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January 14, 1972

Although the final form of the President's New Technology Opportunities Program has not been decided, it is clear that it will stimulate new patterns of association between government and industry. A new influx of Federal funds and incentives can be expected. Are you prepared to respond to the President's new program and deal with the new requirements?

The Program Director has estimated that an expenditure of $120 billion will be required over the next ten years to use technology to help alleviate society's ills. The trend toward civilian projects is clear--institutions are evolving, projects are being started. Government shifts may include: new tax incentives, guaranteed purchase orders, cost shared R&D, patent law changes, and antitrust regulation. Are you prepared to take advantage of the new opportunities and to guard against the new dangers that will be created?

Something will be done. The U. S. now faces its first trade deficit since 1893. Industry continues to spend less on R&D. Massive aerospace unemployment is no secret. The prime objectives of the President's new program are to stimulate industrial innovation, increase productivity, cope with foreign competition and address domestic social problems. Will you be asked to participate?

If you feel you would like to become involved in the President's new program, we stand ready to assist you. The criteria for distributing these funds to industry will include measures which we use in our socially-oriented government programs as well as our more traditional business evaluation methods. Our firm, with specialists in science, engineering, economics, business, and social science is prepared to help transfer our knowledge of these programs and their requirements to you. I am enclosing the first issue of our "Civilian Technologies Newsletter." It will provide you with an effective monthly report (plus four quarterly summaries) of what is being done and what is likely to be done in the future of this and other industry-oriented government programs. You will receive the newsletter if you decide that you can use our services, or you may subscribe for $50 a year. I am also enclosing a recent Harvard Business Review publication by Dr. Richard N. Foster, Director of our Technology Management Group. Please feel free to contact Dr. Foster or me if you are interested in further assistance.

Very truly yours,

Clark C. Abt

Clark C. Abt
President

Civilian Technology Newsletter

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Urban Problems List Available

Europe: A Competitor and a Market

Volume 1, Number 1

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President Nixon's New Program: Stimulating Civilian Technologies

On January 20, 1972, President Nixon will officially announce that he is organizing a massive new program for applying the country's technological resources to pressing civilian problems. Called the "New Technology Opportunities Program", this effort will be directed toward the areas of: water desalinization, advanced energy systems, solid waste recycling, new health care methods, innovative housing construction, oceanographic exploration, means for increasing industrial productivity, improved law enforcement techniques, etc.

William Magruder has been appointed to head this program which will draw upon such agencies as the Council of Economic Advisors, the Council on International Economic Policy, the Office of Management and Budget, the Office of Science & Technology, NASA, the Treasury, and the Commerce and Labor Departments. The result could be the most massive civilian technologies program ever.

How It Can Be Done

Tax incentives would initiate across-the-board tax breaks for R&D programs dealing with technological leadership or significant opportunities for economic growth, domestic improvement, and increased exports.

Revision of patent and antitrust laws would allow companies to pool talent and money, enable the housing industry to update antiquated building codes and zoning regulations, and renew hope for nation-wide uniform performance standards.

A technology development bank would guarantee loans or direct research grants, accelerate depreciation allowances, provide development funding, and provide government purchases and leases.

Cost sharing of R&D projects would involve government as funds disburser for start-up costs with industry as fund provider for project development and management.

Forecast

It is anticipated that the Administration will propose *few, if any, new major initiatives* for this much-heralded program. The process of trying to develop effective programs from long lists of proposed "initiatives" has revealed the complexity of the problem and an ignorance of cause and effect. This has been the result of many years of "laissez-faire" success in high technology. Look instead for increased funding to better understand the problems of the introduction of innovation, industrial incentives, and more detailed knowledge about the success and failure of similar programs in Canada, Germany, France, England and Japan.

The effort has revealed a lack of knowledge about what results could be expected from changes in tax incentives, patent policies, direct government support of R&D, antitrust relaxation, etc. It is highly unlikely that the Administration will take any bold new action when they are so unsure of the probable effects of that action. In sum, the much-heralded effort has resulted in a clear need for further definition of the problem. Bold action may yet result, but clearly not immediately. However, the administration is now acutely aware that the longer it waits, the more difficult the problems will become in this election year.

Will It Work?

The success or failure of the New Technology Opportunities Program hinges on several factors. **Will companies shoulder the burden of management and project development financing**, and if they do **will total corporate R&D spending result in only a small return? Will competition between firms be lessened**, and **can collaboration yield substantial net gains? Can the hold of the Justice Department on patent and antitrust laws be loosened? Can Labor's fear of job exportation be laid to rest? What will be required to make tax incentive controls effective?** Only if the proper answers arise will the much-needed new ideas get from the drawing board to the market-place.

Market Stimulation: Side-Stepping Lack of Implementation

Congress is also trying to develop programs to claim credit for a "recovery". They seem to be passing through the stage of spending money to retrain manpower for jobs that do not exist and are now considering programs to stimulate markets. Senator Kennedy has introduced a bill calling for the creation of a new NASA-like agency to spend $2 billion to design efficient urban systems for new towns.

It unfortunately stops short of implementation.

New Company Defines Urban Technical Problems

A new company has been formed to provide a channel for communication between the cities and business. Called **Public Technology, Inc. (PTI)** and located at 1140 Connecticut Avenue, N.W., Washington, D.C., this group will define urban technical problems for business and bring to municipal areas knowledge of what business is doing. They currently have a list of over two hundred urban problems needing solution in 85 cities. It would be worth your while to contact them. The Corporation is non-profit and is being funded by the Ford Foundation, NSF, and NASA among others. It is a spin-off from the International City Management Association (ICMA), and has representatives from the ICMA, the League of Mayors, the Council of Governors and the League of Cities on its Board of Directors. It is a useful pressure point for getting your products into the city. Write to Mr. Porter Homer, President.

Creating a New Market: Europe Sets a Pace

The Ministers of Science of the member countries of the Organization of Economic Cooperation and Development have agreed that Europe is going to move in the direction of civilian technologies. They have agreed to direct their programs toward:

Expansion of R&D to meet pressing social needs

Stimulation of technological innovations

Increases in effective management and control of technology which serves the public interest.

Most of the European countries are presently not large enough to create a real market for U.S. goods. France and Germany, however, are the exceptions. Be aware of the program of the **French Delegation General de la Recherche Scientifique et Technologique**, 34 Rue St. Dominique, Paris, France, and the German Ministry for Education and Science **Bundesminister für Bildung und Wissenschaft** in Bonn—particularly their New Technologies program.

Organize for technology transfer

Richard N. Foster

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Richard N. Foster

Organize for technology transfer

A market-oriented transfer program to exploit existing technology—much of it easily traceable—is an investment in the future

Foreword

Application of a technology to some product or process other than that originally intended is common in U.S. industry. But few companies have organized their technology transfer efforts systematically enough for commercial purposes, the author of this article asserts. And many that try it start with the technology and seek applications for it, whereas they should begin with the first buyer of the envisioned product. The author goes step by step through the process, discussing along the way the data banks that can be explored (many of them government sponsored) and estimating the human and financial investment involved.

Mr. Foster is Director of the Technology Management Group of Abt Associates, Inc., a Cambridge, Massachusetts, consulting firm. He directs the largest National Aeronautics and Space Administration technology transfer applications contract, a program to apply technology to problems of urban areas. He has also consulted with the governments of France, Germany, Sweden, and South Korea and with venture capital companies and industrial corporations on technology transfer.

Gloomy assessments of industrial research and development are now all too familiar to most executives. Evaporating government funding, rising costs of scientific manpower and equipment, and declining returns on product-oriented research are causing officers of technologically advanced companies to take hard looks at R&D policy and strategy.

Unfortunately, now that every outlay is receiving more critical examination for its impact on the bottom line, management's reaction to the high-risk flavor of R&D expenditures is often hasty and self-defeating. It is not uncommon to find a concerned top management diverting funds from the R&D budget to other segments of the enterprise that exhibit more immediate prospects for tangible returns, while at the same time exhorting the R&D manager to come up with better results within the restricted operational parameters.

But better results can come only from better management of the total R&D effort. Organizations that rely on technical innovation to increase market shares will have to reap more from past, as well as present, investments in science and technology if they hope to maintain their competitive clout.

One way of doing this is through the process of technology transfer. A well-developed technology transfer program can substantially increase the payback potential of the R&D effort in large and small organizations alike.

While this process is periodically a popular topic, only recently has sufficient experience accumulated to allow a retrospective presentation of how a transfer program works, what corporate resources it requires, what it costs, and where it benefits the corporation. The purpose of this article is to offer such a presentation.

Simply stated, transfer is the process of employing a technology for a purpose other than that for which it was developed. While "normal" R&D tends to emphasize creative laboratory work, tech transfer focuses on the utilization of previous research. But there is no clear separation between the two, just as there is no demarcation between basic and applied research; industrial technical development involves aspects of each.

What is the value of a transfer program? There are several benefits:

□ It can increase the productivity or reduce the cost of the company's R&D effort. By applying the technology that has been previously developed, the company can avoid duplication of effort and improve efficiency.

□ It increases the probability of selecting the best technology for the task. The current race to develop air pollutant sensors is a case in point. Initially, wet chemical methods were tried. Now chemical analysis instruments are taking over the market, and there is talk already of a third generation of solid-state sensors that will be much less expensive to use than the analytical ones. This solid-state sensor technology has been around for some time. Through tech transfer it could have been identified earlier, eliminating the need for the other expensive development programs.

□ It can markedly shorten the time between the development of a technology and its first successful application in a new field. There is usually quite a lag between the two events—an average of 12 years, according to some estimates. A well-established transfer procedure can shorten this time span substantially, reducing the cost and increasing the effectiveness of an R&D program.

□ It opens channels of communication between the company and the market, providing more entrees for the future. A significant barrier to the utilization of existing technology is simple lack of awareness that it exists. Both the company and its customers can benefit from the improved communication resulting from a tech transfer program.

Obviously, an ambitious internal tech transfer program is not cheap and is therefore not feasible for many small companies. It involves a good deal more than a few days' research in the company library to find out what is known about a particular process. (I shall go into cost factors later.)

However, let me point out that small companies can benefit from such a program because of the existence of outside sources of information, much of it very low cost, since it is government sponsored. And smaller companies that do not have sufficient internal resources can sometimes help organize them through their trade associations—when, of course, the situation does not involve proprietary information. For example, NASA and the Apparel Research Foundation run a joint program that has resulted in new textile adhesives developed from aerospace technology. (From time to time in this article I shall discuss further the role of smaller organizations.)

How it works

The elements of the transfer process are interrelated and therefore must be managed as a system. Ideally, a company should build a tech transfer team that operates in the new business department, although, of course, the team will interface with the R&D, marketing, and manufacturing functions.

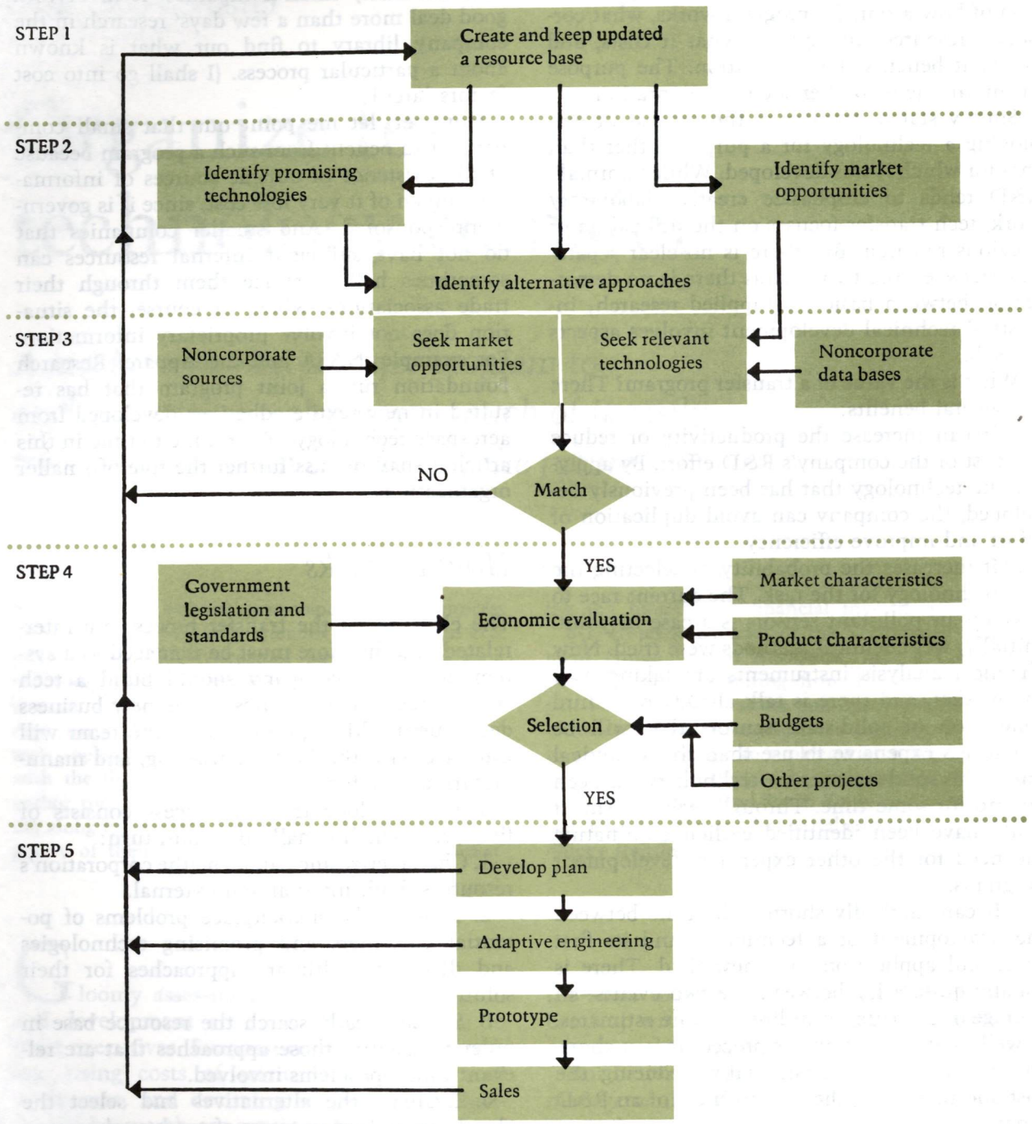
The technology transfer process consists of five steps, which I shall take up in turn:

1. Characterize and catalogue the corporation's resources, both internal and external.
2. Identify the marketplace problems of potential customers and promising technologies and determine ultimate approaches for their solutions.
3. Systematically search the resource base in order to identify those approaches that are relevant to the problems involved.
4. Evaluate the alternatives and select the "best" technology in terms of product characteristics, anticipated costs, marketability, profit potential, and so on.
5. Develop and pursue a plan for exploitation.

