

Congressional interactions at very small impact parameter

A Scientist Fellow, sponsored by The American Physical Society, evaluates his one-year term in the Washington maze as adviser, legislative aide and handyman.

Paul Horwitz

THIS IS A REPORT to the members of The American Physical Society on some recent data obtained from the ongoing Congressional Fellow Deep Inelastic Scattering Experiment. This experiment, which was initiated by the APS and other scientific and engineering societies three years ago, represents a first attempt to probe the nature of the US Congress. The concept is very simple: a strongly focused beam of high-energy Congressional Fellows is directed at the Congress and allowed to interact. An analysis is then made of the final state of the system (which may be either a free Fellow or a bound Fellow-Congress pair) and, in this way, insight is gained into the nature of the unknown scattering center and its interactions. A more ambitious goal is to learn to use and perhaps even modify these interactions for some practical purpose—this goal is still a long way off, and at present very little is known about the fundamental nature of either the Congress or that larger entity of which it is a part, the Federal Government.

Although the Government had been postulated by E. O. Lawrence and others during the 1930's, its existence was not definitely established until the Manhattan Project during the Second World War. The existence proof was considered of so little importance at the time, however, that no publication was sought and the exact identity of the discoverer is unknown. In 1950 the interest in the Government was whetted by a further important discovery. This was the observation that, in certain

highly excited states, the Federal Government undergoes a class of reactions that result in the outflow of significant sums of money for the support of scientific research (see Public Law 81-507, the National Science Foundation Act).

A period of intensive research ensued, directed not only at uncovering new production mechanisms for the excited states of interest, but also at a fuller comprehension of the Federal Government itself. Progress in the latter program was disappointingly slow up to the late 1960's when a discovery was made—the Government was not, as had been previously supposed, an elementary particle, but rather it was composed of three loosely bound constituents: an Executive, a Legislature and a Judiciary. The so-called “quark model” of the Federal Government was successful in unravelling many perplexities, particularly when the symmetry groups—Democratic, Republican and Independent—were invoked to describe the interactions of the quarks.

The choice of the legislative quark as a suitable target for the APS Fellow Accelerator was suggested by the discovery that this quark is itself composed of two constituents: a House and a Senate, of mass numbers 435 and 100, respectively. In fact, at the highest obtainable beam energies, scattering actually takes place off the fundamental building blocks of these constituents—the offices of individual Representatives and Senators.

Among the limitations of this experiment that are important to recognize is its insensitivity to global phenomena. Thus, in this article I do not attempt to describe the workings of the Congress as a whole, nor even of the Senate alone. Rather, I report on the operation of a single Senate office, that of Senator Edward M. Kennedy, and my interaction with it during the most intensely interesting period of my life.

Let me examine first the popular conception that the primary role of the Congressional Fellows is to act as “science advisers” to committees or individual members of the Congress. The notion of science adviser implies the communication and interpretation of scientific facts. One might imagine a scenario like the following:

Kennedy Paul, I've got a question for you. Why do the Canadian reactors use heavy water, and what does this have to do with nuclear proliferation?

Horwitz Well, Senator, the neutron-capture cross section of heavy water is much lower than that of ordinary water, so it thermalizes neutrons without absorbing them. This means that you don't need so many neutrons, so you can use natural uranium and you don't need enrichment plants. That's good from the proliferation point of view, but heavy-water reactors have a continuous-feed cycle that makes the diversion of plutonium from them easier—this is the case with reactors in India.

Kennedy Thank you very much, Paul. Now

I know how to vote on S.2035.

The more cynical reader might imagine a slightly different scene:

Kennedy Paul, I'm going to vote “No” on S.2035 and I want you to give me some sound scientific arguments to back up that vote.

Horwitz What's S.2035?

Neither of these conversations, nor any resembling them, ever took place. A more realistic possibility is one in which the scientist performs the usual functions of a legislative aide: setting up hearings, writing statements and press releases, and briefing the Senator. These duties typically have very little to do with the technical expertise of the Fellow.

