The Congressional Science and Engineering Fellows Program and Other Efforts to Help Congress and the Public Make Wiser Decisions on Technology

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I played the main role in starting both the AAAS and APS Congressional Scence Fellowship programs in 1970-1973. They grew out of one of the first of the Stanford Workshops on Political and Social Issues (SWOPSI). I organized and led this workshop with Bob Jaffe, Frank von Hippel, and Martin Perl in 1969-70 [1]. SWOPSI courses were co-led by grad students (Jaffe and me, in this case) and faculty. They were unusual in that they aimed to improve the world – typically by doing studies on public issues – as well as to educate. Our workshop was focused on improving U.S. decisionmaking on technological issues. One of our projects was to prepare a questionnaire for Congress, which was distributed by Senator Alan Cranston and Representative Jeffrey Cohelan. Of the several ideas we suggested, the two that were most popular were a science advisory agency for Congress (much like the subsequently created Office of Technology Assessment), and a program of young scientists serving for a year on Congressional staffs.

Our workshop wrote an analysis of the Congressional questionnaire, and Frank von Hippel and I wrote a more general report, *The Politics of Technology*. I then set out to try to get our recommendations implemented while I began my scientific career. When I was a Harvard Junior Fellow 1970-73, Ed Purcell was very supportive of these ideas, and he got me appointed to relevant committees of APS and AAAS. I sought out other receptive officers of these organizations, and worked with other young activists. Among my important allies in the effort to create the Fellowship program were AAAS Treasurer William T. Golden and Carleton College physics professor Barry M. Casper (who was also an early leader of the APS Forum on Physics and Society).

Bill Golden challenged me to give him a list of Senators and Representatives who would like to host a Fellow, and a list of excellent young scientists who were interested in applying for such a program. Although I was initially hesitant to employ the buddy system to do the latter, I did what he asked. Golden responded by writing a personal check to fund the AAAS Congressional Fellowship program, and he helped persuade the AAAS Board of Directors to start it.

APS Executive Secretary Bill Havens was initially hard to convince, but he ultimately became one of the strongest supporters of the Congressional Science Fellowship program – and APS joined with AAAS in initiating the program. (A lesson I learned from this experience: the advantage of convincing a conservative is that you only have to convince him once!) Havens was persuaded that it would be a good thing for APS to help legitimize for physicists activities other than traditional research in universities and industry. A supportive 1973 *Physics Today* editorial pointed out that "A modest-size business corporation faced with making million-dollar decisions typically has more specialists in science and technology on its staff than are available to Congressional Committees reaching decisions on billion-dollar questions." At that time

the entire Congressional staff included only two PhD physicists, John Andelin and J. Thomas Ratchford. I had consulted them, among many others including several members of Congress, in designing the program.

The three young scientists whom I recruited at Bill Golden's request before the program existed all subsequently became members of the first class of Congressional Science Fellows. They were physicists Ben Cooper and Michael Telson and biologist Jessica Tuchman [Mathews]. Ben Cooper, one of the first two APS Fellows, gave up tenure at Iowa State after his Fellowship year to join the staff of the Senate Interior Committee, subsequently renamed Energy and Natural Resources, where he remained for more than twenty years. Michael Telson had received his M.I.T. PhD just before becoming a AAAS Fellow. After his Fellowship year, he had offers from three universities and several Federal agencies, but he instead joined the staff of the newly formed House Budget Committee working on energy and environment, where he stayed for twenty years. He subsequently worked as Chief Financial Officer of the DoE for several years, and now works for the University of California. Jessica Mathews helped lead Mo Udall's Presidential campaign, served on the National Security Council staff, was an editor at the Washington Post, and is now President of the Carnegie Endowment for International Peace. [2]

The career paths of the 58 APS Congressional Fellows have been diverse. One, Rush Holt, is now the Representative for the New Jersey district that includes Princeton University, where he had earlier worked at the Forrestal Research Center. Five others are presently on Congressional staffs. Twelve have positions in the Executive Branch, ten are at universities or laboratories, eleven work in industry, five are on professional society staffs, and seven work for public interest groups.

