Four years of Congressional Science Fellows

At the end of this year, 50 science and engineering Fellows will have participated in the program, which is leaving its mark on the Congress, the sponsors and the individuals involved—many of whom are physicists.

Richard A. Scribner and Mary L. Shoaf

Five years ago this spring, The American Physical Society and the American Association for the Advancement of Science selected their first Congressional Science Fellows. At the same time, the American Society of Mechanical Engineers had its first Fellow already working with the Congress, and the Institute of Electrical and Electronic Engineers was selecting its first Fellow.

By the end of this year, 50 engineers and scientists, many of them physicists, will have completed one-year Fellowships with the US Congress and the program appears to be growing steadily. To date, more than one-third of the Fellows have been physical scientists and a comparable number have been engineers. This distribution is no doubt a reflection of the circumstance that the program initiators were primarily physical science and engineering professional societies. Why these organizations chose to start the effort, as opposed to biological scientists, for example, is a question for the sociologists of science. The distribution by field of applicants to the AAAS Congressional Science Fellow Program is approximately: 45% physical sciences, 30% biological/biomedical sciences, 10% behavioral/social sciences and 15% engineering. The fact that physical sciences applicants outnumber the biological science applicants to the AAAS (which has more than one-third of its membership in the biological/biomedical sciences), raises a similar question.

In the Fellow program, the heavy concentration of people coming from academic environments (65%) and the large percentage of individuals seemingly ending up in policy careers (45%) are remarkable figures. The "sticking factor" of former Fellows in Congressional staff positions is about 35%. While substantial, this figure indicates that about two-thirds of the Fellows do not remain with the Congress; the majority of Fellows return to non-governmental positions outside Washington. This balance strikes us as an ideal match with the purposes of the program, which will be discussed later. The situation for physicists in the program, however, is in sharp contrast to that for the larger group.

Of the 17 physicists who have held Fellowships, ten have taken up permanent staff positions. The sticking factor for physicists is much higher than for the program as a whole. One can speculate that physicists may be more in demand for some of the "choicer" Congressional-staff roles.

For the 1977–78 program, there will be 12 sponsors of 18 Congressional Science and Engineering Fellows in a program coordinated by the AAAS. This group includes the Acoustical Society of America and the Optical Society of America, sister organizations of the APS.

Physicists and the APS have obviously played an important role in the development and continuation of this program.

Program overview

The Congressional Science Fellow effort was initiated by individuals within professional societies as a broadly educational, public-policy/public-interest activity. The awareness that the program might be a useful way for scientific and engineering societies to interact with the Federal legislative process came about through the work of many individuals, including several members of Congress who urged the societies to do so.

As described in the literature published by the APS and AAAS in the spring of 1973, the purposes of the program are two-fold:

- to make practical contributions to more effective use of scientific knowledge in government—sometimes referred to as the "arrogant" purpose, because it says: Congress has a need and we have the expertise to fill that need and perhaps a public-service imperative to do so, and
- to educate the scientific communities regarding the public-policy process and to broaden the perspective of both the scientific and governmental communities regarding the value of such science–government interaction—sometimes referred to as the "humble" purpose because it recognizes that scientists and their organizations have a great deal to learn and understand about the policy process and applying science to social needs.

The Congressional Science Fellowship Program has several basic elements, including: application and selection; orientation and placement, and in-office experience. In addition, the Fellows attend regular seminars and are required to submit interim and final reports. Each of these elements could be discussed in some detail, but only three aspects of the procedure are singled out here for comment—application, selection and placement.

Candidates apply as individuals, with no institutional endorsement required. The application procedure is simple and straightforward.

In the case of the APS, selection is performed by an *ad hoc* selection committee formed by the Council and headed by the vice-president elect of the Society. The selection criteria in use now are the same as those formulated at the inception of the program: "Prospective Fellows are expected to show exceptional competence

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in some area of science or engineering; have a broad background in science and technology; be cognizant of many matters in nonscientific areas; and, perhaps most importantly, have a strong interest and some experience in applying scientific knowledge toward the solution of social problems. Candidates are expected to be articulate, literate, adaptable, interested in work on a range of public-policy problems, and able to work with a variety of people from diverse professional backgrounds."

Placement is the responsibility of the Fellows, although the AAAS provides information, contacts and guidance. Information is provided to them in the intensive orientation and also by the annual survey of Congress, which determines opportunities for the Fellows. Both of these operations are performed by the AAAS. Guidance throughout the placement period is also provided by the AAAS. The final selection, however, is a matter of mutual agreement between the Fellow and a particular Congressional office.

