the American people?

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Opposition to Research Centers

I would like to comment on Barbara J. Culliton's account (News & Comment, 6 May, p. 713) of discussions of science policy at the recent annual meeting of the National Academy of Sciences. Referring to "members of the physical sciences" who "had prepared draft resolutions to oppose the National Science Foundation's emphasis on research centers, at what is perceived as at the expense of individual researchers," she says that such "resolutions never made it through."

As chairman of the class of physical sciences (which includes mathematics, astronomy, physics, chemistry, geology, and geophysics) of the NAS, I presided over the class meeting on 26 April. The following resolution was passed unanimously by the class and forms part of the official record of our meeting:

> The membership of Class I reaffirms its commitment to the preservation of the role of the independent investigator, which is so central to the health of many areas of American science. Accordingly, we continue to express our concern over the increasing emphasis by the National Science Foundation on channeling its support of basic academic science through mechanisms other than traditional grants to individual investigators. Such mechanisms include the designation of so-called "priority areas" of basic research and the proposed establishment on a large scale of science and technology research centers, and of programs for the selective support of group research.
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> If implemented, these changes could affect adversely the patterns of scientific research and education in our universities, for example by suppressing or distorting the original contributions of emerging investigators. We request that the council of the Academy continue to examine the implications of these developments and recommend appropriate responses.

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(Continued on page 149)