Exhibit I illustrates how the transfer elements interact. The extent of the transfer team's role depends on how well the company's marketing and R&D functions are organized. But, in my experience, teams have been used to assist in all phases of the operation.

Most companies do not yet have data bases

Exhibit I. The technology transfer process



that adequately characterize their resources, and many are reluctant to build them because of the cost involved. But as corporate life becomes more complex, making communication within organizations increasingly difficult, a formalized system will become a necessity. Similar systems for such complex areas as chemistry and aerospace programs are now available in the market. And several companies in the United States and Europe are beginning to create their own corporate resource data bases. These efforts are in their preliminary stages, however, so it is too soon to discuss them retrospectively.

1. Creating a resource base

A company must first pinpoint its own capabilities by systematically cataloguing its resources in terms of "resource units," which are often technical, marketing, or production reports. Next, each resource is characterized with a number of key words that can be used to recall information quickly from the catalog.

The cataloguing system must be flexible and must accurately reflect the realities both of the marketplace and of the research lab. It is not necessary to create the entire resource base for it to be useful; a base with 2,000 to 3,000 documents is sufficient to begin the activity. While the buildup of the data base is going on, an informal network, probably much like the one that the typical company operates, can be used.

2. Defining needs & markets

The second step can be either need recognition or technology identification. Actually, in many cases these two operations proceed simultaneously. If the project begins with recognition of a need, then it is necessary to determine alternative technological approaches that might satisfy the need. These alternative technological approaches can be used as a framework for searching the resource base. Marketing as well as technical personnel should be involved in the analysis, which typically includes a good deal of "brainstorming."

For the best results, the brainstorming session should include representatives of several technical disciplines from outside, as well as inside, the organization, if necessary. The chairman should give a synopsis of the problem and then open the meeting to a freewheeling discussion of how it might be solved. A useful ground rule is to avoid negative comments.

Should the process begin with the discovery of a new technical capability, the next move is to identify market areas that might benefit from the technology. For example, an advance in the efficiency of ultrasonic devices would find a ready market in welding, cleaning, temperature measurement, and so on. Again, a committee of technical and marketing experts can serve as a framework for evaluating the technology.

It is an obvious, but often forgotten, fact that the "market" demands nothing; rather, it is the individuals who make the purchase decision. Forecasters once told of the future demand for computer-assisted instruction equipment. Alas, disappointment; there were no purchasers at the offering price. These errors can be avoided by defining market needs in close cooperation with the ultimate purchaser.

The essence of market definition is identification of potential purchasers, not abstractly, but specifically by name, title, and telephone number. They must be persons who are optimistic about the use of the new techniques and who have the power to buy the eventual product. They may even help in its development, such as defining specifications.

If the "right" person is found, he will need little incentive to maintain his interest other than the possibility that he will receive greater recognition because of his contribution to the company. The identification of these problems or market "specifiers" is difficult and normally accomplished only through personal contacts in the market. This activity is also very helpful for a company's normal marketing efforts.

Once the right man is found, the team can proceed to define markets and potential market needs. It should delimit the problem precisely, set down how it developed and what is currently being done to solve it, and propose several technical approaches to the problem. (The Appendix, beginning on page 119, gives an example of a well-developed statement concerning market need.)

3. Making a match

After the initial opportunity investigation, the team searches the resource base for application opportunities. The search is guided by the alternative strategies that were outlined in the problem statement. The procedure may be formal (manually or via the computer) or informal (via personal contact).

Formal approach: In addition to the corporation's resource catalog, there are many computer reference banks available from industry and government that make possible a search for technology existing outside the company. (No such systems exist for market problems other than what the company itself may have. A market search must be performed largely on an informal, personal basis.)

In examining the search results, the team should be concerned with these questions:

- What is the technology?
- If the goal is a product, has it been made; if it is a process, has it been tried?
- What is its uniqueness?
- Can it be protected through a patent?
- What would be the cost of further development and commercialization?

○ What are the cost/performance and performance/benefit tradeoffs?

If a computerized reference bank is queried, the "results" of the search will be titles of documents stored in the system. An abstracts journal can then be consulted for a brief summary of the work performed. In my experience, typically about 10% of the titles printed out are of sufficient interest to warrant seeking the abstract, and about 10% to 20% of the abstracts are of sufficient interest to warrant obtaining the original document.

If the original document shows promise, the author is then contacted for his opinion about the applicability of his technology to the need in question. And if the answer is positive, a "match" has been made. About 10% of the articles read produce workable ideas. Thus a realistic expectation is one good idea for every 1,000 titles obtained from the initial investigation.

A few of the most useful public resource data banks are the Scientific and Technical Aerospace Reports (STAR), the Science Information Exchange (SIE), and Chemical Abstracts. In addition to individual searches, one can purchase data from these banks on magnetic tape. (By no means do all of the banks offer tape, however.)

Review articles, documents reporting the work of investigations, and so forth are referenced in the large data bases, such as these three. Using this approach, the researcher simply defines the appropriate key words for the computer and receives a list of titles or abstracts. The key words, selected from a "thesaurus" of acceptable terms, should fall within the context of the alternative technological approaches which the team developed.

There are also several national centers that maintain most of the useful reference banks on their computers. One such group consists of the regional dissemination centers, which are partly supported by NASA. Located at various universities around the country, these centers are especially helpful to small and medium-sized companies. Searches usually cost less than $2,000 each and enable the user to see the extent of the work in his field of interest and to identify the companies, universities, or research foundations doing the work, the government agencies funding it, and the trends in the work over the past several years.

Smaller companies, which are not likely to have in house the necessary range of capabilities to address many problems, should seek out the vast reserves of "public domain" knowledge available in this country. Public-domain technology is found most readily in the reserves of the National Technical Information Services Branch of the U.S. Department of Commerce.

Contrary to what many think, the fact that a technology is in the public domain does not make it unusable for industrial purposes. Consider these situations:

◇ A company can obtain a license to use a particular technology, possibly on an exclusive basis.

◇ The technology required is part of a proprietary system, and the source of protectability of the component technology is immaterial.

◇ While a report is in the public domain, there is only one copy available, and others are not likely to make use of it.

Informal approach: In this procedure the team members rely on personal contact with technologists in and outside the company. A statement of the problem, such as the one appearing in the Appendix to this article, can be a very useful starting point for talking to these persons.

Within the company, the tech transfer team should seek out those members of the organization who have been characterized as "technological gatekeepers." [1] They are individuals who are particularly effective points of reference for others in the organization.

I should stress that the ultimate objective is not to find a technology, but a technologist. By that I mean: once the team finds the technology which matches the need or the market opportunity, it usually has to go back to the person outside the organization who had most to do with developing it. It is very unlikely to come upon a technical advance that does not have to be altered before it can be adopted for the company's purposes.

In this case, the team may find it expedient to hire the technologist to do the necessary adaptations, since he is more familiar than anyone with the technology. This means that the team probably will have to bid with his employer for his services.

4. *Evaluating & selecting*

After the match between the problem and the technology is made, the first question should be whether the technology has the potential for making a significant advance in solving the problem. A "significant advance" is an order-of-magnitude change; a much lesser improvement in efficiency or marketability is generally not worth the effort.

The next step is to evaluate the quality of the match—"quality" normally meaning the financial merits of the project. It is necessary to analyze the market, although a full-scale marketing study is neither needed nor desirable. Rather, a short survey should be conducted focusing on the size and profitability of the market, the potential market shares, and the characteristics of competitive products. An integral part of the evaluation is determining what modifications in the product or process would be required for its marketability.

At this point the company may be considering simultaneously several potential projects involving technology transfer. It must compare the costs and benefits of each and select those that meet corporate criteria within the budget. For a decision on the ultimate resource allocation, therefore, each project must be evaluated not only in terms of whether it is a significant advance and whether it will deliver sufficient sales and profits, but also in terms of questions like these:

○ What competition exists for the technology under consideration, both for the same and for competitive technological approaches?

○ What legislative factors are likely to affect sales, and how will their influence most likely be felt?

○ Will the product be sold to a clientele capable of backward integration into the product?

As soon as the answers to all these questions are found, the company can make an estimate of the value of each project. There are numerous methods for evaluating projects, including wholly subjective indexes, which have the advantages of being fast and inexpensive, and objective measures, such as internal rate of return, which are more precise and informative but also more costly and time consuming.[2]

Once the values for each product are displayed, the company can allocate resources either by comparing projects with each other according to cost/benefit ratios or by measuring each project against an existing slate or minimum acceptable rate-of-return indicator.

5. *Adapting the technology*

After the technology transfer decision is made, the process of development overlays the normal R&D work—adaptive engineering is performed, prototypes are made and tested, test marketing is done, and the new product is introduced to the market. If a difficulty is encountered at one of these later points, it is generally not resolved in the laboratory; rather, a search of the resource base is undertaken.

Often, at this stage, researchers will revert to laboratory experimentation. But an attempt to resolve the difficulty is an implicit recognition of a new need, and so the team should start from the beginning. In other words, it should return to the initial steps of generation of alternative technical approaches.

Needed: low-cost switch

Let us see how these steps are illustrated in an actual case concerning efforts made to introduce advanced technologies into the construction of housing, partly in order to reduce costs. Because housing demand is very price-sensitive (e.g., the National Association of Homebuilders estimates that for every $100 increase in the price of a house, 15,000 more families find mortgages unobtainable [3]) it is important to seek cost-reduction measures.

At present, slight use is made of advanced technology in the electrical circuitry of a house. The circuitry is composed of two systems, power distribution and switching. The latter operates at the same electrical potential as the former and requires the same rather costly materials.

The New York State Urban Development Corporation (UDC) is a large agency currently designing or building 50,000 housing units in the state of New York. Naturally, UDC is interested in keeping costs low, and one of its activities in this regard is seeking a less expensive electrical switching system.

With this problem definition and a ready market in hand, a brainstorming session was held in which several approaches surfaced, including a remotely actuated power line (where the actuation could be made by some radio signal) and a low-voltage switch circuit with a relay in the power line. Once these and other ap-

1. See T.J. Allen and Stephen I. Cohen, "Information Flow in Research and Development Laboratories," *Administrative Science Quarterly*, March 1969, p. 12.

2. A useful reference work for this purpose is Burton Dean, *Evaluating, Selecting, & Controlling R&D Projects* (New York, American Management Association, 1968).

3. James R. Simpson, "Opportunities and Barriers to Technological Innovation in the Building Industry," unpublished paper.

proaches to the problem were suggested, the NASA data bank was searched for relevant technology. Some 957 titles were obtained, of which 128 were considered potentially relevant. Abstracts of these were sought, and 11 produced articles of interest—5 of them identifying technologies that offered some promise.

It was found that NASA had developed a flat conductor cable, which several companies were producing, that could easily carry a low-voltage signal. Originally developed for use in space capsules, the cable had the advantages of being less bulky, lighter, and potentially cheaper than

standard varieties. It could be made with adhesive backing for easy installation. Combining the flat conductor cable with a relay device that reduced voltage appeared to be an answer to UDC's problem.

Companies identified in the search were contacted to determine whether the concept seemed feasible to them and, if so, what the costs would be. An analysis of the figures indicated that the device could be produced more cheaply than available systems. So UDC approved it. A prototype was built after labor cost estimates were obtained from an electrical contractor.

An important feature of the device is the extreme thinness of the cable (six mils with an adhesive backing, which is about the thickness of two human hairs). This means that, when it is affixed to an exterior surface and painted over, the cable is invisible. Moreover, the system's voltage is below that covered by the provisions of the National Electric Code. This "switch pack," as it is now called, can be purchased and installed for about 60% of the cost of standard systems. The state of New York will save hundreds of thousands, if not millions, of dollars, and a new market has opened for cable and relay producers.

Low-voltage systems have been tried as far back as 30 years ago, but the necessary hookup technology did not exist until it was developed under the auspices of NASA. Once it was matched to the need, product development took less than a year. Exclusive of prototype development, the project has cost about $60,000 but is expected to yield a benefit in 1972 alone of ten times that amount.

Organization & costs

How does a company organize to facilitate technology transfer? What does the process cost? This section is addressed to these all-important questions.

How to organize

One of the most difficult issues is determining the focal point or work unit for planning and evaluation. In my experience, the most efficient unit is the "problem/customer" pair. This refers to the combination of a problem, which may be applicable to several customers, and one of those customers (who may have several other problems too).

For example, a company that has several steady customers in the aerospace, building construction, and paper industries may identify three promising high-technology areas, such as composite materials, polymers, and high-strength materials. A problem/customer match would be the application of the company's composite technology to the particular building requirements of one customer. A second customer with a similar "problem" would be considered a second problem/customer pair.