I have already mentioned SWOPSI. This program, which I organized at Stanford in 1969 with undergraduate student body president Joyce Kobayashi and fellow physics graduate student Bob Jaffe, continued for some twenty years. I also played a major role in starting the American Physical Society's program of studies on public policy issues. Freeman Dyson and I drafted the proposal for the first of these studies, on Light Water Reactor Safety, and in 1974 I led the group that obtained funding for this study from NSF director Guyford Stever. Among the most ambitious of the subsequent APS studies were those on Directed Energy Weapons (1987) and Boost-Phase Missile Defense (2004) [3]. In 1976, at the first meeting of the AAAS Committee on Scientific Freedom and Responsibility, I helped to start what has become the AAAS Program on Science and Human Rights, which has also continued to the present.

In creating enduring social innovations like SWOPSI, the Congressional Science Fellowship Program, the APS studies, and the AAAS Science and Human Rights program, I have found that the first requirement is that it be "spherically sensible" – it has to make sense from everyone's perspective [4]. The Fellowship program, for example, benefited the fellows themselves, Congress, their professional societies – as well as their scientific professions and the larger national interest. The second requirement is to recruit excellent people. Dick Scribner, the initial director of the Congressional Science

Fellowship Program, played a crucial role in steering the program through its difficult first years – and the Fellows themselves were superb. The final requirement is that initiators like me get out of the way! It is essential that the people who do all the hard work have managerial responsibility and get credit for their successes.

In 1974, Frank von Hippel and I published a book, *Advice and Dissent: Scientists in the Political Arena* [5]. Our goal was to improve decisions on technology by improving both **advice** (from scientists to government) and **dissent** (political advocacy by scientists and their organizations). We presented many case studies of technological issues – ABM, SST, cyclamates, persistent pesticides, chemical and biological warfare, nuclear reactor safety – and concluded that insider scientific advisors can tell government officials how to do better what they have already decided to do, but that turning government decisions around usually requires outsider activism.

President Franklin D. Roosevelt once told visitors: "Okay, you've convinced me. Now go out and bring pressure on me!" [6] Both advice and advocacy are essential in a democracy.

In *Advice and Dissent* we recognized that few people can indefinitely sustain an intense involvement with issues remote from their personal lives, and argued that it was important to civilize the environment of public interest science so that more scientists can contribute. We had urged creation of new institutions such as the Congressional Science Fellowships and the APS studies partly in order to provide new avenues for scientists to contribute to the public debate on technological issues, and to receive training and credentials. Several thousand scientists have become what Neal Lane [7] calls civic scientists through such channels, at least for a few years. As a result, there is no doubt that democratic decisionmaking on technological issues has improved.

But despite all these efforts and many more by others, U.S. science and technology policy is terrible and getting worse! Examples of bad science and technology policy in the current Bush Administration include the following claims:
• There is not enough evidence of global warming to actually begin to do something to slow the growth in carbon consumption.
• But there is plenty of evidence to support deploying a missile defense system now.
• And we need to be ready to test new generations of nuclear weapons.

Advice and Dissent didn't anticipate the willingness and ability of the federal government to persist in spending a fortune on technology that was incapable of working – for example, the strategic defense initiative ("star wars") missile defense systems. How was this possible? The public evidently doesn't know enough or care enough to demand sound technological decisions.

What can scientists do to improve the situation? We need to present, not only sound recommendations backed up by convincing studies, but also wise moral leadership. In short, at least some of the civic scientists must become public heros in order to be effective leaders.

