bauer, the beer bottles of Donald Glaser, the moldy little glass dishes of Alexander Fleming, etc. In his earlier (and more productive) years, Albert Einstein carried out his relativity research on his kitchen table. Despite its great success and its specified goal and program toward nuclear energy, wartime Los Alamos is not necessarily an ideal model; few places can match the combined talents of Hans Bethe, Richard Feynman, J. Robert Oppenheimer, Edward Teller, et al.

I am not suggesting anarchy for scientific research, but there is a real danger of overcoördination and overly systematic management. It is already too easy, for example, to put an already well understood problem on a larger computer for a slightly more accurate solution, whereas more interesting problems (for example, why some of the very early and crude models of Peter Debye, Linus Pauling and John Van Vleck agree better with experiments than the later and supposedly more refined calculations) remain untouched.

The danger of overmanagement is even more acute in the days of shrinking research budgets. It can be very demoralizing to a scientist who, after surviving years of publish-or-perish pressure, suddenly finds himself outranked by an administrator or coördinator with little scientific achievement.

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Federal cuts may help

I believe that most aspects of the cuts in federal funding are good for the development of physics. The cuts are certainly not immediately good for the total number of physicists or their average standard of living—but these are different matters.

Federal support of university physics, through an agency of the Department of Defense or the Atomic Energy Commission, is invariably justified on the basis of an ultimate spin-off. Such a basis for financing has and must result in the success of the salesman–physicist, or the physicist with an applied bent. In these days of beginning cosmology and unraveling particle hierarchies, physicists should be seekers of truth unadulterated by subliminal engineering pressure. Physicists who support the confusion of physics and engineering not only cloud the military development of their country, but soon find themselves to be engineers (a man is according to what he does).

The other side of the federal funding coin concerns the government's mission-oriented laboratories. The military problems of the day are engineering problems: how to combat enemy submarines and missiles, how to enable radar to penetrate high-altitude nuclear explosions (to detect missiles coming in behind an explosion) and how to protect urban civilian populations from bomb damage. The laboratories in question support fundamental research from a prestige as well as a spin-off point of view. The prestige argument should not hold up, as success in the problem areas is where the prestige with sense should come from. As for the spin-off approach, having worked in a mission-oriented laboratory, I have concluded that the money would be better spent by raising engineering salaries. The mission-oriented laboratories need PhD engineers, not PhD physicists. Should an atomic-bomb type of development problem arise again and the only people with pertinent engineering background be physicists, then I would suggest that our physicists line up outside the government laboratory employment offices. There isn't any cause for this at the present as I believe that the existing military-engineering problems chiefly concern sophistication of existing concepts and equipment.

There is a pertinent source of money other than the federal government. That source is associated with the universities. Universities small and big should be made to understand that continued research is an integral part of a professor's life and must be supported. The cost and understanding must be passed on by the university to its own sources of income. Foundations, federal and state educational departments and direct as well as indirect sources of tuition all must be sold on the support of research as part of the cost of education. The overflow of good physicists into the poorer and smaller universities, where research is now the exception rather than the rule, will be of lasting value to physics, education, and the conscience of man.

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