The team effort hinges on the potential first sale of the eventual product, and the implementation of the results must be customer oriented. Furthermore, for each need of a particular customer, a separate planning category should be set up. (The same company representative may service two or more problems of a single customer, depending on the resources of his organization.)

If the company goes to an extreme and organizes its efforts exclusively according to customer needs, it may find itself getting involved in technologies about which it knows little. The result may be many more misses than hits in its tech transfer program.

On the other hand, if the company focuses on particular problems exclusively, it may discover that it is not meeting the needs of its customers. At first blush, Customer A may appear to have the same problem as Customer B, but on closer inspection he usually does not, in high-technology products and processes.

The company representative dealing with one or more needs of a customer is not necessarily a member of the transfer team, though its members may be more familiar with the situation than anybody else. The team is a dynamic thing, changing as the organization's technological interests change and as members "peel off" for assignment to developed products or reassignment to their original departments.

Current situation: In view of the nearly equal roles that R&D and marketing play in the tech transfer effort, neither the R&D nor the marketing department is the most comfortable home for the tech transfer team. The scant experience that industry has had so far indicates that the best location for the team is in the new business development group, if it exists.

An alternative is organizing the team within the R&D sectors, but making it functionally responsible to marketing areas. Recently some companies—including Sun Oil, Standard Oil of New Jersey, and Union Carbide—have assigned specialists to positions that are administratively in the R&D department but functionally in the marketing department. And they have had apparent success.

To date, however, transfer, as a recognizable function in the organization, has existed mainly in aerospace companies. The reason is that NASA requires each contractor to report any new technology that is developed under NASA contract. Thus companies have been obliged to organize activities administering the "new technology clause."

Although there are many examples of the utilization of technology by aerospace companies for nonaerospace purposes, few of these companies have organized their transfer activities systematically enough to pursue commercial ventures—mainly because they generally are uncomfortable marketing to nondefense markets. Typically, technology transfer is accomplished in the aerospace industry on an ad hoc basis.

Ideally, in large organizations, the tech transfer effort could be set up in terms of staff and line functions. Transfer teams, each containing one or more problem/customer pairs, would be serviced as the situation demands by four staff functions: planning and evaluation, problem definition, technology reconnaissance, and market evaluation.

The planning and evaluation section would assign problems to particular transfer teams and coordinate the total effort. Operating like profit centers, the transfer teams would be charged for the staff services they used.

Smaller companies of course could not afford, and would not want, such an elaborate arrangement. One man, however, can serve several functions simultaneously as long as the organization controls the number of problem/customer pairs.

Cost factors

While the element of cost varies widely from one organization to another, a company that follows the steps which I outlined earlier can expect to spend about $270,000 a year, at today's prices, to maintain a minimal level of activity. The expenses that combine to make this total, it should be noted, are fully loaded, including overhead, general and administrative costs, computer time, and so on.

The basis for this calculation is the estimate from my experience that it takes a minimum of a half man-year of effort to maintain the problem definition activity. This level will yield about 1,000 problems per year. Naturally, not all of these problems turn out to be solvable or even significant; in fact, my experience is that only 1 of every 40 eventually is useful. Therefore, definition of 1,000 problems would produce some 25 valid problems that warrant further investigation.

On the assumption that it costs about $50,000 a year to maintain a skilled technology specialist, half a man-year would cost $25,000. This is the minimum fixed cost.

The other components that combine to make up the $270,000 minimum total cost of the program are also broken down according to man-years. The two major items are management ($70,000) and team activity associated

Exhibit II. Economies of scale in program costs
[Dollar figures in thousands]

Number of work units completed	Total annual cost	Fixed costs per work unit	Variable costs per work unit	Total cost per work unit	Approximate number of full-time personnel
1	$ 270	$270.0	—	$270.0	5
5	270	54.0	—	54.0	5
10	333	27.0	$ 6.3	33.3	6
20	470	13.5	10.0	23.5	9
30	681	9.0	13.7	22.7	14
40	927	6.8	16.4	23.2	19
50	1,135	5.4	17.3	22.7	23
60	1,293	4.5	17.1	21.6	26
70	1,471	3.9	17.1	21.0	29

with individual projects ($50,000), each requiring a man-year. Technology search would cost an estimated $75,000 (one and one fourth man-years), market research and economic evaluation, $20,000 (one fourth a man-year), and financial planning and control, $30,000 (half a man-year).

Economies of scale: Fixed costs are not the only expense element, however; tech transfer exhibits complex variable cost patterns. Given the basic increment of $25,000 for identification of 25 problems, it will cost about $1,000 to define each problem over the first 25. Obviously, by breaking down costs by man-year, similar variable costs apply at every step of the transfer process as more problems are taken on.

However, since there is a relatively high ratio of fixed to variable costs in such an operation, the economies of scale are substantial. *Exhibit II* demonstrates this.

This exhibit shows how the cost per completed work unit declines as the scope of the tech transfer program enlarges. At the minimum level of activity, a team has the capacity to see some five projects through to the first significant sale. Thus at the minimum level, the cost is $54,000 per transfer. Costs rise as the program expands above that figure. (For the sake of brevity, I have omitted the methodological details—based on man-years of effort used in calculating the fixed- and variable-cost estimates.)

It is clear that the unit costs of a program producing as many as ten work units are large, but they decline abruptly as the organization expands its activity (and, presumably, the number of successes it derives from it) because the need to increase the managerial and informational effort occurs much less frequently. At a high level of activity, companies that can afford it will find the per-transfer cost reduced to $21,000.

Conversely, since technology transfer is a risky undertaking (as is any kind of new product development), a less active program is likely to produce proportionately fewer payoffs.

Conclusion

The benefits of a transfer program vary more widely than do the costs. But the limited evidence available suggests that, while a typical research program will run for a year and a half, a typical transfer project will extend a half year, with an additional half year necessary for applications engineering. If the data accurately reflect reality, then tech transfer is on the average 33% more efficient than "normal" R&D.

Clearly these estimates should be regarded with great caution. If they reflect reality, however, they are quite significant, for they indicate a way for the company either to cut research expenditures or, more appropriately, to increase benefits without increasing expenditures.

To what extent can these expectations be generalized? The wide range of possible variations in benefits and costs indicates that there are some cases where tech transfer is clearly a more effective way to approach technical development than is the normal R&D process and some cases where transfer is clearly less efficient. In any case, going through the tech transfer process generates many options for consideration. It thereby substantially increases a company's ability to choose the optimal approach and its potential for a better payoff.

There are, of course, benefits to such a program that are difficult to ascribe to a particular source, such as improved communication with the market and a broader view of the technology.

Technology transfer has become important. Large organizations will find it a valuable adjunct to their R&D efforts; smaller ones can use it as an alternative to R&D since entry is easy and large lab facilities are not needed.

The process is not inexpensive, but from the scant evidence available, the rewards are proportionately great. It should be actively considered by all companies, both large and small, that are seeking ways to make their investments in technology more productive.

Appendix: Statement of a problem

What is needed is a low-cost, reliable fire warning system for use in residences.

Background

More than half of the 12,000 people killed annually by fire die from fires in the home. A large fraction of these are killed while they are asleep or because they did not awaken in time. An alarm system that would detect smoke or other combustion products formed during the incipient stages of a fire and then sound an alarm could help significantly in enabling a family to escape from a burning building.

There are many smoke, heat, and fire detectors available today, but the cost of a reliable system (detectors and an alarm for an entire dwelling) is high. It is generally accepted that a large number of detectors (heat detectors in most rooms and several smoke detectors strategically placed in those areas where the smoke might accumulate) are necessary. Present systems are available either as single-station units, where the alarm and detector are contained in the same unit, or as interconnected systems, where the separate detectors are wired to a central alarm. In both types, the cost is high. In the former, the combination is costly, while in the latter, wiring is expensive.

The high cost of these alarm and detector systems (typically $200 to $400 for a six-room, three-bedroom house) limits their general use to industrial plants, schools, and large apartment buildings. Widespread installation of detection systems and inclusion of them in local and federal building codes are desirable objectives not achievable under the present circumstances.

A simple heat detector is often insufficient for giving early warning of a fire. In the majority of fires, smoke and other combustion products are emitted for a long time before the fire becomes hot enough to actuate a thermal detector. Also in this low-heat period, the fire does not spread far. Thus a device that detects smoke or other early combustion products, instead of heat, would provide a much earlier warning—frequently a life-saving one.

The most commonly used smoke detector is the photoelectric type, in which light is scattered by smoke particles into a photoelectric detector that is off the axis of the light beam.

A very sensitive smoke detector is an ionization detector capable of detecting much smaller particles than the photoelectric type. In this device, an alpha radiation source ionizes air molecules between two plates, across which voltage is applied. Smoke particles are attracted to the negative ions, causing the average mobility of the charge carriers to decrease and thus reducing the current flowing between the plates. This change of current is amplified and then fed into an alarm.

The major difficulty with both these single-unit smoke detectors is that they are too expensive to permit installation of an adequate number in the average home. The photoelectric detector, while less elaborate and hence less expensive than the ionization detector, is not as sensitive and is bulky. What is needed is a reliable system costing less than $100.

A system of interconnected detectors is perhaps an improvement over the single-unit devices, but the cost of wiring alone—using union labor—can exceed the desired $100 total cost. Perhaps a method using existing wiring can be devised.

We ask you to consider the problem in two parts. The first is finding suitable detectors. A possibility is a very cheap detector that gives reliability through redundancy. There might be several of these detectors in each room—perhaps one at each light socket, outlet, and wall switch. Achieving a low-cost product would be a constraint, however, unless the second part of the problem were solved—that is, finding an inexpensive method for interconnecting the detectors to the power source and alarm. The connection might be made over existing power lines or by means of radio or ultrasonic signals.

Constraints & specifications

In formulating approaches to correct this problem, here are some things to be considered:

1. To be fail-safe, backup battery power or power (mechanical) independent of the power mains should be provided. However, the likelihood of a fire and an electrical failure occurring simultaneously may be little enough in newer houses to warrant relaxation of this requirement—a measure that would effect a large cost saving. As a compromise, power for the alarm system might be provided through a separately

fused circuit, so that a fire-causing short in the same room as the detector would not seriously affect the line voltage in the alarm circuit.

2. The National Fire Protection Association's standard on placement of detectors calls for thermal detectors to be placed in almost all rooms and closets, and for smoke or combustion-product detectors to be placed strategically in main stairwells and other key locations where smoke might accumulate. Although this standard should not be viewed as a necessary constraint, it does provide reasonable guidance.

3. The alarm threshold of the smoke detectors must be sufficiently high to prevent cooking effluents and tobacco smoke from causing false alarms. Furthermore, detectors must not clog up with fatty condensations given off in the kitchen.

4. The appearance of the detector and its associated circuitry is important. For example, a large, unsightly apparatus in the middle of a living room ceiling would not be acceptable.

5. The cost of installation should be a consideration, since it can account for a significant part of the total outlay.

Relevant technology

To detect the presence of fire in its incipient stages, a device must be sensitive to various emitted gases (carbon monoxide, for example) or smoke particles, which vary in size from approximately .01 inches to a few microns. (It is generally accepted that thermal detectors are either not sensitive or not discriminating enough.) One idea is a solid substance that undergoes a change in its electrical or mechanical properties on exposure to combustion products. How to protect such a device from degrading under normal environmental conditions is a problem that would have to be dealt with.

(The suggestions included in the problem statement are intended to be illustrative and are by no means inclusive of all possible approaches to this problem.)

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Maintaining the linkage

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Both research laboratories and operating organizations can share in the common task of a mission-oriented technical organization: learning relevant new knowledge and applying it. The problem common to both activities is one of maintaining the linkage between awareness of the possibilities of new knowledge on the one hand, and awareness of the needs of operations and the marketplace on the other. In industrial research the major problem is avoiding irrelevance; in design the problem is one of avoiding obsolescence. In central laboratories, which tend to be well coupled to the dynamic world of science and technology, the problem is made manifest as one of maintaining contact with the real needs of the organization. In operating units, which tend to be well coupled to the real world of needs and capabilities, empirical success in making something work can seem more important than understanding why it works. The problem in that environment is one of maintaining contact with knowledge of the best techniques.

Another Technology Viewpoint

(The Nixon Administration has been making a strong case for pushing a new national technology policy as part of its attempts to stimulate the national economy. Dr. Edward E. David, Jr., science adviser to the President, recently presented his interpretation of this policy to the Electronics Industries Assn. in Washington. Key extracts are presented below.—Ed.)

. . . The Fiscal 1973 budget does not answer all the questions, settle all the issues, or provide all the policies. What it does is set a course fairly clearly.

First of all, it is a pro-technology budget. It assumes that quality and quantity can be reconciled and that economic growth per se is not inimical to better life, the natural surroundings, or the national environment. In terms of actual numbers, the overall research and development budget this year is up $1.4 billion, from $16.4 to $17.8 billion. That's a 9% increase.

On the defense side, the defense R&D effort will increase by about the same proportion. It will be up by $800 million. . . .

On the space side, the President has announced his support for the space shuttle. The shuttle will preserve options for the future. With it we can undertake practically any space application, space science, or manned space flight effort that we might picture for the '70s or '80s, and hopefully some we don't now foresee. In addition, the shuttle can be the workhorse for launches into low orbit. The shuttle represents the transition from the era of space flight in which most of our launch vehicles came from the military side to a new era. It is an effort to make space accessible on a more routine basis, on a more economical basis, and to bring some of the benefits of space to society at large in an economical way.

We expect to see an active space science program in the '70, including two Viking spacecraft to land on Mars in the 1975 time frame; a Mercury-Venus fly-by mission; a high energy observatory for X-ray and cosmic ray astronomy, and an investigation of the outer planets, though not the Grand Tour as it has been proposed.

