# News and Comment

## Research Competition: As Budgetary Pressures Grow, Congress Reveals Concern about Scientific Choices

One of the consequences of budgetary pressures on federal support for research and development is increased congressional agitation over which project should be sacrificed to keep down the total.

This agitation is not new. Financial limitations have always made it necessary for Congress, as well as the Executive, to pick and choose. But, as the operating and equipment costs for many fields of research reach unprecedented levels, and as the administration strains to keep the overall federal budget below the politically embarrassing $100 billion mark, the battle over scientific and technological choice is now becoming more intense than ever. And as it does, it is illuminating important strands of congressional sentiment on things scientific; of these, perhaps the most significant is Congress's instinctive preference for developmental research, the kind of research that produces visible and functional hardware that is readily understood by a legislative body composed of laymen. It is true, of course, that Congress has been generous to basic research beyond any justifiable complaint, and it is plain that no abrupt changes are in the works. But, as the budgetary pressures grow, it is also becoming plain that this generosity is the result of persuasion by leaders of the scientific community. Congress's natural preferences, as well as those of the great majority of the American people, tend toward a utilitarian concept of research. This was sharply illustrated last week when Donald F. Hornig, the newly installed White House science adviser, made his first appearance on Capitol Hill.

For a man only 5 weeks out of the placid environs of Princeton University, it was quite a baptism of fire, and though Hornig managed to emerge smiling and well-composed after 2½ hours in the witness chair, his experience demonstrates that it is not salary limitations alone that makes it difficult for the federal govenrment to attract first-class scientists to its ranks.

Hornig's appearance was before the Joint Committee on Atomic Energy, a body that of late has been understandably aroused by the administration's failure to share its enthusiasm for giving nuclear power applications a more generous slice of the total research and development budget. With the administration's scientific and budgetary advisers teaming up to slash a number of the committee's pet projects—such as the nuclear propelled rocket and nuclear power systems for space satellites—Hornig came before the group at a time when it was loaded for science adviser, any science adviser. Having spent hundreds of millions on these efforts, largely at the instigation of the Joint Committee, the administration has late in the game come to the conclusion that the probable fruits aren't worth the cost, and, to the committee's accompanying sense of outrage, it is slowly but surely cutting off the money flow to these once-thriving developmental programs. Though the committee repeatedly stated that the new incumbent was, of course, not responsible for these Executive sins, it also made it clear that it is feeling an agitating sense of hostility toward the White House's sense of priorities on research and development. In particular, it announced that it was incensed by the administration's seeming fondness for a burgeoning basic research program in high energy physics at a time when programs for developing nuclear hardware are being cut back. And it declared that while it credited Hornig with clean hands at this point, it expected that he, as the President's No. 1 science counselor, would henceforth provide the committee with a lot of explaining about the ups and downs of support for basic and developmental research.

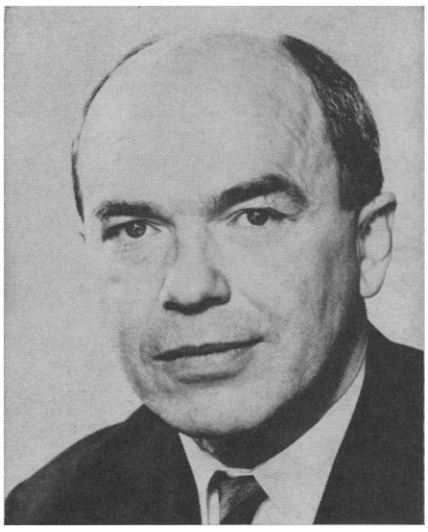
The hearing, though affable on the surface, maintained a constant note of tension from the outset, when the committee chairman, Chet Holifield (D-Calif.) stated: "It is important to know that a primary justification for the support of basic research is the fact that our basic research can be translated into practical achievement. However, except for the Space Agency, the budgets of our principal research and development agencies this year are not consistent with this policy. . . . Research is the broad road leading to improvements in technology, but *development* is the vital bridge that links the two. There is no 'payoff' from our research efforts, either in terms of improved economic strength or national defense, unless the development bridge is completed. . . . It is our concern that the reorientation of many AEC programs by eliminating their development objectives will obviously lead to a situation on the floor of the House and in the Senate in which the broad road of research will run into funding difficulties.

### "No End to Projects"

"Turning specifically to the field of high energy physics," Holifield continued, "we realize that no definite technological achievement can be predicted. Yet this is an increasingly expensive program, heavily supported by the federal government. Its size and growth demand that the high energy physics program be well managed and carefully coordinated." Though he did not state precisely what coordinating concept he had in mind, Holifield later indicated that he wasn't pleased to note that the AEC's overall budget remains fairly constant while "the high energy physics part of it is increasing [according to the committee's figures, from $53 million in 1960 to a projected $340 million in 1969] and it is increasing at the cost of applied research and developmental projects, many of them right near the point of fruition."