Most legislative aides are generalists,



and bring to their job a frame of mind at odds with the average scientist's training and attitudes. A scientist with broad interests may of course pick up enough information in fields unrelated to his training to become a useful legislative aide. If he fails to perform adequately in this role, however, he may find himself shunted aside with his activities restricted to answering the mail, unjamming the Xerox machine and going for coffee. These may be useful functions, to be sure, but reminiscent of George Plimpton's efforts on behalf of the Detroit Lions.

Life with Kennedy

In my work for Kennedy I tried to steer a course between the roles of science adviser and legislative aide, but my job included other duties as well. I did quite a lot of casework in which I acted as a consultant, referral agency and ombudsman for individual constituents. I also did some work connected with Kennedy's re-election campaign and a few of my activities, such as ones in connection with the Science Court, had no direct relation to my official position at all. These activities came much later in my term—the first few weeks were wholly absorbed in feeling my way, learning new skills and trying, without much success, to understand the nature and scope of my new boss's job.

The thing about Kennedy that impressed me most during those first weeks was how extraordinarily busy he is. In a world of corporate executives, scientists and administrators, I have never met any one as busy and active as he (see Box).

One of the most remarkable institutions in Kennedy's office is "the bag."

This is the briefcase the Senator takes home with him every night, bulging with memos and briefing papers from various aides. He rarely fails to get these memos back to their authors by the next morning with a hurriedly scribbled (and often nearly indecipherable) notation authorizing or blocking an action, proposing alternatives, asking a question, or seeking additional advice.

Thus, although direct access to him is severely limited, any aide can get through by "return mail." If faster action is required, one can slip him a note during a hearing, or even pull him off the Senate floor for a hurried consultation—but the need had better be apparent and immediate!

There is an unwritten rule, however, concerning memoranda: They must contain a "bottom line." Memos must end by proposing some action or set of actions, which involve the Senator. This basic rule, which forces one to think always in terms of possible legislative action, is alien to the usual scientific mode of operation, and is often hard for a scientist to live with. For one thing, it requires him to make choices based on fragmentary and inaccurate data, and strips him of his accustomed freedom to deal only with facts and certainties. I often asked myself during those first weeks, "What's a nice physicist like you doing in a place like this?"

I had, of course, only myself to blame for being there. The Congressional Fellowship program does not assign the Fellows to a particular office. The program provides them, under the aegis of the American Association for the Advancement of Science, with a thorough (and completely exhausting) orientation period. The final decision on where to work is left entirely to the individual, provided only that the office of his choice is dis-

posed to have him. His choice may be limited not only by the chronic shortage of office space, but also by the understandable reluctance of many staff directors to become involved with an unknown scientist who may prove woefully inadequate to the tasks set before him.

I chose Kennedy's office primarily because of his interests and his committee responsibilities. Science-related issues are handled by a single Committee in the House of Representatives. In the Senate, by contrast, jurisdiction is shared among three Committees and Subcommittees. One of these is the Special Subcommittee on the National Science Foundation, headed by Kennedy since its creation in 1969. My interest in the Special Subcommittee brought me face to face with Anne Strauss during the orientation period of my fellowship.

Strauss works for the NSF subcommittee. My purpose in coming to her had been to offer general assistance in handling the NSF authorization bill, but in the course of our first conversation, she described a project that immediately caught my attention. A year previously, Kennedy had asked the General Accounting Office (GAO) to cast a critical eye on the management of RANN (Research Applied to National Needs—the applied-research directorate of NSF), and to come up with ideas for improving it. A draft of this GAO report was out and Strauss asked me to read it over and suggest a Kennedy response to it.

Research-user coupling

In reading over the GAO report, I was struck by the fact that apparently many of the RANN projects were not being used by anyone, even when the research had been a success. Although this fact would not matter much in a basic-research program, it was a very serious criticism for an

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A typical, though fictional, daily schedule for Kennedy