On the domestic side, the R&D budget this year is up 15%. This represents an attempt to achieve "a critical mass" effort in domestic areas. The special efforts which are going to be undertaken there are typical, and I would like to talk briefly about just a few of them. Transportation R&D is a very important element, one pursued not only in the Dept. of Transportation, but in NASA and, to some extent, in DOD. Exclusive of DOD, R&D funds for transportation are up to $666 million from $456 million. The important directions are continuing efforts on air traffic control, personal rapid transit for urban transportation including future dual-mode systems. These endeavor to combine the best features of the automobile and its convenience with the high-traffic capabilities of mass transit. Systems of this sort utilize a car (electric) which can be driven either on the street as an independent vehicle or attached to a guideway and used more or less as a unit on a rapid transit system. We are also looking at V/STOL aircraft and high-speed rail systems.

Another area on the domestic side, one which we think is very important, is energy R&D. As I said, I would choose this field as the most important one. The President last year announced funds for a fast breeder reactor prototype to be completed by 1980. He has since announced a second plant to be built in approximately the same time frame. We have now begun to undertake that program. The utilities which have been asked to put up funds for the development have already pledged $250 million. The federal government will supply the rest. . . .

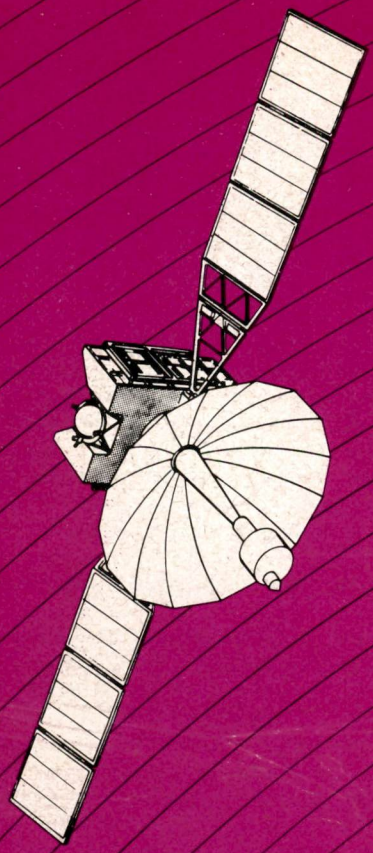
An interesting group of programs I have called the "Apocalypse package." This is a disaster-loss reduction package centered on hurricanes, earthquakes and fires. . . . We believe that we can help minimize both damage to property and loss of life by predicting earthquakes. There is even some possibility, as revealed in an experiment done by the U. S. Geological Survey, that earthquakes can be controlled by the injection of fluid into locked fault areas. This result suggests that stresses there can be relieved non-catastrophically by "lubricating" the fault zones. We are also paying attention to the design of earthquake resistant structures. Weather modification, particularly the modification of hurricanes, and the application of modern technology in fire fighting areas are important, too. . . .

There are a number of strategic policies which underlie the budget. . . .

First, I have spoken of the necessity of new relationships between industry and government. These will be investigated through a trial incentives program included in this budget. The program is centered in the National Science Foundation and the National Bureau of Standards. Current economic theory specifies that industry underinvests in R&D. The theory says that some fraction of industrial R&D produces elements of societal benefit so general that they cannot be captured by the company doing the R&D. Therefore, a contribution by society to cover that portion of the benefits which accrue to the public generally appears justifiable. The second perception is that the universities have a much greater societal role to play in R&D than at present. The NBS/NSF incentives program will amount to $40 million.

The second policy that animates this budget prescribes using the high technology agencies to deal with long-range domestic problems and goals. For example, we believe NASA has strong capabilities in long-range transportation research, and we intend to make use of NASA in that field. At the same time, we must strengthen the R&D capability of the civilian mission agencies. We intend to do that both by funding and by the infusion of manpower.

Just a few more words about the budget and the course that it lays out. It said that it is a pro-technology budget, and it implies that science and technology have a vital role in achieving the goals of the nation. The job of the scientists and engineers, as I indicated earlier, is to discriminate between what is possible and what is impossible, a very important input. But broader participation on the part of scientists and engineers is going to be required in setting such goals, particularly on the domestic side where the market will determine what is acceptable. Science and technology, I think, must now rise to the expectations of those people who recognize their capabilities for achieving national goals. Too, through constructive accomplishment, we must reassure those people who are wary of science and technology's effects. This will require new institutional relationships between federal and local governments, between government and industry, and between industries and universities. With the 1973 budget we are accelerating down this road. The decade of the '70s should be an exciting and productive time, if engineers and scientists, government and industry, laboratories and service operations combine in a strategic approach to develop the required balance between the pure and the applied, between the public and the private effort, to focus our disciplines on societal needs.



What happened to our technology lead?

The job of keeping the U. S. competitive in the world market is becoming more burdensome; the "technology gap" is shrinking rapidly. Our choices: loss of economic leadership or drastic changes in R&D policies.

By JOHN H. SHERIDAN

NOT SO LONG AGO, the United States was a clearcut front-runner in the world technology race. For years, technical superiority has been the economic buffer which kept U. S. goods competitive in international markets—offsetting our higher labor costs.

Today, however, that buffer shows signs of eroding. The tortoises of the world are suddenly within snapping distance of the hare's tail. This development has been viewed with alarm by government officials as well as businessmen. As a result, the Nixon Administration has begun to reexamine government's role in fostering the advancement of science and technology.

In some manufacturing areas, the U. S. faces the disconcerting prospect of staring at its world competitors from the wrong side of "the gap."

The anemometer which perhaps best measures the winds of change is the import-export balance sheet for technology-intensive products—chemicals, machinery, transportation equipment, and scientific and professional instruments and controls.

Traditionally, these high-technology goods have yielded balance of trade surpluses which offset U. S. deficits in other commodity groups. But, in 1971, that surplus showed a sharp $1.3 billion decline—from $9.6 billion to $8.3 billion. Oddly enough, the only product group in which the U. S. improved its trade balance last year was agriculture.

Analyzing the trade picture, U. S. Secretary of Commerce Peter G. Peterson recently told the House Subcommittee on Science, Research & Development: "The most disturbing [trend] to me is the softening in the so-called technology-intensive products. . . . By now, U. S. imports of these commodities have reached the level of about two-thirds of U. S. exports [compared with 26% in 1960] . . . and their growth continues to exceed the growth of our exports by more than 100%."

The flow of funds

Why the turnabout? Many attribute it to a leveling off in the support for research and development in the U. S. As other industrialized countries capitalize on technology developed here—and enhance it with intensive R&D programs of their own—the U. S. must quicken its efforts to develop more sophisticated products. But, observers point out, that hasn't been happening—at least not in sufficient measure.

The facts, gleaned from data supplied by the National Science Foundation (NSF), are these:

- Investment in research and development activities in the U. S. grew from $5 billion in 1953 to $26.8 billion last year—and will reach an estimated $28 billion this year. But, handicapped by inflation, the curve of "real" input is heading downward.
- Whereas the U. S. spent slightly in excess of

treatment practices, political appointments in complex technological areas, technologically ignorant environmental lawyers, and decisions based on political and economic expediency.

The problem, as Dr. Wood views it, is a combination of industrial mercury wastes, improperly treated municipal sewage, improper testing techniques, and a political approach to solutions.

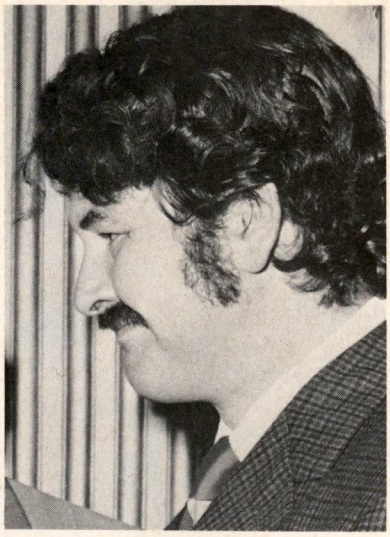
Essentially, the presence of lethal methyl mercury in water is a natural phenomenon, since inorganic mercury and the agents which convert it to methyl mercury are present in a natural state in many bodies of water.

Industrialization adds to the problem. Industrial pollution, says Dr. Wood, "has vastly magnified the problem, making it more widespread. It must be emphasized that the contribution to the mercury problem by industry is to relocate inorganic mercury into areas where rapid synthesis of methyl mercury is assured."

Elements vital to the conversion of inorganic mercury to the far more dangerous methyl mercury in sediments have been identified. Carbon, nitrogen, phosphates, and trace metals provide microorganisms with the food they require to grow and divide. The bacteria and molds living in sediments accomplish the conversion.

A great deal of confusion about mercury pollution in water still exists, primarily because of inappropriate testing procedures, technological ignorance on the part of regulators, and political approaches to solutions, contends Dr. Wood, in discussing his experiences with regulators and legislators over the past several years.

To date, methods used to test mercury levels in water measure total mercury, even though this method does not accurately



WOOD—*"Blind leading the blind."*

determine the presence of methyl mercury, the compound which accumulates in fish. Procedures to test for the presence of methyl mercury "have been available since 1968," but have been largely ignored, says Dr. Wood. "It is obvious that the problems created by technology must be solved by technology." Legal and political approaches "are somewhat hazardous to say the least."

Politicians and lawyers, he asserts, "react to the comments of the last person who gave them advice. . . ." We have, he says, "the ultimate case of the blind leading the blind."

Lawyers, he argues, "should not be allowed to work on environmental problems unless they have the necessary training in chemistry to understand these complex problems. Furthermore, the Environmental Protection Agency would be a much more fair organization if it employed the best people, those with the most expertise in the various areas of environmental chemistry. Political appointments in complex technological areas are dangerous not only to the health of the general public, but also to the economy. Under the present set of circumstances, both industry and the populace suffer."

The ideal answer to mercury pollution, says Dr. Wood, is "improvement of water quality" by removal of nitrogen-containing compounds and phosphates at every water quality treatment plant, and by curbs on agricultural overfertilization with ammonia and phosphate compounds. Then, he says, "the microbial populations in sediments will fall to natural levels and the rate of synthesis of methyl mercury will decrease quite rapidly." Furthermore, "improved water treatment facilities will help alleviate similar problems, such as the methylation of inorganic arsenic compounds by molds and bacteria." □

3% of its gross national product (GNP) on R&D programs in 1964, it will spend only 2.5% this year.

• The U. S. ranks poorly in growth rate of R&D spending when compared with its leading competitors. In the years 1967-69, Japan increased its support for new technology at an annual rate of 33%, and West Germany showed a 16% boost. The U. S. input climbed only 5%.

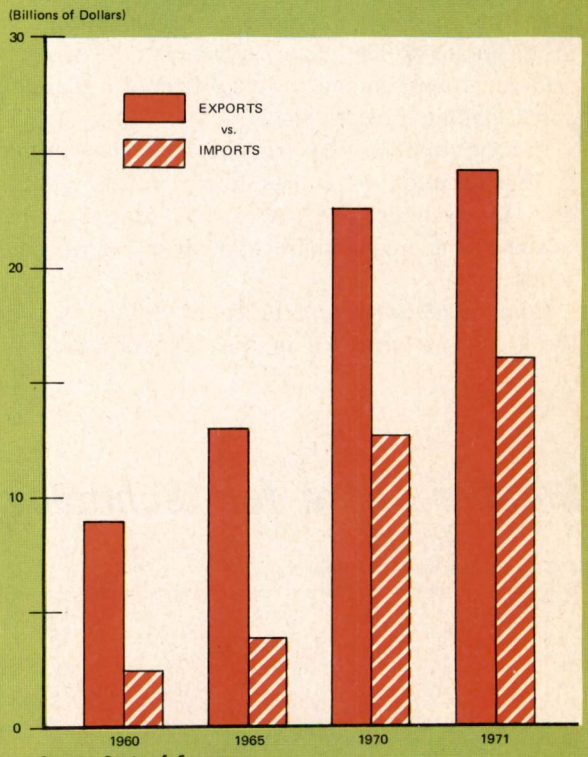
• For the five-year period, 1967-72, U. S. funding for R&D grew at an average annual rate of 3.4% in "current" dollars—but showed an average *decline* of 1% yearly in "real" dollar terms.

• The federal government, which stepped up R&D funding at an average annual rate of 16.3% during the boom years of 1953-61, has been increasing its support by a skimpy 1% average rate for the last five years. Again, that's ignoring inflation. Measured in real dollars, government investment in new technology has been dropping at a 3% rate since 1967.

• Although the government still foots the bill for more than half (54%) of the total R&D effort in this country, industry has increasingly been shouldering a larger share of the burden—from 31% in 1964 to an estimated 40% in 1972.

• Industry now finances 58% of the research and development work it performs—$11.1 billion of a $19.2 billion total. Yet, eight years ago, the govern-

U.S. TRADE IN TECHNOLOGY—INTENSIVE MANUFACTURED PRODUCTS



Source: Dept. of Commerce.

Our strong point grows weaker

Although U. S. exports of technology-intensive products increased 169% from 1960 to 1971, imports of these products jumped almost sevenfold. Imports as a percentage of exports grew from 26 to 66% during the same period. And last year the margin shrank to $8.3 billion from the 1970 total of $9.6 billion.

ment financed 57% of the industrial R&D programs.

The list of figures could be continued almost indefinitely.

What's ours is theirs

Lincoln R. Hayes, director of business planning, E-Systems Inc., Dallas, believes one reason that countries such as Japan and West Germany have made such great strides is that "we publish everything we do." He points out that Massachusetts Institute of Technology published a collection of books (available at $400) representing 40 years' work which "put Russia right up with us in the development of electronics. . . . But this is normal. We learned about printing from Europe."

It is a fact of life, he believes, which should spur the U. S. to maintain its trend-setting pace in technology. The logic is simple: "If we can't sell our fountain pens, we'd better do something about making a better one."