Results and lessons

The Fellow clearly benefits the most from the program in the short term. Education, character growth and development of leadership potential are the first returns. More will be said on this later in the article. In the largest and most general sense, however, society at large benefits, because in a kind of average, probabilistic way, better legislative and public-policy decisions result.

The Fellows have made a significant impact simply through a greater visibility of scientifically-trained individuals in key locations throughout the Congressional staff. Six years ago, Congressional staff numbered about 12 000 and perhaps as many as 4000 of these could be considered "professional–legislative" staff. By a conservative estimate, about one-half of one percent of these people appeared to have a PhD- or MD-level training.

Now, Congressional staff number about 17 000 or 18 000 and perhaps 6000 of these are "professional–legislative" staff—among them are 50 or so identifiable scientists, or one percent of all Congressional staff. These scientists include the Congressional Science Fellows, past Fellows who have stayed in Congressional positions, and other technically trained people hired directly in the Congressional staff (perhaps in large part due to the Program's success). This percentage would still seem small when compared with the number of legislative issues with scientific and technical components that come before Congress. In the past six years, other parts of the Federal government that support Congress (Office of Management and Budget, General Accounting Office, Office of Technology Assessment and the Congressional Research Service) have all strengthened their scientific staff with

Science Fellow Placement

Office of Technology Assessment—six Fellows

Senate Interior Comm. (Senators Henry Jackson and Paul Fannin)—four
Senate Commerce Comm. (Senators Warren Magnuson, Philip Hart and John Tunney)—four
House Science and Technology Comm. (Reps. Olin Teague, Don Fuqua, James Symington and Mike McCormack)—four

Senate Health Subcomm. (Senator Edward Kennedy)—two
Senator Dale Bumpers (D–Ark.)—two
Senator Gary Hart (D–Colo.)—two
Senator John Glenn (D–Ohio)—two
Rep. Morris Udall (D–2nd CD, Ariz.)—two
Rep. George E. Brown Jr (D–36th CD, Calif.)—two
House Armed Services Subcomm. on R&D (Rep. Melvin Price)—two

Senator Warren Magnuson (D–Wash.)—one
Senator Edward Kennedy (D–Mass.)—one
Rep. Charles Mosher (R–13th CD, Ohio)—one
Rep. Mike McCormack (D–4th CD, Wash.)—one
Senator Mark Hatfield (R–Ore.)—one
Senator Pete Domenici (R–N.M.)—one
Rep. David Obey (D–7th CD, Wisc.)—one
Rep. Jack Kemp (R–38th CD, N.Y.)—one
Senator Charles Mathias (R–Md.)—one
Senator Howard H. Baker (R–Tenn.)—one
Senator Bob Packwood (R–Ore.)—one
Senate Subcomm. on Environment (Senator Edmund Muskie)—one
Senate Subcomm. on Children and Youth (Senator Walter Mondale)—one
Senate Subcomm. on Alcohol and Narcotics (Senator Jennings Randolph)—one
House Subcomm. on Energy and Power (Rep. John Dingell)—one
House Subcomm. on Energy, Environment and Natural Resources (Rep. Leo J. Ryan)—one

PHOTO: PAUL CONKLIN

Three Congressional Science Fellows consult for a brief moment in the hall of the Dirksen Senate Office Building. They are (l to r) Granville Smith, Willis Smith and Benjamin Cooper.

more than 300 scientists and engineers.

We made a rough calculation in dollars of the public-service contribution by scientific-society sponsors, based on a average Congressional salary of $25 000—over four years, 50 Fellows would have earned $1.25 million if they had been hired.

In areas such as energy or recombinant-DNA research regulation, Fellows, former Fellows and other scientific staff appear very much in evidence. Furthermore, because a scientifically trained person in the Congressional staff brings a unique professional training and perspective, the significance of that person's role is perhaps greater than that of just one more competent staff person. We think these scientific skills and viewpoints are especially needed in Washington, and Congressional response confirms this impression. The House and Senate Concurrent Resolution 100, which applauded the Congressional Science Fellow effort, was passed in the spring of 1976 (see Science, **192,** 544, 1976 and **193,** 41, 1976).