7:30 am —Briefing by a staff member on the 200 Mile Limit bill	Photograph on the Capitol steps with Nantucket girl scouts.
8:00 am —Breakfast meeting with representatives of the Massachusetts fishing industry Conference en route to the Senate with a Health Subcommittee staff member	Telephone conference with Joseph Kennedy II, the re-election campaign manager in Massachusetts Tapes radio message concerning the Presidential veto of the Department of Health, Education and Welfare appropriation
9:00–11:30 am —Chairman of a hearing on the Health Manpower bill (interrupted twice by votes on amendments to the Military Construction bill)	2:30 pm —On the Senate floor—managing the Anti-Trust bill
11:25 am —Consultation with a Refugee Subcommittee staff member on the Lebanon situation	4:15 pm —Interview with CBS news on the swine-flu inoculation program
11:30 am —Witness at the Senate Finance Committee hearing on tax-reform legislation	4:30 pm —House–Senate conference on an energy conservation bill (interrupted by a vote to end a filibuster of the Anti-Trust bill)
Lunch —Interview with reports concerning the investigation of the Federal Aviation Administration that was recently completed by the Subcommittee on Administrative Practices and Procedures	6:30 pm —Fund-raising dinner
1:00–2:00 pm —Meeting with the Ambassador-designate to Spain	8:30 pm —Reception at the Kennedy Center
	9:00–12:00 pm —Reading and attending to the contents of the "bag"

applied program like RANN. I was curious; Why were perfectly valid and useful research results just sitting on the shelf unused? In most cases, the GAO found, the fault lay in a failure to identify the potential users of the research and involve them at an early stage. As a result, not only were the users unprepared and often unwilling to take advantage of the research results, but frequently the research itself turned out to be misdirected, because the needs and constraints of the user had been inadequately assessed.

Gradually the whole thing began to make sense. In basic science, the researcher usually defines his own problem, guided by his personal sense of what is both feasible and scientifically interesting. In applied research the guidelines are altogether different. One has a definite user—a "customer"—in mind, and as in many fields, the customer is always right. In other words, the problem to be solved is not a purely scientific one, and the constraints and boundary conditions are dictated by nonscientific criteria. For example, the development of an infrared detection device to be used by policemen on the beat would be worthless if the detector did not work in the rain.

The question then becomes: How can one improve the coupling between researcher and user? The logical answer, I thought, was a greater reliance on the profit motive. If a researcher hopes to make some money on the application of his research, he is more likely to be responsive to the needs of the user. The response to the GAO report was beginning to take shape: Clearly we ought to be examining more closely the interactions of the NSF with industrial scientists. Somehow, imperceptibly, I had slipped

into using "we," rather than "you" and, although I didn't know it yet, and it wouldn't be official for another week, I was working for Kennedy from that point on.

In addition to writing a press release on the GAO report, I spent my first two weeks reading and talking to knowledgeable people about the NSF. Suddenly, all thoughts of RANN and its problems were cast aside as I struggled to cope with my first crisis.

A turning point

A year later the term "crisis" seems an exaggeration, yet that's how I felt on that chilly October afternoon when Strauss informed me that she was taking a few days of emergency leave, and I was faced with the prospect of trying to fill her shoes. This involved, among other things: briefing Kennedy on a meeting with Robert Seamans (Administrator of the Energy Research and Development Administration), arranging a meeting between him and Philip Handler (President of the National Academy of Sciences) on the International Institute for Applied Systems Analysis, coordinating congressional efforts to get together a New England proposal for the Solar Energy Research Institute, advising three or four constituents who were having problems with NSF and other agencies, and setting up a meeting in Massachusetts for industrial companies interested in energy research. Like most people on the Hill, Strauss seldom does one thing at a time.

Looking back, the meeting on energy research was really a turning point for me. The idea was a good one—we would bring together some 50 to 100 industrial companies, to meet with representatives from

every Government agency involved in energy-related research. There would be two panel discussions in which the bureaucrats could explain their programs to the scientists, who in turn could ask questions, make comments, and complain about not getting enough support for their projects. At the back of the room, we would set up tables. There interaction could take place between individuals in a workshop atmosphere, and the scientists could get assistance shepherding their proposals through the Washington maze. In this way, the companies would be marketing new agencies, more research would be supported and the energy problems of Massachusetts and the country would presumably be alleviated. The idea sounded great.

In fact, the meeting was great, and all it took was about six weeks of phone calls, letters, memos and mind-numbing attention to detail to set it up. Cosponsored by two local industrial associations, the meeting attracted 600 people, who overflowed the available facilities and stopped just short of a violation of the fire codes. Kennedy, winging it on a 15-minute briefing in the car, headed the first half of the meeting brilliantly and good will was generated on all sides. The result was decidedly a political plus, and Strauss and I basked momentarily in the glow of a job well done.