Contributing to the current economic problem is the direction R&D has taken in this country: defense systems and aerospace programs have cornered the major share of available government funds.

Commerce Secretary Peterson points out that the U. S. performance in the "generation of new technology, which in the past frequently yielded whole new industries," has lagged that of other countries. "In the 1960s, our economy's expenditures on R&D relevant for economic development, plus R&D equivalent purchases of advanced foreign technology" averaged only 1.1% of GNP—versus a 2.2% average for France, West Germany, the United Kingdom, Italy, and Japan.

And, due to the time lag (estimated at six to ten years) between R&D expenditures and the emergence of commercially useful technology, the U. S. may now be only at the "threshold" of its competitive difficulties, Mr. Peterson adds.

NSF estimates that $12.6 billion—or 78%—of the federal outlays for research and development in the U. S. this year will be plowed into defense and space research programs. With cutbacks in the space budget, priorities have shifted somewhat since 1966 when defense and space research accounted for 90% of the total federal investment in R&D.

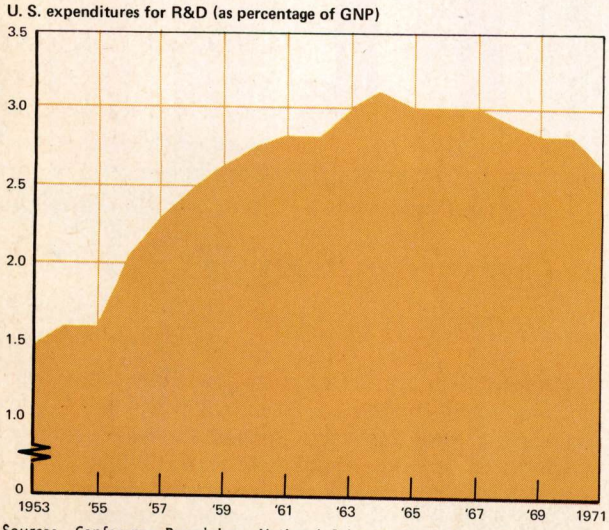
Still, the imbalance contrasts sharply with the thrust of efforts in Japan where approximately 70% of the government's support is geared to economic growth.

In current federal R&D funding, commerce and transportation has been dropped from fourth to fifth on the priority list with $566 million—$73 million less than it received in 1971. Top priority item is defense ($9.4 billion), followed by space ($3.2 billion) and health ($1.3 billion).

And while the federal budget has more than doubled in the last ten years, the outlays for new technology have grown only 47%.

Smaller share for technology

U. S. expenditures for R&D (as percentage of GNP)



Sources: Conference Board Inc., National Science Foundation, Dept. of Commerce.

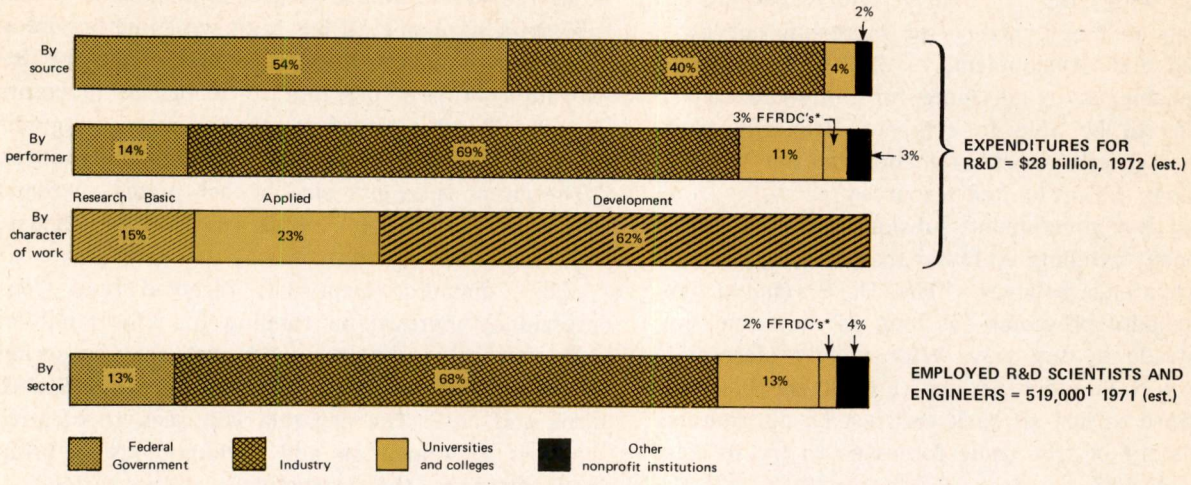
Slicing the budget

Daniel Creamer, economist, Conference Board Inc., New York, explains the reluctance of Congress to appropriate greater amounts this way: "Reduction in research expenditures is a politically painless act and therefore . . . among the first to be curtailed and among the last to be expanded." He predicts that the scientific knowledge industry "will not operate with as much vigor during the decade of the seventies as it did during the fifties and sixties."

Industry, which in 1971 employed almost 70% of the 519,000 R&D scientists and engineers in the U. S., has also been somewhat budget-conscious.

"It has been my observation," says Charles A. Anderson, president, Stanford Research Institute

The national R&D effort



* Federally Funded Research and Development Centers administered by universities and colleges.

† Full-time equivalents.

Source: National Science Foundation.

(SRI), Menlo Park, Calif., "that severe pressures on earnings have forced broad scale reductions in development programs throughout industry. Programs with high risk—but also high potential payoff—have been cut. When the squeeze is on, the natural thing is to protect today and hope you can play catch-up ball in time to protect tomorrow. But, unfortunately, a great deal is lost in the process."

More than money

Barriers to more effective technology development in the U. S. extend beyond money problems. Commonly mentioned are:

- Government antitrust policies which discourage collaborative efforts by competing companies. As a result, the argument goes, money is wasted by duplication of effort.
- Certain patent policies which hinder the commercial application of government-generated technology. ("Past policy has offered royalty-free, nonexclusive rights to all who ask," states James H. Wakelin Jr., assistant secretary of commerce for science and technology. "The results? Just what one would expect—most patents were not asked for.")
- A growing negative opinion toward technology, especially among the young who link it with the "war machine" which produces defoliants and napalm, among other things.
- Environmental restrictions which delay projects —while impact studies are prepared—or reduce potential profitability by requiring costly control measures.

Encouraging signs

There are signs of an awakening in Washington. The Commerce Dept. is formulating a program which would permit broad, joint research efforts by companies with common goals—generally projects which involve highly sophisticated technology and prohibitive costs. Secretary Peterson suggests: "Research projects carried on under this program should not carry antitrust risk. . . . General government oversight would guard against restrictive practices. Any patents resulting from such efforts would be privately owned but broadly shared."

One approach to joint research which sidesteps antitrust problems has been initiated by two computer firms—National Cash Register Co. (NCR), Dayton, Ohio, and Control Data Corp. (CDC), Minneapolis. They formed a jointly owned, but independent and self-sustaining company, Computer Peripherals Inc., which will conduct certain kinds of R&D and sell computer equipment to its parent firms.

The venture will not mean a reduction in NCR's research efforts, nor will it restrain competition, says Richard Kleinfeldt, manager of R&D finance and administration at NCR. "We will still fiercely

compete with CDC . . . and we will essentially be investing as much money—or more—in our own research and development. . . . The whole thing is to enable us to get more for the same dollar, in order to be able to compete—primarily with IBM. It's strictly an effort to broaden our base of technology within limited resources."

Aided by government subsidies, foreign firms have been "catching up faster than we're growing," Mr. Kleinfeldt believes. "The U. S. should encourage joint programs—as long as they don't restrict trade in any way. With rapidly increasing pressure from other nations, I can't see how we can afford to just sit back and rest on our laurels. Our history of free trade forces us to try to stay a step ahead."

Incentives in store?

To encourage commercial applications of government technology, the Administration has proposed a change in patent policy which would make some government patents available to private firms through exclusive licenses.

"Some of America's best commercial companies, which have demonstrated their innovative ability to build industries, patents, and jobs . . . either do not get involved at all in government R&D or, if they do, usually not with their best people," observes Secretary Peterson. "In the risky entrepreneurial world of innovation, many of these companies have apparently concluded that what belongs to everybody, in fact, really belongs to nobody."

As a result, he believes, the level of industrial fallout from government-supported R&D is "simply inadequate in relation to the enormity of the investment." He suggests factoring "commercial possibilities into government technology strategy" and taking "a whole new look at incentives."

Mr. Peterson isn't, however, about to endorse the suggestion of a 25% tax credit for R&D expenditures. "Such a plan would cost the government $2 billion to $3 billion annually and this is judged too expensive at this time," he says, adding that the Commerce Dept. is considering a "broader cost-sharing program for encouraging high-risk R&D—innovative technical research where success could mean whole new industries." The program envisions granting proprietary rights to the contractor in return for his investment and commercialization efforts.

In the White House Office of Science & Technology, a six-man staff has been screening hundreds of nominations for the Presidential Prize for Innovation—a new program to recognize inventor-innovators who play key roles in translating important new technology into commercial success. "The intent is to give sizable cash prizes—perhaps as much as $50,000," notes Dr. Carl Muelhause, who heads the program.

The Commerce Dept. has received final Congressional approval on funding for a $40 million experimental technology and incentives program to be implemented by the National Bureau of Standards and NSF. The program will seek to identify barriers to innovation and find methods to bring new ideas to the marketplace. "The rationale," says a department spokesman, "is to develop products for export and to bolster our sagging industries. There is a pretty good consensus that we are not doing all we could to foster new technology."

What about priorities?

There is little argument that the federal government must continue to be the major contributor to the national R&D effort—especially for long-term, basic research. The debate centers on the setting of priorities: should more be allocated for non-defense programs?

One manager for a defense contracting firm sees some justification for "people programs"—transportation, housing, pollution control, and efforts to avert an energy crisis. But, he argues, the current priorities should not be altered in light of the available funds.

"R&D money into aerospace and defense research has commercial spinoff," argues a spokesman for Honeywell. "Several years ago, Honeywell discovered magnetic sensing—which is used to spot intruders at military installations. But the company also found a commercial market for this in burglar alarms."

"You've got to put the whole thing into context and find out where the high technology is," says Mr. Hayes at E-Systems. "You wouldn't have a pocket computer today if it hadn't been for the defense business. The little man building a new spin top for the kids probably pays for every nickel of the R&D cost—because the government isn't too anxious to underwrite that."

Dr. Roger Sebenik, director of process develop-

This programmable controller means even less maintenance.

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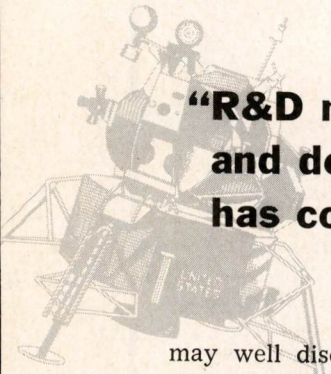
ment, Applied Aluminum Research Co., New Orleans, sees a need for increased federal support—at least in the form of loans—to small companies which are "striking out on . . . novel ways to make old products and materials." His firm is working on a process to substitute clay for bauxite in producing aluminum. It would lower costs and reduce reliance on foreign supplies by taking advantage of a raw material which exists in abundance in the U. S., he notes.

And a spokesman for a computer manufacturer suggests that new R&D emphasis is needed in systems analysis. "Problem-solving solutions are needed, not just more hardware," he says. "We may well discover that the equipment is already there, and we've just never asked it to do a certain task before. . . . In pollution control, for example, the technology may be running ahead of the marketplace. Somebody is just going to have to say, 'We will have clean water,' just as they said, 'We will go to the moon' . . . and put up the money for it."



"R&D money into aerospace and defense research has commercial spinoff."

Industry's role

Despite a commonly held view that the federal government should be doing more, there is a school of thought which says certain kinds of programs should be declared out-of-bounds.

Dr. Arthur M. Bueche, vice president-research and development, General Electric Co., Schenectady, N. Y., believes that government support and performance of R&D "needs to be limited to what the private sector cannot adequately do for itself."

In seeking answers to future sources of energy, electric power in particular, the research should be funded through the rate-setting process rather than general taxation, he says. "Such rates can and should be set, as accurately as possible, to assure that each customer benefits in proportion to what he pays. . . . The argument that large project size—and large size alone—should automatically require government support does not seem necessarily valid.

"Today's great challenge for government is to devise new and more effective institutional arrangements—to achieve some kind of order out of the jurisdictional hodgepodge that smothers some of our best technical efforts."

Many problems are too massive or too long-range for industry to solve, contends SRI's Mr. Anderson. "But a larger share of our applied efforts—those programs that will produce for the next 20 years what in the last 20 years was our TV industry, the computer industry, the jet aircraft industry—these can, and should, come from industry.

"Incentives, within the government's power to provide, would be desirable to give added energy to what is demonstrably the most efficient and effective industrial R&D system in the world."

Mr. Anderson also suggests that industry reexamine some of its attitudes. He cites the reluctance of many companies to take advantage of "certain advanced automation concepts developed in the course of [SRI] work for the U. S. government." The reluctance, he notes, stems from the fact that the firms "would not necessarily achieve a secret or proprietary advantage over their competitors. . . . [yet] we know that Japanese industry has joined together in rather massive support for a similar type of program in that country."

GE's Dr. Bueche believes an industrial research director must look to outside sources of new technology—including other companies as well as foreign companies. "No company today, regardless of its size or technical reputation, can afford the false pride of avoiding opportunities to obtain access to external technology through licenses and technical exchange agreements with other companies, large or small."

General Electric, he notes, maintains scientific "observation posts" in other parts of the world, with offices in Zurich and Tokyo and a representative in London.