Aside from augmenting the scientifically trained Congressional staff, we see substantial impact of the Fellows on legislative issues. Not the kind of impact that replaces or in any way subverts the legislative process and the legitimate decision role of the legislators, but rather the impact of complete staff work that often benefits from a unique perspective and application of a "scientific" methodology aimed at uncovering pertinent facts. Fellows do not delude themselves into thinking their impact or value is greater than it is. One former AAAS Fellow, William Moomaw, who had a key role to play in the Congressional action on the ozone–fluorocarbon controversy, observed:

> "It is obviously satisfying to see one's ideas accepted by a Senator, and in some cases actually enacted into law. On the other hand, it is easy to start believing that one's contributions are greater than they actually are. By the time a particular piece of legislation makes it through both houses and is enacted into law, so many other people have had a hand in shaping the final product, that it is often impossible to recognize one's original contribution, let alone take credit for it."

Impact on scientists

Of the 37 Fellows who had completed their terms by 1 January, 18 had chosen public-policy/public-service careers, while 17 had returned to their previous positions (two chose other careers). The Fellowship experience therefore has had a significant impact also on career goals—especially among physicists in the program. According to Benjamin Cooper, a former APS Science Fellow,

> "The Fellowship [resulted in] an offer to me by the Interior Committee staff to become a permanent member of their operation. I accepted this offer, so the impact of the Fellowship on my career has been enormous. The position I had at Iowa State included academic tenure, to be formally granted in 1975 after my return from Washington. All over the country tenured positions in physics departments are filling up, and they will remain full for at least a generation. Turning down that position to stay in Washington meant foreclosing any [future] possibility of a job as a physics professor.
>
> Because of the oversupply of academically oriented physicists, careers in physics must come to encompass a broader range of occupations. Some of these ought to involve public affairs, and I assume that one of the purposes of the Congressional Fellowship is to explore the potential of the Congress to absorb persons whose background in the sciences is strong. When the offer was made to me to become a professional-staff member, it seemed reasonable to see in more detail what this potential actually might be. It is not clear what the outcome of this experiment will be, but it will involve a great deal of interesting work in the meantime."

As enjoyable and stimulating as the experience can be, it is a very different life with very different rewards than the traditional academic or research scientist's role. This fact was eloquently pointed out in an article by Paul Horwitz (a former APS Congressional Science Fellow), which appeared in the December 1976 issue of PHYSICS TODAY. Horwitz concluded:

> "I learned more [during the Fellowship year] than during any comparable period since my childhood. ... [but] I would not want to be a legislative aide for the rest of my life. ... [among other drawbacks] a legislative aide's job requires anonymity ... [and] I could never accept such a low profile on a permanent basis."

What value has the program had for the APS and the larger scientific community? The Congressional Science Fellow Program gave the APS the opportunity to get involved in a significant, appealing public-service activity. The results have been very, very satisfactory from almost every viewpoint. If willingness of Society officials to serve on the selection committee is any indication of the regard for the program, the Fellow program continues to have the highest appreciation of the Society. The APS vice-president elect and other members

chosen by Council for the selection committee not only enjoy the experience, but also look forward to serving in this capacity as one of the pleasures of service to the Society. They have not hesitated to express this view in various public forums.

The success and satisfaction with the Congressional Fellow Program has helped to pave the way for other public-service/public-policy activities of the Society, such as the Panel on Public Affairs. Increasingly, former Fellows will find themselves in leadership roles in the APS as participants in Council, POPA and the Forum on Physics and Society. For example, N. Richard Werthamer now is a member of the APS Council and POPA; Benjamin Cooper is a member of POPA and chairman of the Forum on Physics and Society; and Allan Hoffman is an active participant on the Forum on Physics and Society. The success of the Fellow Program was certainly an important factor in the APS decision to establish an industrial-fellowship program this year.

The largest and ultimate benefit of the Congressional Science Fellow Program, however, is to the scientific community. We are just beginning to perceive the benefits of the understanding fed back from Fellows and also through the process of our own involvement in the Program. The enlargement of the boundaries of "what is acceptable for a physicist to do" and still be a member of the physics community will not be fully explored for some time.

As former Congressman Wes Vivian, himself an engineer by training, once commented—the program has created a "club of misfits," which will have a greater impact through the network it creates and the eventual leadership roles its "alumni" assume than was ever dreamed of when the program was conceived.

