Letters

U.S. Science and Technology

Daniel E. Koshland, Jr.'s editorial of 31 January (p. 441) concerning the need for a highly qualified presidential science adviser brings to light concerns not limited to members of the scientific community. As a U.S. Senator, I share Koshland's concern about the future of research programs and the potential impact of that future on the well-being of our nation.

Several recent trends lend a sense of urgency to my concerns. First is the eroding base of our university research enterprise. Some of our brightest investigators now are being forced to work with outdated equipment in antiquated facilities. Construction and renovation of academic research facilities could amount to from \$5 billion to \$20 billion over 10 to 20 years according to some estimates. Costs for closing the gap between present university instrumentation and that required to ensure maximum productivity from creative and innovative researchers may alone be as much as \$1 billion. In the face of this need, however, we have seen federal obligations for academic research and development plants decrease by 90 percent (in constant dollars) between 1966 and 1983.

Second is the direction R&D spending has taken during the last two decades. Primary in the significant rise in R&D expenditures over the 1982–86 period has been the major increase in Department of Defense (DOD) R&D support. National Science Foundation director Erich Bloch recently emphasized that today only a little more than a quarter of all federal R&D effort goes into civilian research. Indeed, U.S. civilian R&D as a percentage of gross national product is now below that of Japan and West Germany. Moreover, as Bloch also noted, DOD funds largely are directed to shorter term development efforts, with roughly only 3 percent going to basic research.

Third is the growing recognition of the importance of science and technology to economic health, to developing new products, to creating new jobs, and to increasing productivity, as in Massachusetts, where our blends of mature industries and high technology enabled the state to weather the recession of the early 1980's and emerge into a period of economic growth.

And fourth is the fact that we stand at the threshold of many exciting developments in fields such as biotechnology, advanced materials, microelectronics, and supercomputers. We need to take steps to maintain our position of leadership in these areas. Without support from government, America's high technology industry is in danger of falling behind those of Japan, Europe, and the Soviet Union.

Certainly, now more than ever, it is important to have an active, truly representative voice for all of science in our government. So important is this need that the President's own Commission on Industrial Competitiveness has recommended a cabinet-level Department of Science and Technology to promote national interest in policies for R&D. Today our national security strongly depends upon our ability to compete in international markets. That ability in turn depends upon a sound research base, able to fuel the technology and innovation needed to sustain our economic leadership. In order to maintain our position of leadership, we need strong support for science in the Congress, and from the President.

It is no secret to anyone in the scientific community that, in the past few years, the role of the President's science adviser has changed from that of a representative of the scientific community, to that of a promoter of the President's policies, such as the Strategic Defense Initiative. It is my sincere hope that we will soon see a presidential science adviser able to represent the interests of science policy and the scientific community, as well as the use of science for policy.

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"Money Pot" Clarified

I would like to clear up an erroneous impression that might have been created by the otherwise excellent article "Beggs takes a leave of absence at NASA" by R. Jeffrey Smith (News and Comment, 20 Dec., p. 1363) concerning the manner by which the federal government supports independent research and development (IR&D) performed by industrial organizations. Smith refers in his article to a "pot of money available for IR&D and new contract bids." The term "pot of money" implies that government agencies fund IR&D directly.

In fact, IR&D is charged to all customers (both government and nongovernment) as an indirect cost, along with other business expenses, such as those for utilities and facilities. These expenses are included in the cost of the product or service being delivered; hence, IR&D expenses are funded from appropriations intended for purchase of products or services and not from a separate "pot of money." (This is an important distinction—a customer does not pay directly for a manufacturer's utility bill, nor for his rent, nor for his IR&D.)

A feature that distinguishes IR&D expenses from other business expenses is the fact that the federal government limits the amount of reimbursement for IR&D. Public law requires the federal government to establish a maximum amount of IR&D expenses for each of our major contractors, and these expenses are then shared by all customers. The Department of Defense further limits the amount of IR&D expenses to those that have a potential relationship to a military function or operation. As a result, the Department of Defense reimburses its major contractors for IR&D expenses at an average rate of approximately 35 percent of actual cost to the contractors.

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Filamentary Structures

M. Mitchell Waldrop (Research News, 8 Nov., p. 652) gives an interesting summary of some recent observational results about "threads" in the galaxy that are claimed to constitute "new mysteries" that resemble nothing else.

In *Cosmic Plasma* (*1*), I devote chapter II.4 to filamentary currents (or "threads") in cosmic plasmas. Examples of such currents are auroral rays (*1*, figure II:3), solar prominences, the solar corona (*1*, figure II:5), and filamentary structures in cometary tails (*1*, figure II:6). In interstellar space the Veil nebula (*1*, figure II:8), the Lagoon nebula (*1*, figure II:9), and the Orion nebula (*1*, figure II:10) are given as a few examples of similar filamentary structures.

Filamentary structures in plasmas are explained as resulting from the pinch effect (*1*, chapter II:4.3) of electric currents, typically 10^9 to 10^{15} amperes, parallel to magnetic fields (*1*, chapter II:4.4). Currents of this type normally transfer large quantities of energy and momentum over long distances. Such phenomena seem to indicate where we should look for the energy source of double radio sources (*1*, chapter III.4.4) and quite a few other extremely energetic objects (compare also chapter I.3).

The filaments described in Waldrop's article are probably very important. If analyzed in the same way as other filaments (*1*,