On the other hand, Dr. Bueche sees a tendency on the part of U. S. businessmen to "give too much away too cheaply" in licensing arrangements with strong foreign competitors. "Now that many of them are able to challenge—and put out of business—major American industries," he says, "I think the time has come to be a little more realistic and businesslike about patent licensing." □

NOV 29 1971

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20506

NOV 22 1971

Dear ~~Mr. Olsen~~ Ken:

On behalf of Dr. David and Mr. Magruder, I want to thank you for attending a panel review of the new technology opportunities program. Your comments have been received and are deeply appreciated.

We are now in the process of reviewing abstracts of your comments with the government personnel that have been responsible for preparing the initiatives. We are also in the process of reviewing industry contributions to the initiatives program. It does seem likely that within the next month we shall ask for your advice once again with respect to reviews of the initiatives that you have already heard and also with respect to some industry suggestions. We do hope to maintain this dialog with experts in each of the initiatives areas throughout the conception and implementation of this program.

Thank you so much for your efforts.

Sincerely,

Larry

Lawrence Goldmuntz
Assistant Director (Civilian Technology)

Mr. Kenneth H. Olsen
President
Digital Equipment Corporation
Maynard, Massachusetts 01754

October 12, 1971

FURTHER THOUGHTS ON TECHNOLOGICAL INITIATIVES

Society made some unbelievable organizational mistakes when computers came along. People concluded that the organizations responsible for certain activities, whether they be in the government, in business or in the local high schools, were not competent enough to use computers so they used experts to run the computers. With two groups sharing responsibility, no one could be blamed for failure and no one could fix the problems.

Five years ago, if the local high school consistently fouled up its schedules, they would have fired the administration. For the last four years the schedules have been unbelievably fouled up. Year after year everyone blames the computers and the software. The administration has no responsibility because the school board hired experts from the outside to do the job and the experts, of course, have very limited responsibility. This also goes on in the organization which I run and in almost every organization with which I have any contact.

We now have a wonderful new opportunity to do the same thing with communications. It is clear that HUD is not technically competent to use modern communications to solve their problems, so if we impose new communications experts on them they can have an excuse for failing in their commission and they can blame it on the communications software.

The only dehumanizing result of computers that I will admit to is where responsibility and authority for the solution of a problem is taken away from the only group commissioned to find a solution and given to someone else who runs the computer. We can further destroy this authority and responsibility by taking away the control of communications and giving that to an expert.

. . . . . .

Every experiment should be considered an experiment with a predetermined checkpoint and an algorithm on which the decision to continue or stop will be made. It is misleading to call something an experiment, but make a commitment to go on indefinitely.

Kenneth H. Olsen

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VI. ORGANIZATION AND FUNDING POLICY

INTRODUCTION

In the years covered by this report, from 1964 through 1970, the nuclear physics capability of the ~~country~~ U.S. has shown marked growth, based on the strong support the science has enjoyed over many years. Advances in experimental technology and in fundamental concepts are being exploited in an increasing number of forefront facilities, and it can fairly be said that the United States is presently in a position of leadership in its contributions to nuclear physics, in applications to technology and in the production of broadly educated nuclear scientists capable of operating effectively in many scientific and technological areas. The steady growth of the field and its manifold extensions into other areas ~~is~~ are a tribute to the wise management of the significant national investment in nuclear research over the past 25 years.

The early years of nuclear science were characterized by an almost explosive growth in federal support. Even as recently as 1958-1964, the annual increment in federal funding was nearly 14 percent. From 1964-1967 the increase was much smaller, about 9 percent per year, but still adequate to permit a substantial growth in output and a significant strengthening of the nation's research and educational establishment.

Since 1967, however, the growth rate of funds for nuclear research has abruptly declined. In terms of actual purchasing power, federal support in 1969 was about 3 percent lower than it was in 1967.* Including both federal and non-federal sources, the total funds for basic nuclear physics in 1969 were just equal in purchasing power to those available in 1967, and slightly less

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* The decline in support may actually be appreciably greater. The effects of inflation have been included only as they apply to the economy at large. Further, an indirect source of support is rapidly disappearing. The downward trend in federal support of students receiving fellowships and traineeships which began in 1968-69 has continued more sharply into FY 70. Budget estimates for FY 71 reflect a further sharp drop.

than those available in 1968. Estimates for 1970 and 1971 indicate further diminutions of several percent in each year.

The real effect of the changing funding over the past years is best judged in terms of dollars of constant purchasing power. Actual operating funds, excluding major capital investments, for basic nuclear research from 1958-1970 are shown in Figure VI-1 expressed in 1969 dollars. For comparison the trend of the Gross National Product expressed in the same base is also shown. Of particular concern here is the abrupt change in slope in 1966-1967 when the federal support of nuclear research not only failed to rise with the Gross National Product but actually started to decrease in absolute purchasing power.

The steady diminutions over the past few years, in the face of sharply increasing needs of the science, present severe constrictions. While support levels have been dropping, research has inexorably become more expensive. In part these increases reflect the escalation of labor and other costs shared by many components of the economy. In part they reflect the increased sophistication and difficulty of the scientific questions being asked. Further, new facilities designed to attack new areas of nuclear physics, are large, complex, and expensive. These increased claims on the available funding have created severe stresses that have been met so far by austerity measures that cannot be long extended without deleterious effects. It seems clear to us that continuation of present trends in funding will seriously threaten the viability of nuclear physics in the U.S. and drastically reduce the contributions it can make to other sciences and to technology.

If a science is to live, it must grow in depth. As it grows, the questions asked become more difficult, and the answers more expensive. To continue its present progress, nuclear physics must move forward on several well-defined fronts. At least two of these, exploitation of high energy probes and studies of nuclei far off

forcing many talented people out of the field. The remaining program is heavily concentrated in a relatively few facilities, with many presently highly productive groups becoming obliged to change to a user's mode of operation. If the basic work funded by mission oriented needs cannot be included in reallocations, the effects are still more severe in the basic segment. A variant of the level budget is presented to illustrate the consequence. In either case much of the potential of the field cannot be exploited, and, at best, sizeable dislocations of institutions and people occur.

Finally, the effects of a budget declining at the rate of 7.5 percent over a six year period are studied. Much of the new ventures must be given up, and the multi-faceted program is severely truncated. The number of institutions and scientists that can be supported is drastically cut. Two variants are examined, as in the case of the level budget. Again, if the mission-connected basic work cannot be realigned, the effects are exacerbated.

For each of the above funding situations we present a strategy which in our judgment would optimize the return from the available funds. Our rough but considered estimates of the manpower, dollars and facilities that might be allocated to the various components of the nuclear physics program under the assumed constraints are summarized in Tables VI-A and VI-B and Figures VI-C and VI-D. Although we have caricatured the nuclear physics activities by facilities, it should be noted that the considerations that enter the allocations are in fact oriented to quite specific research objectives as discussed in Chapter II and in later sections of this chapter.

These analyses are intended to provide the input data to help to develop a national program in nuclear physics which ~~in the~~ [redacted] would best exploit the funding levels available -- best for the field itself and its applications to technology and society.

the stability line, require facilities and operations substantially more costly then the average of those now comprising the nuclear physics program. The ag[redacted] Question is how proceed along these new lines [redacted] and still support the already ongoing and still essential projects.[redacted].

Quite evidently the prospects for continued progress in nuclear physics will depend sensitively on the level of funding and on the degree to which the available resources are wisely distributed. In this chapter we present an analysis of three quite different levels of possible future funding, and delineate the consequences to the field of nuclear physics and its applications to society.

We analyze first a budget that permits the full exploitation of the opportunities of nuclear physics, without explicit regard for financial limitations. Aggressive explorations in the use of high energy nuclear probes, heavy ion physics, and a prudent expansion of the present multifaceted program based on conventional accelerators form the major parts of this program. We find that there exists already an adequate base of facilities to support most of this ambitious effort, and that the rate at which the new fields can be explored is limited primarily [redacted] by manpower. Such a program, actually requiring quite modest annual increases in funding levels, would, we believe, insure an active and productive enterprise with the prospect of important new discoveries and many benefits to science and technology.

With the full realization that expanding budgets for nuclear science are not likely in the immediate future, we have also considered the effects of a budget held at level purchasing power. Under this constraint, the new and expensive ventures considered necessary for the viability of the field must be carried out at the expense of drastic contraction of the rest of the programs. When details are worked out in realistic terms, it develops that any reasonable distribution of effort among the various kinds of programs has the effect of forcing the closing down of many facilities and of

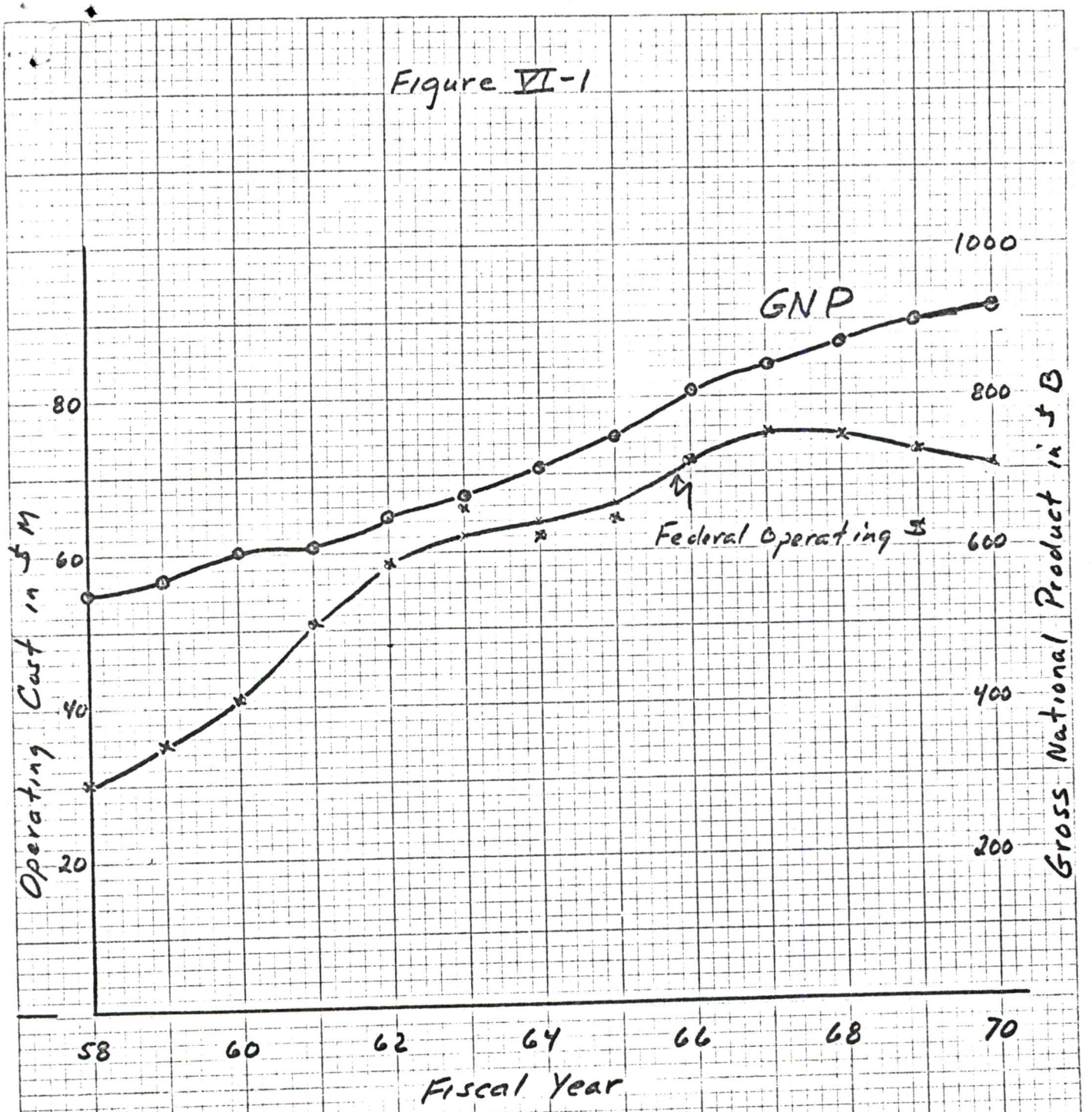


Figure VI-1 shows the trend of federal support of basic nuclear physics research operations for 1958-1970, compared with the Gross National Product, both in 1969 dollars. Figures for 1964-1970 are from Table VI-2; earlier values are from the Pake report, normalized and smoothed to match in 1964-1965.

TABLE VI-A

Number of Facilities, Operations and Research Costs, and Scientific Man Years of Effort in FY 1975 Under the Following Assumed Federal Budgets for Basic Nuclear Physics Research: An Increasing Budget (an 11 percent per year increase in the purchasing power of the operating budgets over those in FY 1969); A Level Budget (measured in dollars of constant purchasing power); and, a Declining Budget (one decreasing at the rate of 7-1/2 percent per year, for the period up to 1975).