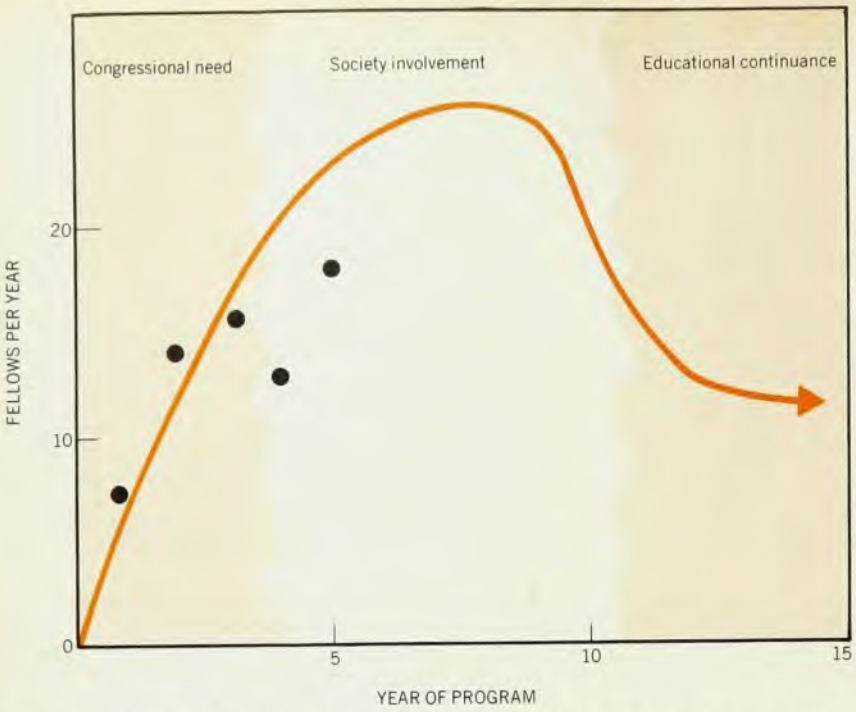
The American Physical Society, the AAAS and the other scientific-society sponsors of Fellows have all gone more than half-way, not only demonstrating a useful public-service program, but also finding a new and effective way of bridging the two-cultures gap.

A few observations

The following points provide *some* insight about the lessons that Fellows and program administrators have learned over the past four years. These points are drawn from the impressions shared by many Fellows and are given here without full attribution. The seven points listed are principally those made by Arthur Silverstein (Federation of American Societies for Experimental Biology Fellow, 1976–77) and Paul Horwitz (APS Fellow,

A history of some physical-science Fellows since 1973

	Affiliation	Served with	Present location
1973–74			
Benjamin Cooper (APS)	Iowa State University	Senate Comm. on Interior and Insular Affairs	Senate Comm. on Energy and Natural Resources
N. Richard Werthamer (APS)	Bell Laboratories	Rep. Charles Mosher	New York State Energy Research and Development Authority
1974–75			
Kevin Cornell (AAAS)	American University	Senator Gary Hart	Senate Environment and Public Works Comm.
Allan Hoffman (APS)	University of Massachusetts	Senate Commerce Comm.	Senate Comm. on Commerce, Science and Transportation
Henry Kelly (AAAS)	US Arms Control and Disarmament Agency	Office of Technology Assessment	OTA
Thomas Moss (APS)	IBM Watson Research Center	Rep. George E. Brown Jr	Rep. George E. Brown Jr
Willis Smith (IEEE)	Sandia Laboratories	Senate Interior Comm.	Senate Comm. on Energy and Natural Resources
Gary Thomas (AAAS)	State University of New York, Stony Brook	OTA	SUNY, Stony Brook
Haven Whiteside (APS)	Federal City College	Senate Subcomm. on Environment	Senate Subcomm. on Environment
1975–76			
Audrey Buyrn (AAAS)	Massachusetts Institute of Technology	OTA	OTA
David Claridge (AAAS)	Stanford University	OTA	OTA
David Hafemeister (AAAS)	California Polytechnic State University	Senator John Glenn	US Department of State security assistance (non-proliferation)
Paul Horwitz (APS)	Avco Everett Research Laboratory	Senator Edward Kennedy	Avco Everett Research Laboratory
William Moomaw (AAAS)	Williams College	Senator Dale Bumpers	Williams College
John Young (APS)	University of Wisconsin	Senate Commerce Comm.	OTA
1976–77			
Ronald Bruno (APS)	Southern Illinois University	House Comm. on Interior and Interior Affairs	University of Montana
E. William Colglazier (AAAS)	Institute for Advanced Study Princeton, N.J.	Rep. George E. Brown Jr	
Michael Crisp (OSA)	Owens–Illinois Technical Center	Senator Howard H. Baker	
Granville Smith (APS)	Grinnell College	Senate Commerce Comm. (additional year on staff) and Senate Comm. on Energy and Natural Resources	
1977–78			
Paul Maxwell (APS)	Central University of Venezuela		
Thomas Sheahen (APS)	National Bureau of Standards		
Douglas Segar (OSA)	National Oceanic and Atmospheric Administration		
Barry Leshowitz (ASA)	University of Arizona		



This representation of the program was conceived by Richard Scribner in 1973. The three regions labeled Congressional need, society involvement and educational continuance show the time periods when these aspects "drive" or are characteristic of program participation. The points are the actual number of Fellows each year (the fifth year is 1977–78) and the long tail reflects our presumption that a lower-level program will continue for some time, beyond the next five years.