The chairman then went on to note "there is no end to the projects and the ideas which scientists may have in this field. There is an end, however, to the public purse," he prophesied, adding that he wanted Hornig's office to come up with and stand by a national plan for high energy physics, similar to the space agency's long range forecasts for space activities and related expenditures.

In response, Hornig argued that high energy physics is now a uniquely vigorous field, and that its rapid develop-



Donald F. Hornig

ment makes it extremely difficult to look very far ahead. In 1960, he pointed out, a White House panel had concluded that accelerators in excess of 30 Bev would probably not be necessary. "As soon as those machines were put to work, so many new discoveries were made that it became perfectly clear that one needed still bigger machines. . . . There are not many fields of science . . . in which such fundamental new ideas have come up with such profusion. It is not true that in all fields of science the available ideas to work on expand limitlessly; in many fields, one is limited by the quality of the people and of the ideas which are proposed."

### Uncertainties

Repeatedly pressed by the committee for assurances that the high energy program would conform to current projections, Hornig argued that any projections in so dynamic a field should be considered subject to change. It is possible, he said, to look ahead to larger and more costly accelerators, such as the 200-Bev and the 800- to 1000-Bev machines proposed last year by a White House advisory panel, headed by Norman Ramsey, of Harvard. "But it seems unavoidable to me that as we come to each of these things it will be necessary . . . to weigh what we hope to get out of these machines in terms of what has happened in science in the meantime. . . ."

On this theme, of Hornig's reasonable refusal to certify the uncertifiable, and the committee's equally reasonable desire for assurances that basic research costs would not suddenly balloon, the science adviser and the congressman went round and round.

"I can understand," said Holifield, "that you cannot lay out a rigid plan, but in my opinion, the administration is going to have to lay out a general plan with a forecast of expenditures as a basic national policy, much as they have laid out a plan in NASA. This has received the approval of the President and of the Congress, right or wrong, and it is considered a national policy. While its limitation on appropriations is not rigidly defined, there is an area of definition which gives us some idea."

The recommendations of the Ramsey panel, Holifield pointed out, cannot be taken as a national plan, since "the Ramsey study made a number of recommendations which have already been turned down." Nor can the "ambition of the scientists" be considered the guiding principle "because it cannot be allowed to run wild in every field that opens up for investigation."

Holifield next observed that "every scientist thinks his project is the best. But we are faced with enthusiastic people in each one of these programs," he added, recalling that an earlier witness, from the AEC, had characterized controlled thermonuclear power as "one of the most important in the world."

### Basic versus Developmental

Hornig, a chemist, replied: "I don't carry any specific torch for high energy physics. . . . In a purely scientific sense, I would stand by my statement that high energy physics is the more exciting and that it has changed already our whole concept of what the fundamental laws of nature are. . . . The excitement of the thermonuclear program lies essentially in the promise of eventual important utility, and that is also a tremendously important goal. In a certain sense, the two cannot be compared. We have both to set up the foundation and build our houses."

The committee, which stressed all along that it wasn't blaming Hornig for the events that produced its concern, next passed to a subject that is of expanding interest to Capitol Hill: the operations of the White House Office of Science and Technology (OST).

How were the decisions made on who got what in high energy physics, Holifield asked. "Is it done on a basis of each one of these laboratories' working on a design and coming up with a design for something they are interested in and then the selection is made on the basis of 'I will get one this year and you will get one next year, and if you will stand aside for us, I will stand aside for you,' or is there a real screening of these designs to obtain the best ones and reject the ones that are not so good?"

Chet Holifield

Hornig replied that proposals normally pass through an informal screening process "until a number of alternatives begin to jell." Then, as they reach the level of agency screening, "our [OST's] work is usually done in close collaboration with the agencies. . . . In fields where there are many agencies participating, part of our role is to bring the agencies together so that this decision-making process not only involves us in parallel all along the line but all of the agencies involved." Ultimately, he said, OST would make its views known to the President. "But it is in no sense a veto. Our views would be compared by the President with those of the AEC and, usually the issue is worked out."

### Energy Study

The Committee did not appear to be particularly taken with this description of OST as just another voice in scientific policy-making. Referring to the still-uncertain fate of an AEC report boosting the development of atomic energy, Rep. Jack Westland (R-Wash.) declared that "the report got genesis in the Atomic Energy Commission but it practically got exodus from the Office of Science and Technology."

Commented Holifield: "We are not

so sure about that. . . . We are going to find out. The orphan has been placed on Dr. Hornig's doorstep. We are going to find out whether he is going to adopt him or get rid of him."