Number of Facilities

	FY 1969 Program	FY 1975 (Estimated) Increasing Budget	Level Budget	Declining Budget
Neutron Facilities	12	6	5	3
Potential Drop Machines	64	21	18-24	12-17
Cyclotrons	21	10	7	5
Heavy-Ion Accelerators	2	3	2	2
Electron Accelerators	10	6	4	2
High-Energy Facilities	4	3	2	1
Future Facilities	-	2	-	-
Small Scale Ventures	-	20	10	3
	113	71	48-54	28-33

Operation and Research Costs (Federal Dollars, 1969 Value)

		FY 1975 (Estimated)		
Neutron Facilities	$ 7.7M	$ 10M	$ 6.0M	$ 4.0M
Potential Drop Machines	19.5	28	17.0	12.0
Cyclotrons	14.2	16	9.5	6.0
Heavy-Ion Accelerators	3.1	16	8.0	5.0
Electron Accelerators	5.8	12	7.0	4.0
High-Energy Facilities	2.1	13	10.0	9.0
Theory	5.0	12	4.5	3.5
Nuclear Spectroscopy	3.9	3	2.8	1.0
Nuclear Chemistry	4.9	8	3.2	2.0
Accelerator Devel., Inst.	3.8	4	1.5	1.0
Nuclear Data	0.9	1.5	1.0	0.8
Other	1.8	2.5	1.0	0.7
Future Facilities	-	10	-	-
Small Scale Ventures	-	3	1.5	0.3
	$ 72.7M	$139.0M	$ 73.0M	$ 49.3M

Scientific Man Years

	FY 1975 (Estimated)			
Neutron Facilities	80	100	60	40
Potential Drop Machines	350	380	250	170
Cyclotrons	190	180	120	65
Heavy-Ion Accelerators	15	125	55	30
Electron Accelerators	60	120	70	40
High-Energy Facilities	20	120	75	70
Theory	195	360	150	140
Nuclear Spectroscopy	65	50	45	20
Nuclear Chemistry	95	115	50	40
Accelerator Devel., Instr.	45	50	20	15
Nuclear Data	15	30	18	15
Other	40	50	20	15
Future Facilities	-	70	-	-
Small Scale Ventures	-	50	25-35	5-10
	1170	1800	958-968	665-670

TABLE VI-B

Elements of a Level Restricted Budget (measured in dollars of constant purchasing power); and a Declining Restricted Budget (one decreasing at a rate of 7-1/2 per cent per year for the period FY 1969-FY 1975.) In both budgets the mission-connected basic nuclear physics is excluded and full costs of high energy facilities are included.

	Number of Facilities		
		FY 1975 (Estimated)	
	FY 1969 Program	Level (1) Restricted Budget	Declining (1) Restricted Budget
Neutron Facilities	7	3	3
Potential Drop Machines	57	9-13	8-12
Cyclotrons	17	6	3
Heavy-Ion Accelerators	2	2	1
Electron Accelerators	7	3	2
High-Energy Facilities	3	1	1
Future Facilities	-	-	-
Small Scale Ventures	-	5	3
	93	29-33	21-25

	Federal Dollars		
		FY 1975 (Estimated)	
Neutron Facilities	$ 4.0M	$ 3.8M	$ 3.5M
Potential Drop Machines	16.5	10.0	8.5
Cyclotrons	11.0	7.5	4.0
Heavy-Ion Accelerators	3.0	8.0	3.0
Electron Accelerators	3.5	7.0	3.5
High-Energy Facilities	4.0	13.2	9.0
Theory	4.0	4.0	3.2
Nuclear Spectroscopy	3.6	2.8	1.0
Nuclear Chemistry	4.4	2.6	1.8
Accelerator Devel., Inst.	5.8	1.0	1.0
Nuclear Data	0.9	0.9	0.8
Other	1.3	0.7	0.7
Future Facilities	-	-	-
Small Scale Ventures	-	-	0.3
	$ 62.0M	$ 62.0M	$ 40.3 M

	Man Years		
		FY 1975 (Estimated)	
Neutron Facilities	44	32	35
Potential Drop Machines	310	135	140
Cyclotrons	137	80	50
Heavy-Ion Accelerators	15	55	20
Electron Accelerators	32	65	35
High-Energy Facilities	26	44	30
Theory	168	140	130
Nuclear Spectroscopy	60	45	20
Nuclear Chemistry	83	40	35
Accelerator Devel., Instr.	60	15	15
Nuclear Data	15	18	15
Other	35	18	15
Future Facilities	-	-	-
Small Scale Ventures	-	10 - 15	5-10
	985	693-698	545-550

FIGURE VI-C

Distribution of Basic Nuclear Physics Research Activity in FY 1975 Under an Increasing Budget, Level Budget, and a Declining Budget Compared with the FY 1969 Program.

Numbers in Boxes are Total Federal Support in Millions of Dollars, and Scientific Man Years of Effort

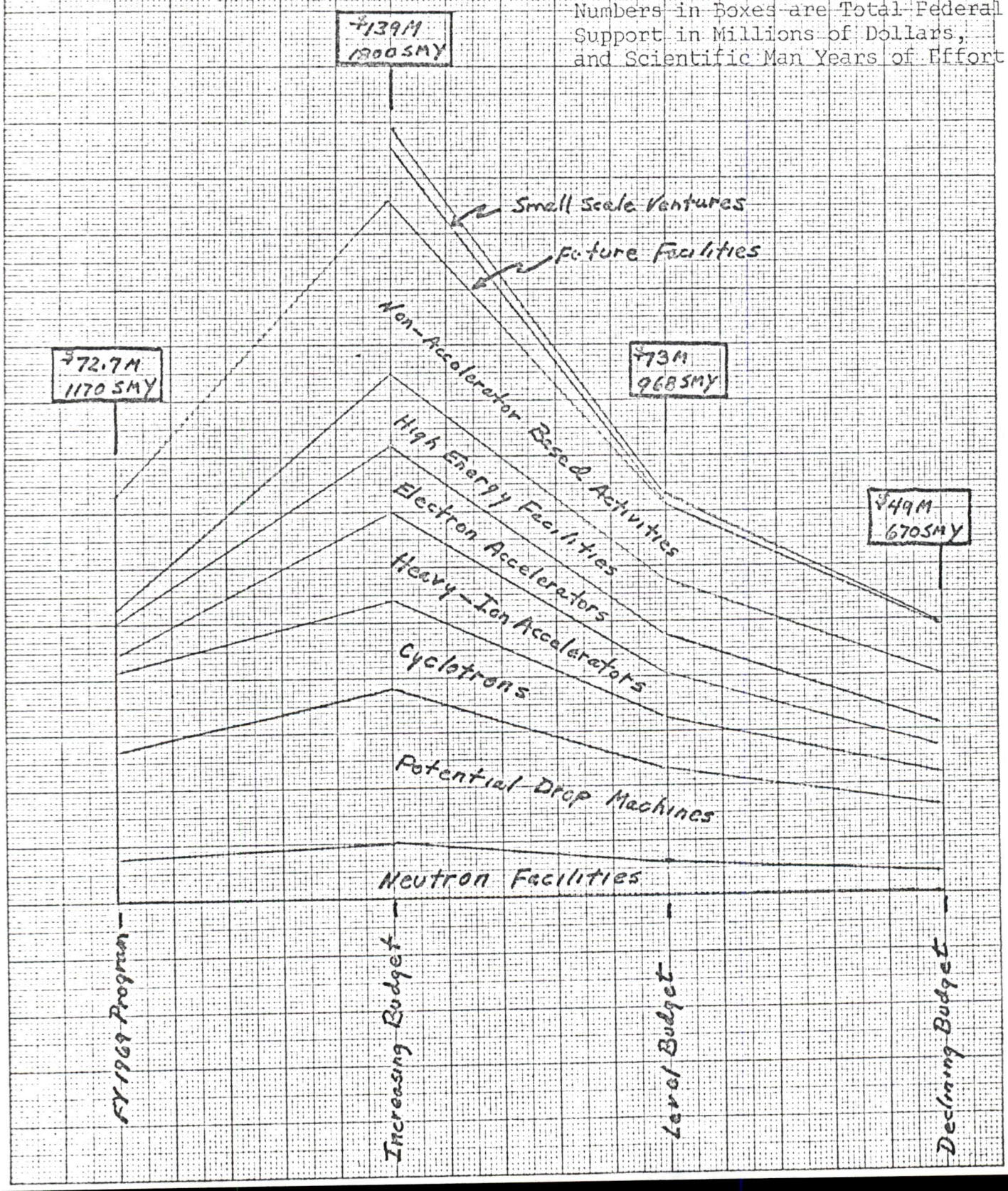
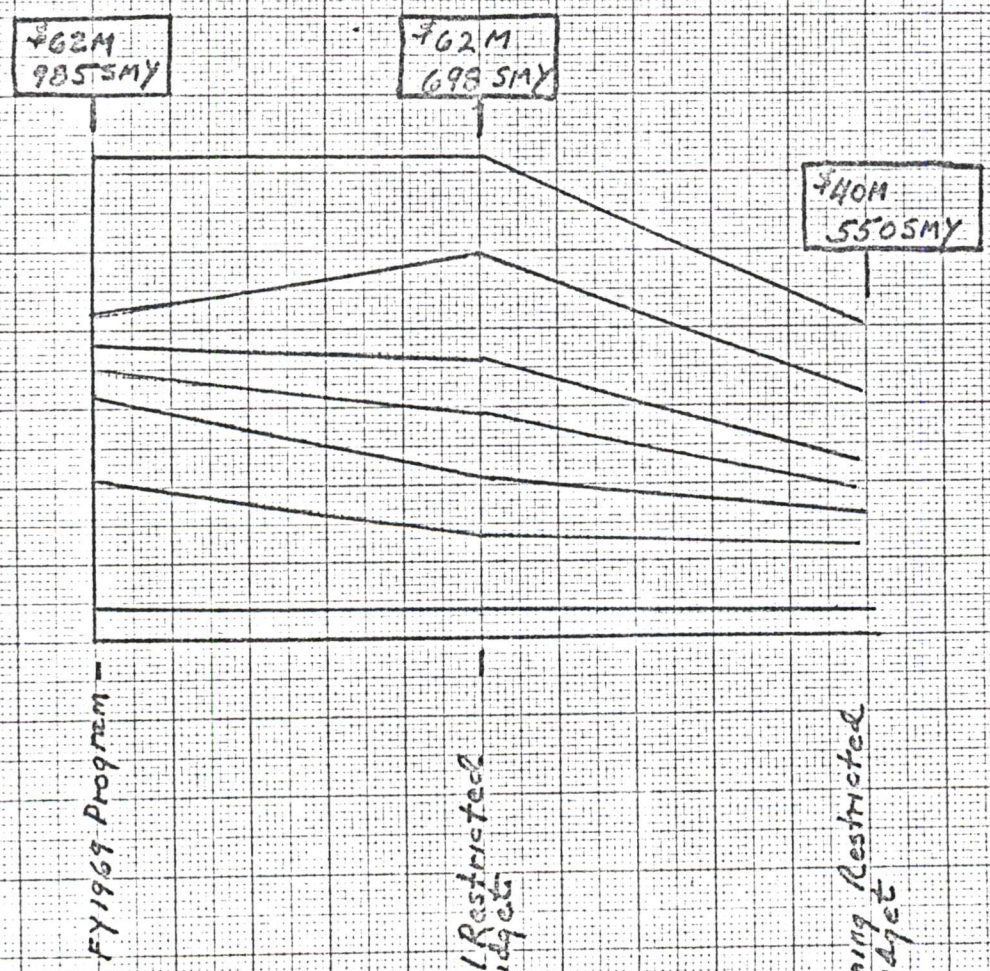


FIGURE VI-D

Distribution of Basic Nuclear Physics Research Activity in FY 1975 Under a Level Budget and a Declining Budget -- Excluding Mission-Connected Basic Research and Including Full Costs of High Energy Facilities -- Compared with the Program in FY 1969

Numbers in Boxes are Total Federal Support in Millions of Dollars and Scientific Man-Years of Effort



REVIEW OF THE 1964-1969 FUNDING PATTERN

The pattern of expenditures for basic nuclear physics reasearch in the university and federal laboratories during the period 1964 through 1969 is presented in Tables VI-1, VI-2, and in Figure VI-2.

Over the period 1964 to 1967, federal annual operating expenditures for basic nuclear physics research rose from 53 to 69 million dollars, an annual increase of about 9 percent per year. State and private contributions to university laboratories in this period for the same purpose increased from about 4 to 6 million dollars; from about 14 percent of their total operating budget to 17 percent.[1] The overall increase of federal and non-federal funds of about 10 percent per year exceeded the 2.5 percent annual drop in purchasing power to leave a growth rate of 7.5 percent to cover the expansion that took place in manpower and facilities and the increasing costs of the more sophisticated nuclear experimentation.

From 1967 through 1969,annual federal operating expenditures rose from 69 to 73 million dollars. Non-federal support of the universities rose from about 6 to 9 million dollars, to 22 percent of their operational budgets. This diminished rate of growth, around 4.5 percent per year has been canceled by inflation, leaving the total real purchasing power in 1969 at a little below the level of 1967. The increase in state and private support has, in part, been in the nature of seed or rescue money. On the basis of the results of a survey of university research groups, it appears that continued growth of these sources is not likely in the future. Many universities have indicated that they have reached the limit of possible non-federal research support.

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1. For definitions of operating expenditures see paragraph 2 page 16.

The total support for nuclear physics in the period 1964-1967, while increasing at a rate of 7.5 percent annually fell well below the effective exploitation budgets for the period which had been developed in 1964 by the Hanna Subcommittee of the Pake Physics Survey; this growth rate however permitted the orderly development of a powerful and broad ranging program of nuclear research.

The momentum thus developed has carried nuclear physics through the period of decreasing support since 1967 but there are already unmistakable signs of faltering. The momentum has been maintained by ever deeper retrenchment in instrumentation, in staff and in the scope of research. This response can carry the field through short range stringencies, but the longer it is maintained the heavier will be is the ~~eventual~~ toll exacted from the health and vitality of the field and the slower is the remaining response capability.

A questionnaire survey of some 150 university and federal laboratory groups brought out the changes which they have had to make. In order to retain trained staff, the life-blood of research institutions, it has been necessary to reduce support of young post-doctoral scientists, to cut back on support staff, and thereby to waste the time and talents of highly trained physicists on routine support functions. Equally critical has been the need to give up the full exploitation of new developments in the experimental technology that keep facilities at their long-term scientific peak. In contrast to the small laboratories, the larger laboratories that maintain a variety of nuclear programs have been able to respond to funding constrictions by cutting off some areas of research and keeping the rest strong. This too can be carried on out for a limited time only, without erasure of the advantages of

multifaceted research efforts--an erasure that has already started.

