Editorial & Letters

EDITORIAL

Making the Case for Federal Support of R&D

President Clinton recognized from the start of his administration that balancing the budget was critical to the future of the nation. At the same time he recognized the need to invest in that future, which included making critical investments in research and development (R&D). The proposed fiscal year (FY) 1999 budget reflects his commitment to R&D, but maintaining that commitment will require support from the scientific community.

As I leave my position as director of the Office of Management and Budget (OMB), I would like to share with you how the scientific community might improve its role in helping to maintain the commitment to R&D by addressing the following questions:

How large a scientific enterprise does the United States need? Last fall hundreds of scientists sent us letters promoting an authorization bill that doubles the research budget but does not address how to fund this doubling. Nor did the bill explain why doubling the budget would produce the correct level of spending. Although not a doubling, the President's FY 1999 budget does provide for aggressive increases for R&D that are fully paid for within very tight funding constraints. Unfortunately, the follow-through by the scientific community has been disappointing. Wish lists do not fund programs—strong justifications, tough choices, good performance, and aggressive follow-through until enactment into law do.

How can we set priorities in the nation's R&D enterprise? If I were to judge from my discussions with university representatives, I would infer that the priority of the research enterprise is to recover indirect costs. I hope that this is not the case, but that the scientific community has something more important to say. We have heard much rhetoric on the importance of setting priorities, and yet we have seen little follow-through. If the scientific community remains silent, priorities will be set without its input, by outside circumstance, by earmarks, and by those outside of the R&D community.

How can we measure the success of our nation's research programs? We appreciate the difficulties of developing performance measures for science, where basic research often results in unpredictable discoveries. Nevertheless, research agencies, as with other federal agencies, must be accountable for how they spend federal dollars. We often hear the success stories that, although necessary, are not sufficient to justify our $70-billion-plus annual investment in R&D. We have to understand not only what new programs and scientific areas are being proposed, but also that they are being conducted in the most effective and efficient ways possible. We must maintain a world-class research enterprise with constrained resources. This can be accomplished through better planning and increased international collaboration in the construction of major scientific facilities and through improved methodologies that lower the cost of research.

How can we strengthen the government-university partnership? I have often heard what the federal government—and the budget—should do to "fix" the problems and stresses at universities, but I have seldom heard what universities and the scientific community are doing to promote and improve our long-standing partnership. For the partnership to continue productively, we must agree on the distinction between support, which connotes entitlement, and assistance, which implies that the federal government is willing to help. We must also emphasize the importance of the peer-review process, or risk simple earmarks that turn science into a high-tech version of pork-barrel politics.

How do we engage the American people in the excitement and wonder of science? The research community first has to clarify its message to the American people. Not every American will become a scientist, and most will not be interested in the arcane details that so excite the scientific community. Yet scientists should make a difference where they can, most importantly by improving the science taught at the K–12 levels. Also, if science is not communicated to policy-makers in a way that they can understand, it will not be supported in the long run.

Although there is general and broad support for investments in R&D, funding is not an entitlement. Annual funding must be justified and earned. The scientific community must learn to be more effective in explaining the scientific enterprise, how priorities are set, and how success is measured. As director of the OMB, I have enjoyed my discussions with the scientific community, and I hope that these discussions will continue with my successor. Together, we can make better decisions about investments in R&D.

Franklin D. Raines

The author was director of the OMB from September 1996 to May 1998.

LETTERS

Microbes and migrations

Questions about why anthrax infections are lethal and how populations can defend themselves against anthrax attacks are addressed (below, the anthrax bacillus). Novelist Jean Auel reacts to the suggestion that an ancient population migrated from Europe across Asia to the Bering Strait land bridge and on into the Americas. And the histories of black hole theory and of brain area terminology are discussed.

ARTHUR M. SIEGELMAN/VISUALS UNLIMITED

How Anthrax Kills

It was with great interest that I read the report "Proteolytic inactivation of MAP-kinase-kinase by anthrax lethal factor" by Nicholas S. Duesbery *et al.* (1 May, p. 734) and Evelyn Strauss's excellent accompanying Research News article "New clue to how anthrax kills" (1 May, p. 676). I would like to add a couple of thoughts. There is much accumulated evidence that lethal factor (LF) is a central virulence factor in the pathogenicity of *Bacillus anthracis* and is directly responsible for many anthrax disease pathologies (*1*). A previous study provided strong evidence that LF maintains structural elements common to Zn^{2+}-metalloproteases that were required for toxicity (*2*); LF was also shown to hydrolyze the peptide hormones granuliberin R, dynorphin A peptide, neurotensin, kinetensin, and angiotensin-1 (*3*). However, linking these hormones to anthrax biology (beyond acting as test substrates for LF endopeptidase activity in vitro) is problematic. This leads one to ask, "Is inactivation of mitogen-activated protein-kinase-kinases (MAPKKs) by LF any more relevant to anthrax than cleavage of peptide hormones?" Although this remains unaddressed experimentally, a brief comparison of the known activities of LF versus the selective MAPKK inhibitor PD09859 may be useful. Duesbery *et al.* report that LF had a similar activity profile, in a screen of 60 human cancer cell lines, when compared with the chemical PD09859. Both agents are currently believed to inactivate MAPKK and inhibit cellular differentiation. But anthrax lethal toxin also kills