In short order, the Committee then returned to Holifield's demand for a "national policy in this high energy field that is more definite in point of planning the project and time period. . . ." To which Hornig returned to his position that "what we can have is a set of guidelines as to what is scientifically profitable as we go ahead viewed at any given time, but it seems unavoidable, simply because the funds are so large, that this policy will be subject to constant modification as the budgetary situation changes from year to year and as the scientific situation changes."

The chair repeated that it was not satisfied with the reply, and Hornig stated: "I understand your concern and will do what I can to sharpen up our views for your guidance."

In general, the new science adviser performed well in his congressional premiere. Though often pressed by the committee to an extent that might have induced a less temperate soul to indulge in sharp rejoinder, he was never harsh, but neither was he ever unduly deferential. When he didn't have an answer at hand, he freely admitted it, and when he disagreed with the committee, he didn't seem to spare them that fact.

On one occasion, though, he found himself in a rather embarrassing position. Addressing himself in his prepared statement to an interdepartmental energy study which is looking into the politically volatile issue of national policies regarding atomic energy, oil, gas, and coal, Hornig stated that the study was progressing: "All told, nearly 100 technical papers were prepared for internal use of the Energy Study. These were reviewed by more than 150 qualified technical reviewers and by about 225 members of 22 special ad hoc committees. . . . By the end of last summer, the team . . . had produced a preliminary draft on the order of 1200 pages in length. . . . In order to make this material more useful for the purposes of overall analysis and intercomparison, an effort has been made to reduce its size while maintaining its high quality. A re-draft, on the more manageable order of 600 pages in length, is now ready for further review by the 10 participating agencies.

"The present situation therefore is that we nearly have in hand a scholarly review of the subject. What is missing is clear-cut findings and conclusions," Hornig explained.

To which Chairman Holifield recalled that last year, when Hornig's predecessor, Jerome B. Wiesner, was asked about reports that the administration was going to make an energy study, he replied, " 'Yes, sir, it will be a small one.' " Hornig then assured Holifield that the report would be completed this spring, and Holifield assured Hornig that a "return engagement" with the committee would take place.

—D. S. GREENBERG

## California: Aerospace Industry Has Meant A Second Gold Rush; Climate and Education Get Credit

*Los Angeles.* In the sharpening regional competition for economic development through research-based industry, California has been widely regarded as representing both the standard and the ideal. A growing number of people, here, however, are suggesting that their state's silver cloud may have a dark lining.

Basis for this apprehensiveness is the dependence of much California industry on government business. This is not a new source of worry for Californians, who suffered fairly painful periods of adjustment after World War II and the Korean War. But, in the last year or so, well-informed people have begun to read signs of some unfavorable long-term changes in the state's economic climate.

Talk of economy in general in Washington and, specifically, of cuts in spending on defense and space, in which California plays a leading and lucrative role, has created an atmosphere of uncertainty probably unmatched since the nuclear weapon systems race between the United States and the Soviet Union began in earnest more than a decade ago.

More particularly, the expected leveling off of expenditures on intercontinental-ballistic-missile systems in the mid sixties—with the maturing of the Polaris, Minuteman, and Titan programs, for example—would presumably cut the growth rate of the state's bellwether airframe-electronics industry. Development work on new weapons systems, which is expensive and involves large numbers of engineers and scientists, has already tapered off to some extent.

Predictions that the pattern of expenditures for weapons will be altered in the direction of more arms for conventional warfare and less for the big systems does not reassure California planners. Manufacturers in the Midwest and East have experience in producing vehicles, ordnance, and soft goods, and in some cases boast a competitive advantage over the West Coast.

Also disquieting to Californians is the clamor that has been raised in the past two years in Congress and by the legislators' constituents over the concentration of defense and space spending in a relatively few states. Since California has taken a long lead over other states as a defense contractor in the era of complex weapon systems, California has become the principal target for critics of concentration on the grounds that such federal spending represents an investment which has broad and perhaps irreversible economic effects (*Science,* 29 March 1963).

Californians find the possibility of a political assault behind a "fairer shares for all" banner particularly worrisome now.

The decision to award the contract for the TFX all-service fighter to General Dynamics for production in Texas and the cloudy future of manned bombers, and of tactical and support aircraft, has made the outlook for California's aircraft industry less than brilliant. The manufacture of commercial jet transports has not proved the boon to employment and profits that many expected. And the placing of a checkrein on NASA spending by Congress last year has forced the California space industry to modify its expectations for snowballing growth.

For all these reasons, Californians now seem to be taking a close look at their state's present situation and its prospects in the light of changing federal policy and national trends.

While California officials and industrialists are discussing potential difficulties with some somberness these days, it is, with employment and business activity in the state at record highs, no time for sackcloth and ashes. Observers from states with less dynamic economics may well wish they could exchange their problems for California's. But to understand the local tendency to see trouble prefigured in present prosperity it is necessary to appreciate the California statistics and the California context.

Governor Brown stated the case in a