The feeling did not last long—the next day Kennedy bumped into me in the office and said: "That was good fun at the meeting up in The State." (For some reason, Massachusetts is invariably referred to in Kennedy's office as The State—the capitals are audible.) "But," he went on, "what are we going to do for these guys now? One meeting like this



isn't going to do them any real good."

Luckily, I had an answer for him. Kennedy had been asked to deliver the keynote address at a national meeting of small research companies. In writing that speech I planned to make it a serious and substantive one emphasizing not only that Kennedy was interested in the problems of these companies, but also that he understood them and was prepared to do something about them. I was taken aback by Kennedy's remark, nevertheless. I was surprised at the degree of his interest and concern with this issue. He could easily have said—to himself, if not to me—"Well, I've done my bit for those guys, now they're on their own. After all, they can't vote for me twice!"

But he didn't say this, and because he didn't I suddenly had a directive to look into the problems of industrial research companies, particularly small ones, and to try to devise some legislative remedies.

NSF funding

The first challenge was the case work. The main purpose of the meeting had been to indicate the Senator's interest in the problems of industrial researchers, and his willingness to help. Naturally, this produced a large volume of mail from people with specific complaints.

In dealing with these individual problems that came to my attention, I tried to watch for generic difficulties that, in principle, Kennedy could do something about. This turned out to be difficult because any proposed actions had to relate to the Kennedy's committee responsibilities. The most obvious place to begin was at the NSF Subcommittee.

Since its inception the NSF has dealt

almost exclusively with universities and colleges. So ingrained is this policy that many people both within and outside the Foundation, believe that it has legal standing, and when RANN was set up a special dispensation was written into the law to enable NSF to fund industrial researchers. I learned, however, that nothing in the NSF legislation prohibits the funding of profit-making institutions in the first place. My involvement with industrial research companies, particularly the smaller ones, was leading me to question the wisdom of an NSF policy that appeared to discriminate against them.

Over the past decade or so, a vast change has been taking place in the scientific community. This change has gone practically unrecognized by the Congress, even though it stems from a very simple observation: University science departments have stopped growing. This has had the effect that recent science graduates, by and large, have made careers not in academic institutions, but in industry and government. Because they are not employed at universities, these younger scientists, who are traditionally among the most creative, have been virtually ignored by the NSF. Yet there is nothing intrinsic to the structure or mandate of the NSF that prevents it from broadening its clientele.

Aside from the basic academic environment in which the Foundation operates, there are certain features of NSF that are well matched to the needs and concerns of small industrial research organizations. NSF has an ability virtually unmatched by any other Federal agency to handle large numbers of small-scale unsolicited proposals. The larger, mis-

sion-oriented agencies, such as ERDA and NASA, which structure their research programs more tightly than NSF, employ the request-for-proposal procedure wherever possible. These agencies deal primarily with large grants that a small, independent firm is not able to compete for. By judging proposals from such companies solely on their scientific merit, the NSF could ensure the participation of recent science graduates, and also increase the probability that research applications will be exploited wherever possible.

The NSF Authorization bill was about to come before the Subcommittee, and I naturally thought in terms of that legislative vehicle. Unfortunately, dealing with complex problems via legislation is like trying to shell a peanut with a sledgehammer, and I wanted to tread very carefully in giving any advice. After a good deal of thought and consultation, I decided to recommend the establishment of an Office of Small Business Research and Development within the Foundation, charged with the role of ombudsman and contact point for the small-business community. In addition, I recommended that the Subcommittee ask the Foundation to re-examine the question of its proper role in the direct funding of non-academic research. I felt that this evaluation was too complex and far-reaching to be taken lightly. In asking for such a study the Congress would be, in effect, opening up the subject for debate.

Reflections

All of the issues, ideas and activities of that busy year cannot possibly be packed into one article. Topics I have left out include: the Clean Air Act, solar power, the Science Court, the role of ERDA in research commercialization, problems of the venture-capital community, nuclear power, patent policy, jet-fuel dumping, barriers to technological innovation, scientific assistance to foreign countries, and the economy of Massachusetts—all of which occupied some of my time. I have attempted only to convey something of the flavor of my job in this article.

