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Effective U.S. Science Continued

The depiction by Radford Byerly Jr. and Roger A. Pielke Jr. of the ecology of U.S. science (Policy Forum, 15 Sept., p. 1531; see also Letters, 22 Dec., p. 1906) is flawed both as history and as policy prescription.

Vannevar Bush's famous report, *Science: The Endless Frontier* (*1*), was written during the last stages of World War II and thus can hardly be equated with the environment for science later created by the Cold War. In fact, the Bush report was never implemented. Instead of the "national research foundation" Bush advocated, defense research remained with the armed services, medical research was placed with the National Institutes of Health, and research on atomic energy was confided to the Atomic Energy Commission (*2*). And so it has been for 50 years. These mission agencies have been supported by democratically elected representatives because of their contribution to social goals (national defense, health, and energy) and thus meet Byerly and Pielke's prescriptions for a "new" science policy. All the mission agencies together account for 97% of federal research and development funds—85% of federal funding for basic research (*3*).

The National Science Foundation (NSF) was created in 1950 on President Truman's terms, not Bush's—that is, it was accountable to the President rather than to scientists. It did not receive substantial funding until the 1960s and subsequently was called on to further social goals like science education and economic competitiveness. NSF nevertheless champions the role of supporting investigator-initiated research meant to advance scientific knowledge. It thus stands as the only conceivable target for Byerly and Pielke's caricature of the "Bush contract." The implication is that this comparatively small island of disinterested research support should be sacrificed to a new standard of "problem resolution."

If Byerly and Pielke believe that science can resolve the problems they specifically mention—"racism, drug abuse, breakdown of community, and crime"—they might ponder the history of the 1960's Great Society programs. Their recommendation for a national debate to achieve democratic accountability (besides begging the questions To whom? In what time frame?) similarly misrepresents what science can and cannot accomplish.

There is some validity to the contention of Byerly and Pielke that metaphor, or ideology (*2*), influences thinking about science. In the 1960s, when academic science better resembled what is indicated in the Policy Forum, research was uncritically enlisted in our "race" with the Soviets. However, the 1970s demanded social relevance from science, as in the dubious "War on Cancer." In the 1980s, science again prospered under the overriding image of technology transfer (*2*). In this decade, though, Byerly and Pielke invoke a spurious "political ecology" to rationalize reduced federal support for science.

The expenditure of public funds for science cannot claim exemption from scrutiny or evaluation, but it is dangerous to suggest that our society might choose to support only "useful" science.

A more valid ecology of U.S. science might start from the fact that the world's most productive scientific community exists within the world's most robust total economy. The notion that such a science- and technology-based economy can be maintained in the long run with a smaller investment in research is the assumption that should be "critically examined." Those who argue that the complex process of scientific inquiry can be bypassed in favor of immediate "problem resolution" or "measurable results" might well consider the fate of the goose that laid the golden eggs.

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Response: Geiger is correct in his assertion that "the Bush report was never implemented." However, as Donald Stokes has noted, "Bush's organizational plan was defeated while his ideology triumphed" (*1*). It is Bush's ideology, what we called the "social

contract," that has shaped the relation of science to its societal environment since World War II.

The linear-reservoir model in the social contract describes a relation between science and society in which funding basic research generates the knowledge society needs to address its goals. Geiger worries that "our society might choose to support only 'useful' science." The public supports science because it expects science to be useful (including contributions to problem-solving *and* to the goal of advancement of knowledge). Our point is made through Geiger's assertions that the mission agencies account for 85% of federal funding for basic research and "have been supported by democratically elected representatives because of their contributions to social goals." Further, NSF has been supported to further social goals, including the advancement of knowledge. Simply because society has supported science generously in the past on the basis of faith in the social contract does not necessarily mean that it will continue to do so (*2*).

That we seek "to rationalize reduced federal support for science" is a misreading of our message. It is an observation, not a recommendation, that all federal budgets are under stress. Federal support for science will be determined in this atmosphere, and the odds of favorable funding will be increased if supporters of science (including ourselves) can make a better case (*3*).

Reliance on the social contract allows one to avoid difficult questions about the relation of science and society. It is conceivable that the social contract described by Vannevar Bush is the best way to relate science and society. Anecdotal evidence suggests it is not. Unfortunately, convincing empirical evidence concerning the validity of the social contract has not been presented; to date debate has relied largely on appeals to faith.

Thus, we recommend a national debate on how science relates to the objectives for which it is supported. We do not suggest that all of science pass a strict short-term cost-benefit test, but we do believe that we can do better than the social contract.

To use Geiger's cautionary metaphor of the goose that lays the golden egg, we suggest that the goose take a moment to ensure that the egg she lays is, in fact, golden and, if it is, that her patrons realize that fact; if it is not, she should take steps necessary to make it golden, for if the egg is not golden, the goose will pay the price.

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Letters to the Editor

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