Two scientists who were heroes of mine and helped to inspire me by their examples were Andrei Sakharov and Linus Pauling. They also had enormous influence on a wide public. I will never forget the impact on me of Sakharov's book *Progress, Coexistence, and Intellectual Freedom* (1968), which convinced me that the Cold War could be replaced by a more hopeful world. Despite his earlier leadership of the Soviet hydrogen bomb program, Sakharov won the Nobel Peace Prize in 1975 as a "spokesman for the conscience of mankind." He was one of the greatest defenders of democracy and human rights in Russia. Pauling was an early and continuing leader in applying quantum mechanics to chemistry. He received a Presidential Medal in 1948 for his contributions during the Second World War, and the Nobel Prize for Chemistry in 1954. In the 1950s he showed that radioactive fallout from bomb tests causes cancer and birth defects. His efforts to end bomb testing included circulating the scientists' petition against nuclear testing, speaking before diverse groups of scientists and citizens, and writing the bestselling book *No More War!* He was awarded the Nobel Peace Prize in 1962 for his leadership in ending atmospheric testing of nuclear weapons. He went on to show statistically that smoking causes cancer. According to Pauling, "It is sometimes said that science has nothing to do with morality. This is wrong. Science is the search for truth, the effort to understand the world; it involves the rejection of bias, of dogma, of revelation, but not the rejection of morality."

In the next thirty years or so, humanity must somehow stop the extremely rapid growth in resource use, and develop a sustainable relationship with the earth. During the past century, the number of people on our planet increased by about a factor of four, but our energy consumption increased by nearly two orders of magnitude. Our collective impact on planetary systems is now so great that this growth in resource use must slow very quickly, despite the increasing global industrialization as an increasing fraction of the world's people improve their lives.

The early universe apparently made such a transition, from a brief period of exponential expansion (which we astrophysicists call cosmic inflation) to billions of years of much slower expansion [8]. If we humans can make a graceful transition from exponential expansion to a sustainably slower growth rate, our descendants can look forward to an immense period of future evolution. If not, our descendants will never forgive us – if we have any descendants.

In addition to their normal research and teaching, at least some leading scientists must benefit society by educating the public as well as advising the government. Such activities must be supplemented by public activism and occasional heroism. There will be many challenges in the coming years that will require intellectual and moral leadership by scientists and others as we try to lead humanity in a new direction.

References

1. Jaffe was chair of the M.I.T. faculty 1992-95, and he is now Director of the Center for Theoretical Physics. Perl received the Nobel Prize in Physics in 1995 for the discovery of the tau lepton. von Hippel is Professor of Public and International Affairs and co-director of the Program on Science and Global Security in the Woodrow Wilson School, Princeton University. One product of our workshop was an article: Martin Perl, Joel Primack, and Frank von Hippel, "Public Interest Science – An Overview," *Physics Today,* vol. 27, no. 6, pp. 23-31 (June 1974).

2. For more on the early years of the program, including analysis of the impacts on Congress, the fellows, and their professional societies, see Jeffrey K. Stine, *Twenty Years of Science in the Public Interest: A History of the Congressional Science and Engineering Fellowship Program* (AAAS, Washington, DC, 1994).

3. The APS studies are listed at http://www.aps.org/public_affairs/popa/popa-studies.cfm The APS Panel on Public Affairs (POPA) also does smaller studies, of which the two most recent are on The Hydrogen Initiative and The Modern Pit Facility; see http://www.aps.org/public_affairs/popa/reports/index.cfm

4. In testifying against the proposed Safeguard anti-ballistic missile system, physicist Marvin ("Murph") Goldberger said that it was "spherically senseless. It makes no sense no matter how you look at it." Ref. [5], p. 70.

5. Joel R. Primack and Frank von Hippel, *Advice and Dissent: Scientists in the Political Arena* (Basic Books, 1974; New American Library, 1976).

6. Saul Alinsky, *Rules for Radicals* (Random House, 1971), p. xxiii.

7. In his article "Benjamin Franklin, Civic Scientist" (*Physics Today*, October 2003), Lane defined a civic scientist as one who uses his or her special scientific knowledge and skills to influence policy and inform the public.

8. Nancy Abrams and I discuss this and other modern cosmological metaphors in a book we are writing, tentatively titled *The Meaningful Universe*, to be published in 2006 by the Riverhead division of Penguin Books.