As for my reactions to the year, I obviously enjoyed the experience very much. I found it fascinating, and I dare say I learned more during the term than during any comparable period since my childhood. On the other hand, I would not want to be a legislative aide for the rest of my life. There are lots of things wrong with the job.

The most obvious drawback is the general quality of Capitol Hill life. I worked in an office that contained eight desks, nine telephones, eight typewriters, eleven filing cabinets, six bookcases and a Xerox machine. The room was 10 ft by 20 ft. If you wanted to have a quiet conversation with a visitor, you either used Kennedy's office, or, if that was already in use, you went out in the hall.

The anonymity required of a legislative

aide was more subtly disturbing, however, than the inconvenience of the office arrangement. I hadn't anticipated this, and no one had warned me about it. In fact, I was surprised to discover that the anonymity bothered me at all, yet I suspect that many scientists would feel the same way.

Scientists place great store in public recognition. They want their work to receive the attention of their peers, and their personal contributions to be publicly acknowledged. Pride of authorship runs deep in the scientific community, where the charge of "idea stealing" is the equivalent of horse thievery in the old West.

A Scientist Fellow has to make a major readjustment in his outlook. He may spend weeks drafting a major address on nuclear proliferation, but this speech is not and can never be his. His boss will

stand up in front of the cheering crowd to deliver the speech while he sits nervously and obscurely in a back row, anticipating each phrase as it appears, relaxing when the jokes bring a laugh, flinching as the name of an African prime minister is mispronounced, and applauding like a mad man at the conclusion. *The New York Times* may even hail the address as a major step forward, but his name will never be mentioned. Such a low profile would be difficult to accept on a permanent basis.

The bottom line

After a year on the Hill I find that I can no longer end an article without a "bottom line." What constructive actions can I recommend for scientists who want to interact with the Congress? I would not suggest, for example, that everyone apply for a Congressional Fellowship and rush

off to Washington. The system would rapidly saturate and, in any case, the legislative experience is not everyone's cup of tea. On the other hand, scientists do possess special knowledge and insights that can be of real value to an overworked legislative aide who has no scientific training and yet must advise his boss on technical issues. To be effective the scientist must know how, and most important when, he can make a useful contribution. (Clearly, little good is accomplished by recommending a "No" vote on a bill that passed last week. Perhaps not so clear is the fact that it is equally useless to recommend major modifications in a bill after it has been reported out of committee.)

To be effective, scientists who are not in Washington must establish a two-way flow of information. The scientist can not effectively communicate his expertise unless he has first taken the trouble to learn something about both the legislative vehicle he is trying to affect and the context within which he is working. Such information is available in a variety of ways. Specialized publications such as the *Congressional Quarterly* (available in most libraries) are extremely useful. The pages of *Science* and *PHYSICS TODAY* frequently feature news of science-related legislation, though admittedly they tend to concentrate on completed actions rather than describing bills when they are still in committee. The most direct approach is to send a letter to a Senator or Representative, preferably one on the appropriate committee or subcommittee, asking about the nature and status of pending legislation. (A remarkably small percentage of the more than 1200 letters that Kennedy receives daily contain such requests for information.)

Above all, in dealing with politicians one should recognize and try to bridge the wide gap between the specialist and the generalist. Scientists typically know a great deal about very little. Politicians, particularly good ones, tend to know very little about practically everything. Although the areas under the curves may be identical, to the scientist who measures everything through a narrow-band filter they may not seem so. This may account for the low esteem in which the average scientist holds the average politician (an attitude, by the way, that is not reciprocal).

In my year on the Hill I came to know one politician well, and several others in passing. I came away impressed by their ability, intelligence and industry, as well as by the need for thoughtful, reasoned input to them on scientific and technical issues. This "science advice" cannot come from a Congressional Fellowship program alone. The larger scientific community can, if it will approach the task with an open mind and a desire to learn, fill this need and serve a very valuable purpose. □



The special-projects room is among the suite of offices occupied by Senator Kennedy and his staff in Washington. The author shared this work space during his term with nine caseworkers whose duties range from press operations to constituent services for "The State" (Massachusetts).