SCIENCE POLICY WITHOUT SCIENCE POLICY RESEARCH

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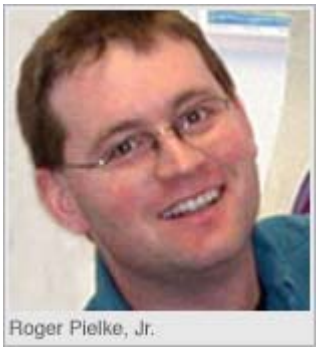
Roger Pielke, Jr.

In 1963 British philosopher Stephen Toulmin warned that decisions about science would be based on little more than "hunches and prejudices" unless scholars devoted more attention to scholarship on "science policy." More than four decades later, John Marburger, science advisor to President George W. Bush, expressed concern that science policy decisions were largely uninformed by science policy research and requested that "the nascent field of the social science of science policy needs to grow up, and quickly." It is in the interests of both the scientific community and the broader society which it supports to proceed with Toulmin's and Marburger's calls to intellectual arms and expect science policy research to play a greater role in science policy decisions.

Current discussion about science policy in the United States, focused on the issue of "competitiveness," provides some evidence for the importance of science policy research, but unfortunately through its absence in policy debate. The focus on "competitiveness" manifests itself in a number of proposed policies, such as the president's "American Competitiveness Initiative" and proposed legislation in Congress titled "Protecting America's Competitive Edge." These proposals share a focus on calling for the production of more scientists and engineers and a commensurate increase in science funding in the physical sciences, among other recommendations.

The current call for increases in science funding as a tool of economic competitiveness might be viewed in the context of a history of such arguments. Juan Lucena, a professor at the Colorado School of Mines, has documented how the scientific community has argued for more funding of science, and the consequent production of more scientists and engineers, as the policy solution for every major problem facing the United States since the launch of Sputnik in 1957. These problems have included the Cold War, environmental challenges, social strife and inequity, economic challenges posed by Japan, globalization, and the war on terrorism. Today's arguments follow in this tradition, with more science funding identified as the solution to economic threats posed by India and China.

The scientific community has been very effective in convincing policy makers that in funding more science lies the key to more jobs and a stronger economy. For instance, last month, Representative Frank Wolf (R-VA), Republican chairman of the House committee with responsibility for funding many science agencies, wrote an essay for the American Physical Society in which he expressed concern upon learning "from groups that advocate for business, education, and research and development . . . that three key measuring sticks show America on a downward slope: patents awarded to American scientists, papers published by American scientists, and Nobel prizes won by American scientists." Unfortunately his concerns are completely misplaced as US patents, papers, and prizes are not declining, but increasing.

Representative Wolf's misunderstanding of the state of science policy is unfortunately not a unique aberration. The widely cited but apparently little read 2005 report of the US National Research Council titled *Rising Above the Gathering Storm* (RAGS) is often invoked by scientists and policy makers as a basis for increased science funding and the production of more scientists and engineers; however, a close look at the report reveals a complicated picture of science in the economy, with no simple cause-effect relationships. For example, RAGS favorably cites a literature review by Alister Scott and colleagues at the University of Sussex produced for the UK Office of Science and Technology, which cites studies showing a return on investment from government spending on research and development of between 20 percent and 67 percent. What RAGS does not inform its readers about are the broader conclusions of Scott et al.:

> The relationships between public research and innovation are recognised to be an increasingly significant topic in the emerging knowledge economy. However, this is an area beset by high levels of complexity and a surprisingly small amount of empirical research. It is a field where it is easy to be misled by simplistic ideas, or to become confused by such data as do exist and the conflicting interpretations that can be made from them. As this review will show, even now eminent commentators and analysts are grappling with some of the most fundamental dimensions of the relationships between research and innovation, science and technology.

Instead of just more funding for science, or the production of more scientists and engineers as tools to improve a single nation's competitiveness, Scott and his colleagues argue that collaboration among networks of scientists in different countries is a key to economic growth - a very different message than the somewhat nationalistic tone taken by RAGS. Such critiques are not unique. For instance, in 1996 Charles L. Schultze, former chairman of President Jimmy Carter's Council of Economic Advisors, provided guidance for those seeking to explain the role of science in the economy: "First, do not specify the target as increasing competitiveness. *Competitiveness* is a virtually meaningless, if widely used, word. It can - and has been - used to justify virtually anything."

It seems that advocates for increased public support for science in the United States are crystal clear in identifying the solution - more science, more scientists - but completely incoherent in terms of delineating the problem that the solution is to address. There are far-reaching risks in such a situation.

First, science policy making might simply be ineffective from the standpoint of broad public goals. Will more funding for basic research in fact lead to the promised outcomes in terms of jobs and economic growth? To be fair, the various competitiveness initiatives currently being discussed contain provisions for improving pre-college education and teacher training, among other actions. But among much of the science community, the focus has been primarily on provisions which call for a dramatic increase in funding for the physical sciences. Yet, as the RAGS report readily admits, the connections of science funding with the promised corresponding outcomes are not based on rigorous understandings: "Even if unlimited time were available, definitive analysis of many issues is simply not possible given the uncertainties involved. The recommendations in this report rely heavily on the experience, consensus views, and judgments of the committee members." And it just so happens that the report's authors in industry and academia are also primary beneficiaries of the report's recommendations. None of this is to deny the possibility that the science policy recommendations currently being discussed might succeed with respect to their goals of jobs and growth. It seems, rather, that no one knows if they will succeed or not, which does not seem to be a good recipe for effective science policy decision making. Most scientists would likely object to a similar lack of a scientific basis for policy making in areas such as the environment, health, or national security - why should science policy making be any different?

A *second* risk is to the science community itself. In the United States, science and technology have had an extended unbroken record of tremendous public support expressed both in opinion polls and federal spending. In particular, over recent years government budgets for research and development have increased to record amounts at a pace not seen since the Apollo era of missions to the moon. Is it possible that such public support is risked if the scientific community acts like any other special interest group fighting for its share of public resources? History would suggest that such a risk is small, but given the increasing share of federal resources going to science and technology, and the promises made to the public to secure such increases, the scientific community should not take public support for granted. If for no other reason than to maintain a broad public view of the research enterprise, it is in the interests of the scientific community to ensure that the policies that it proposes can, in fact, work as promised. Science policy research is an important mechanism for understanding the relationship of science policies and their societal outcomes.

As we consider science policy decisions in the early years of the 21st century, scientists and policy makers would do well to heed the words of Stephen Toulmin from 1963:

> Unless decisions about science policy are to be left to be made by *éminences grises*, we shall need a corresponding body of independent informed opinions about the natural history of science: men whose business is to undertake academic research on the intellectual foundation of scientific policy, and who are engaged continuously in a critical exchange of ideas with the actual policymaking agencies of government.

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