1976–77) in private communications, but many other Fellows have made similar observations. They are presented in no special order and do not represent a complete set of insights.

- The range of experiences in the legislative (political) process to which the Fellows are exposed is more extensive and more interesting than they anticipate.
- The people in the Congress (both Members and staffers) are much better at their jobs, more hard-working, and generally more knowledgeable than science Fellows expected. The system, on the other hand, is perhaps worse than they expected, in terms of the following—difficulties involved in dealing reasonably with facts, problems posed by jurisdictional disputes, and the ease with which irresponsible legislation can be got through, as well as the ease with which responsible legislation can be impeded at almost every step.
- Fellows generally are impressed and reassured by the responsiveness of legislators and their staffs to public opinion and to public inputs, although one of the most important lessons has been an understanding of what type of input, made by whom, and made to whom, will have the greatest effect.
- There are large groups in this country (including probably all scientific societies and their aggregates) who have a vital stake in the legislative process, but who are ill-organized and not familiar enough with the process to make their positions and their interests known to the legislators in a clear and effective manner.
- There is very little time available in the Washington atmosphere to think carefully and fully about what you are doing. Decisions that may have very important consequences for the country and the world must often be made on the basis of incomplete data and preliminary analysis. Sometimes this kind of decision making is unavoidable, but more often it occurs because the individuals and groups outside of Washington who could be helpful are not consulted, and are not sufficiently "plugged in" to the process to be aware of how, and most importantly *when*, they can make a useful contribution.
- Some of the most important contributions of a Fellow may be not in what he has caused to happen during his tenure, but rather what he has prevented from happening (this point was stressed by Silverstein). Advice to prevent a member of Congress from taking an ill-considered position may be as crucial as talking him into taking another worthwhile stand. The prevention of an untimely or counter-productive hearing may be as important as the development of some other useful one; the effort to kill someone else's bill or amendment may be as critical as the effort to sponsor one's own.
- Generally speaking, Congressmen and others working in the Congressional process are not antagonistic towards science and the information scientists can bring to bear on public-policy issues. They are, however, not accustomed to having factual scientific or analytic information be a significant part of their consideration. They assume all too easily that scientists would not be particularly useful in the legislative process. These views come about for a host of sociological, professional-training and historical reasons. The Congressional Science Fellow Program has helped to change some of these views, and this accomplishment may be one of its most important ultimate impacts.

The program's future

The Congress is by no means near the saturation limit for good opportunities for Science Fellows (see figure). In 1972, Congressman Mike McCormack stated that Congress would have no difficulty in using 50 to 100 such individuals, if they were readily available. That forecast proved true then and it may be even more valid now. The scientific and engineering community interest is expanding at a significant rate. From a start of four society sponsors in 1973, this year there are 12 societies sponsoring Fellows—these groups span the physical, biological and behavioral sciences and engineering.

The program was conceived, in part, as a kind of seed effort—where the germination period might be five, six, or seven years—to demonstrate that scientists can perform effectively in the Congressional environment. One of the original expectations of the program was that it would change Congressional attitudes about hiring scientists for regular staff positions (which is now occurring at a significant rate) and would suggest that Congress consider starting its own Science Fellow effort to meet the demonstrated need. (There are many reasons why that last change is slow in coming, if it ever will materialize. Some of the reasons include questions raised by: Congresswide perceptions about who is being served by a necessarily limited program; the public's perception of special-interest catering by Congress; the need to extend an option, such as a Fellow program, to other professional areas, and individual Congressmen's ideas of ideal staff size and utilization.)

No matter what happens to the prospects for a Congressionally supported program, some small number of independently selected, high-quality Congressional Science Fellows (almost all of whom do not remain in Washington) is necessary to continue a direct involvement with Congress and feedback to the scientific community over the long-term.

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This article is an adaptation of a paper presented in Washington, D.C. at the spring meeting of The American Physical Society, 25 April. Information on the Fellowship Program, including a full list of participating organizations, is available from Richard A. Scribner at the AAAS, 1776 Massachusetts Avenue NW, Washington, D.C. 20036. □