



## FUNDING FOR SCIENCE: THE SYSTEM *IS* BROKEN; WHY NOT FIX IT?

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From time to time the idea of a Federal Department of Science and Technology, with a full-fledged Secretary, has been mooted, but in many circles in which I have heard it discussed it has been dismissed, sometimes by reference to the great successes of our current system, which are often ascribed to its very diversity and consequent messiness. One is asked whether one wants any single person to have overall authority over science funding. (In fact, at the White House there is just such an individual, the science adviser, and in general—except for a while under Ronald Reagan—it has been felt that he has been a positive if inadequate force for science. For some years under Richard Nixon the office was empty, and science felt its absence.)

However, it is becoming clearer and clearer that we have been, when successful, lucky rather than wise, and that our success is beginning to wear a bit thin:

▷ Direct government funding has emphasized big science projects, while small science has had to rely on other sources such as industrial and military funding. But changes in tax policy, antitrust actions, deregulation of the securities markets and possibly some deeper changes in society and the economy, not to mention management deficiencies, have decimated the industries that were the research leaders and have greatly reduced total industrial spending on R&D. At the same time there has been a great reduction in the military component, which was in any case of very variable quality; this reduction inevitably will continue. Small science—materials, electronics, biophysics, basic biology,

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theoretical economics and so on—is in deep trouble for these reasons, and it has very weak organizational support in the government.

▷ In a given field, research at different institutions is funded by agencies at varying levels of the executive branch, and these agencies are overseen at different levels within the Congressional committee structure. A similar lack of uniformity in level afflicts the funding of different fields at a given institution or even of comparable scientists working in the same university department. By historical accident, the Department of Energy is the only full Cabinet department with a base in science research, and historically it has taken its funding responsibilities for weapons research and for basic research in nuclear physics and elementary particles (which are irrelevant to the use or generation of energy) more seriously than its ostensible responsibility for research relevant to energy. The nation's institution with primary responsibility for funding basic research, the National Science Foundation, is many levels lower in the government, and its appropriation is commingled with those for veterans' affairs, welfare and so on. At this writing NSF is also threatened by Congress with being asked to substitute for our missing industrial research—an idea that industry itself seems to reject out of hand. The nation's biomedical funding and research agency, the National Institutes of Health, is at an organizational level in the Department of Health and Human Services that does not reflect its importance or its funding. NIH survives primarily by catering to the whims and concerns of appropriate members of Congress and because of its well-deserved popularity with the public.

▷ Fourteen scientific societies—most of those with relevance to space science—condemned Space Station

Freedom in a joint statement, to absolutely no effect. If the American space program were not an open scandal, this failure might be forgiven—but could scientists possibly have *less* influence? Clearly aerospace contractors have NASA under control, but even CEOs of aerospace companies have tried unsuccessfully to divert Congress from Freedom, the “great pork barrel in space.” NASA's independence, which owes to its historical ties to the highest levels of Presidential Administrations and to its popularity with Congress, is an anomaly that warps our entire technological effort. Recent moves have improved the situation, but NASA's history is an object lesson in how not to manage science in government.

▷ Pork barrel funding is an increasing danger to the dignity and independence of science. It exists not only in naked power plays by chairmen in charge of the many subcommittees of both houses that write science appropriations but also, and much more seriously, in the careful apportioning of contracts for big science and military projects (such as the Strategic Defense Initiative, the space station and the Superconducting Super Collider) among all the relevant Congressional districts. This makes these projects proof against real setting of priorities and prevents us—Congress and the scientific community working together—from genuinely addressing the weaknesses of our science and technology. Here as elsewhere complacent or ambitious scientists and university administrations are part of the problem.

▷ We have on our hands three national laboratories with basic responsibility for nuclear weapons technology, in a situation where only one is needed, and no sufficiently rapid mechanism for rationally converting these (admittedly very competent) institutions to economically viable uses. Though DOE is making va-

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liant efforts to assess the scientific components of their work, they nonetheless represent a problem that DOE alone seems unlikely to be able to solve. The Department of Defense has similar problems with the many military labs that are likely to become redundant.

These laboratories especially, as well as the very large Federal bureaucracy that has grown in parallel with them, are the place where a reassessment in terms of national needs is most desirable, rather than the relatively "lean and mean" NSF. The historical reasons for the duplication of Los Alamos by Livermore do not bear looking into, and I am sure equally unsavory stories must abound elsewhere in the Federal establishment. One of the strongest arguments for a major change in the organizational structure of Federal science is that the kind of change in goals and attitudes that we need, along with a wholesale phasing out of programs that have become entitlements, is not at all easily made in incremental stages. The organization has grown up under conditions and for purposes that no longer hold.

▷ We must not ignore the fact that we ourselves are much of the problem. Young scientists don't seem to realize that the possession of a PhD never guaranteed a career in basic research: It is and should be the privilege of a small elite. We are overproducing and undertraining young people, unfitting them for useful careers in teaching, development, quality control, marketing or management, or in emerging new technologies—yet these are the careers that most of them perform must follow. One of the primary functions of a more central Federal administrative structure for science should be the honest assessment of manpower needs and resources, unhappy as the history of previous efforts at such surveys is.

It is, of course, we practitioners of small science who are the most eager for change, but I believe that the sense of worth, the unity and the balance that a full-fledged departmental structure could lend us would lead to advantages for all of science. At present we are for the most part dependent on the vagaries of overburdened members of Congress, who are, though more competent than we usually admit, often scientifically illiterate and feel a primary responsibility to their wealthier constituents. The complicated historical process that has led us to the present irrational and inequitable system should not be allowed to determine our future. ■

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