It is vitally important that we not be mislead by apparently contradictory short range consequences as has been ~~evident~~ pointed out occasionally in recent scientific journalism. During initial periods of financial stricture in recent years it has been noted that the actual publication output from some groups has increased, and this has been adduced as evidence for greater efficiency and effectiveness in the field. ~~All too~~ Frequently this phenomenon is simply a reflection of general retrenchment in which a research group lives off its capital of instrumentation, ideas, and working progress mortgaging its future against the short range objectives of getting as much as possible of its output into print--often in less than its most effective or complete form--before possible worsening situations preclude this.

It is clear from the survey made of the nuclear research community that is referred to above, that further reductions in support levels would produce highly amplified cuts in scientific productivity. The funds above fixed costs available to a laboratory are only a fraction of its operating budget, because there are sizable maintenance, materiel, and technical staff costs that must be met if the facility is to operate as ~~designed~~ intended. As these are cut away, scientific efficiency is lost. The community estimates that a further 20 to 30 percent cut in funds below 1969 levels would take most facilities, especially the largest and most advanced, past the "critical point" to a markedly lower level of scientific capability. This implies that from the viewpoint of research efficiency, further funding constrictions should not be met by across-the-board measures.

Of special concern for the future is the ~~practical irreversibility of the~~ effects of the diminishing funding ~~in~~ of the past few years. For both operations and facilities, expenditures lag behind obligations or appropriations by a year or more--in the case of facilities, often several years. Thus, while Figure VI-2 shows continuing, albeit rapidly declining, expenditures for construction of new facilities, these were mainly obligations undertaken several years before 1969. All of the major facilities now under construction were started in 1966 or 1967, and at this writing in FY 1971 there is no immediate prospect of any comparable commitment for future facilities. We have thus a lapse of 3 to 4 years which implies an equivalent delay in access to new frontiers already recognized.

As one example, we may cite the heavy-ion accelerator facility, for which a number of feasible designs have been in existence for several years. Taking into account the time required for administrative action on these proposals, the lag between authorization and actual funding, and the construction period, the most optimistic prognosis would not anticipate their entry into this field before 1975 or 1976. [redacted]. Germany, France, and the U.S.S.R. are moving ahead agressively. If we delay, we may well be accepting from the beginning an inferior status in areas of national consequence

Before turning to estimates of future needs for research funds and possible responses to a set of assumed funding levels, it is useful to describe the structure of the nuclear research establishment.

TABLE VI-1

TOTAL COSTS
OF BASIC NUCLEAR PHYSICS RESEARCH
IN U.S. 1964-1971

OPERATIONS

Performer	Agency	Funds in $ M, for Fiscal Year 1964	1965	1966	1967	1968	1969	1970	1
Labs	AEC	28.6	29.7	33.2	34.5	35.1	36.4		
	DOD	2.4	2.7	2.7	3.2	3.3	3.1		
	Other	1.0	1.0	1.0	1.3	1.7	2.0		
	SUBTOTAL	32.0	33.4	36.9	39.0	40.1	41.5		
Univ.	AEC	13.6	14.0	16.3	18.5	20.1	20.3		
	DOD	5.1	5.2	4.5	4.6	2.4	1.2		
	NSF	2.7	3.3	6.1	6.8	8.4	9.7		
	NON FED	(3.6)	(4.2)	(5.6)	(6.3)	(7.5)	(8.6)		
	SUBTOTAL	25.0	26.7	32.5	36.2	38.4	39.8		
TOTAL	FED	53.4	55.9	63.8	68.9	71.0	72.7	(< 74.2	(<
	NON FED	(3.6)	(4.2)	(5.6)	(6.3)	(7.5)	(8.6)		
	OPER	57.0	60.1	69.4	75.2	78.5	81.3		

FACILITIES

Labs	AEC	6.1	3.2	5.0	8.7	11.3	8.9		
	Other	(1.3)	(1.4)	(1.2)	0.1	0.4	0.3		
	SUBTOTAL	7.4	4.6	6.2	8.8	11.7	9.2		
Univ.	AEC	1.6	2.4	4.0	5.5	2.8	4.7		
	DOD	0.0	0.0	0.7	0.7	1.6	0.7		
	NSF	3.0	1.6	4.5	3.2	4.5	4.3		
	NON FED	(1.7)	(0.7)	(2.9)	(3.3)	(3.4)	(3.1)		
	SUBTOTAL	6.3	4.7	12.1	12.7	12.3	12.8		
Total	FED	12.0	8.6	15.4	18.3	20.6	18.9	11.9	(> 1
	NON FED	(1.7)	(0.7)	(2.9)	(3.3)	(3.4)	(3.1)		
	FAC	13.7	9.3	18.3	21.6	24.0	22.0		

SCIENTIFIC MAN-YEARS

Labs	(498)	(480)	(507)	(525)	(514)	(505)
Univ	(520)	(542)	(585)	(675)	(675)	(665)
Totals	(1018)	(1022)	(1092)	(1200)	(1189)	(1170)

Numbers in ( ) are approximate figures

Table VI-1 exhibits the Panel's estimates of the total costs of basic nuclear physics research in the U.S. for the fiscal years 1964-1969. To delimit the field of discourse as precisely as possible, we have adopted the following defintions:

1. *Basic vs. Applied Research*[1]*: "In basic research the investigator is concerned primarily with gaining a fuller knowledge or* understanding of the subject under *study."* *"In applied research the investigator is primarily interested in a practical use of the knowledge or understanding for the purpose of meeting a recognized need."*

2. *Nuclear Physics*[2]*: "Nuclear physics is here defined to include the study of nuclei, their structure, disintegration, interactions, and other properties: It includes also the study of the constituent parts of the nucleus, their interactions with one another and with nuclei."*

The Table distinguishes two categories of expenditures: "Operations" includes salaries, overhead, expendable supplies, and minor capital equipment necessary to an ongoing research program. "Facilities" includes major capital and construction items such as computers, accelerators, and buildings which permit expansion or redirection of a research program. These definitions differ from normal federal accounting practice through the inclusion here of "minor" capital expenditures under "operations". For university projects in steady state, our "operations" cost corresponds to the total research grant or co *"minor capital" costs are usually about 10 to 15 percent.*

The two categories of performers considered are universities and "laboratories", the latter including Federally Funded Research and Development Centers (FFRDC), in-house government laboratories, and industrial laboratories.

Among the performers of basic nuclear physics research are included certain high-energy (100 to 1000MeV) installations, large synchrocyclotrons and linear accelerators -- most notably the Los Alamos Meson Physics Facility (LAMPF) -- which engages in both nuclear structure and meson research. Only the nuclear programs are within the purview of this Report, and therefore only the budgets associated with these parts of the overall effort are included here. As a rough working average, we have taken one-half of the total budgets of these facilities for the nuclear budget estimates. This estimate is subject to considerable uncertainty since particle physics and nuclear structure research have broad areas of overlap and mutual support. Generally speaking, we have considered as primarily nuclear physics such studies as nucleon-nuclear scattering, meson-nuclear scattering, nuclear form factors and mesic atoms. "Gray areas" include pi meson-nucleon scattering and nucleon form factors, while such experiments as decay properties

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1. *"Federal Funds for Research and Development", NSF 69-31, p.95*
2. *By-laws of the Division of Nuclear Physics, A.P.S.*

of mesons we consider to lie in the realm of particle physics.

Funding agencies supporting nuclear research include, within AEC, the Division of Research: Chemistry, Low Energy Physics and Medium Energy Physics, Division of Reactor Development and Technology (RDT), and the Division of Military Applications (DMA). For the latter two, the separation between "basic" and "applied" research is necessarily somewhat arbitrary. We have chosen to base the distinction on the stated motivation -- whether for devices or for new knowledge -- rather than on the character of the work. Thus, for example, about $4 M in 1969 by RDT for reaction cross section work has been excluded. On the other hand, some $9.5 M expended by DMA at Los Alamos and Livermore has been included as "basic", according to the judgment of the group leaders involved. In government laboratories, we have included only those programs clearly segregated from mission-oriented endeavors.

The funding figures of Table VI-1 derive mainly from an informal survey conducted by AEC, supplemented by numerous formal and informal reports from AEC, DOD, NSF, and NASA, and further supplemented by a questionnaire distributed in February 1970 to nearly 150 research groups. For the fiscal year 1969, this process lead ultimately to a detailed listing of about 280 individual projects in 102 universities and 15 laboratories. Figures for earlier years were largely derived from the AEC report, with adjustments in categories based on the 1969 list. Non-federal funding estimates came from the questionnaires which were normalized to take account of incomplete response.

It should be noted, however, that because of some differences in definitions already alluded to, the present figures are in no sense official: rather they are intended to answer the academic question "what is being spent on basic research in nuclear physics", as defined in this Report, irrespective of source or budget category.

Our figures differ significantly from those of the annual NSF report "Federal Funds for Research and Development" NSF 69-31. Detailed comparison with earlier editions in which nuclear structure research is set forth separately indicates that the principal difference lies in the inclusion here of the DMA funds referred to above, and funding by the AEC Chemistry section of nuclear physics projects: together these add about $21 M in FY 1969. Other differences lie in the handling of high energy physics installations and in the distinction between operations and capital discussed above. As compared with FY 1964 figures given in the Pake report[3] our estimates of operating costs agree within $1 M if Chemistry funds and "minor capital" costs are subtracted. *"Facilities" funds in the two reports are not comparable because the Pake report lists obligations, while we have used estimated actual costs. For large facilities, costs may lag obligations by several years.*

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3. *"Physics: Survey and Outlook" NAS-NRC* 1966.

The number of scientific man-years given in the table was obtained from the questionnaires. A "scientist" as the term is used here means a staff member, faculty member or post-doctoral fellow. To normalize for incomplete coverage by the questionnaires, the reported numbers were normalized by the ratio of federal operating costs determined in the present study to federal operating costs reported in the questionnaires. For the government laboratories the questionnaire coverage was close to 100 per cent for 1969. For universities the coverage for FY 1969, was about 85 per cent.

TABLE VI-2
TOTAL FEDERAL COSTS
OF BASIC NUCLEAR PHYSICS RESEARCH
BY SUPPORTING AGENCY

OPERATIONS

Agency	Categ	Funds in $ M, for Fiscal Year 1964	1965	1966	1967	1968	1969	1970	1971
AEC(DMA)	L	7.6	7.7	8.4	8.8	9.1	9.5	10.1	(10.0)
AEC(CHEM)	L	(9.3)	9.7	10.2	10.7	11.5	11.6	12.0	12.3
AEC(LEP)	L	21.1	22.0	23.7	24.7	25.7	26.7	26.5	25.1
AEC(MEP)	I	2.6	2.7	4.5	5.5	5.6	5.5	(5.7)	(5.1)
	½ H	1.6	1.5	2.7	3.2	3.2	3.4	4.2	(4.7)
AEC TOTAL		42.2	43.6	49.5	52.9	55.1	56.7	58.5	57.2
NSF	L	2.7	3.3	5.5	5.8	7.7	7.9	8.2	(8.8)
	I	0.0	0.0	0.0	0.0	0.0	0.1	0.0	(0.5)
	½ H	0.0	0.0	0.6	1.0	0.7	1.7	1.5	(1.6)
NSF TOTAL		2.7	3.3	6.1	6.8	8.4	9.7	9.7	(10.9)
DOD	L	5.8	5.9	5.6	6.2	4.2	4.3		
	½ H	1.7	2.0	1.6	1.6	1.5	0.0	0.0	0.0
DOD TOTAL		7.5	7.9	7.2	7.8	5.7	4.3	(<4.3)	(<4.3)
Other	L	1.0	1.0	1.0	1.3	1.4	1.6	1.5	
	½ H	0.0	0.0	0.0	0.0	0.3	0.4	0.2	
OTHER TOTAL		1.0	1.0	1.0	1.3	1.7	2.0	1.7	(1.7)
TOTAL FED		53.4	55.8	63.8	68.8	70.9	72.7	(<74.2)	(<74.1)

FACILITIES

AEC(DMA)	L			0.1	0.2	1.8	1.9	0.5	
AEC(RDT)	L			0.1	0.7	1.1	0.3	0.1	0.1
AEC(LEP)	L	7.3	5.3	7.3	10.0	8.5	6.0	1.7	1.1
AEC(MEP)	I	0.4	0.3	1.4	3.0	1.8	1.5	(1.1)	(1.7)
	½ H			0.1	0.4	0.9	3.9	6.2	(10.6)
AEC TOTAL		7.7	5.6	9.0	14.3	14.1	13.6	9.6	(>13.5)
NSF	L	3.0	1.6	4.0	2.9	2.5	2.0	(0.1)	(0.7)
	I					1.4	1.8	(1.1)	(1.1)
	½ H			0.5	0.3	0.6	0.5	0.8	(0.7)
NSF TOTAL		3.0	1.6	4.5	3.2	4.5	4.3	2.0	(2.5)
Other	L	0.1	0.2	0.2	0.1	0.2	0.2	0.2	
	½ H	1.2	1.2	1.7	0.7	1.8	0.8	0.1	
OTHER TOTAL		1.3	1.4	1.9	0.8	2.0	1.0	0.3	
TOTAL FED		12.0	8.6	15.4	18.3	20.6	18.9	11.9	(>16.0)

Table VI-2 exhibits total costs of nuclear research sorted according to supporting agency, for laboratories and universities combined. The AEC Divisions involved are DMA: Military Application, RDT: Reactor Development and Technology, CHEM: Chemistry, LEP, MEP: Low and Medium energy physics. DOD includes the Office of Naval Research, Army Research Office, Air Force Office of Scientific Research. "Other" includes NASA and National Bureau of Standards (and, for "Facilities", also DOD).

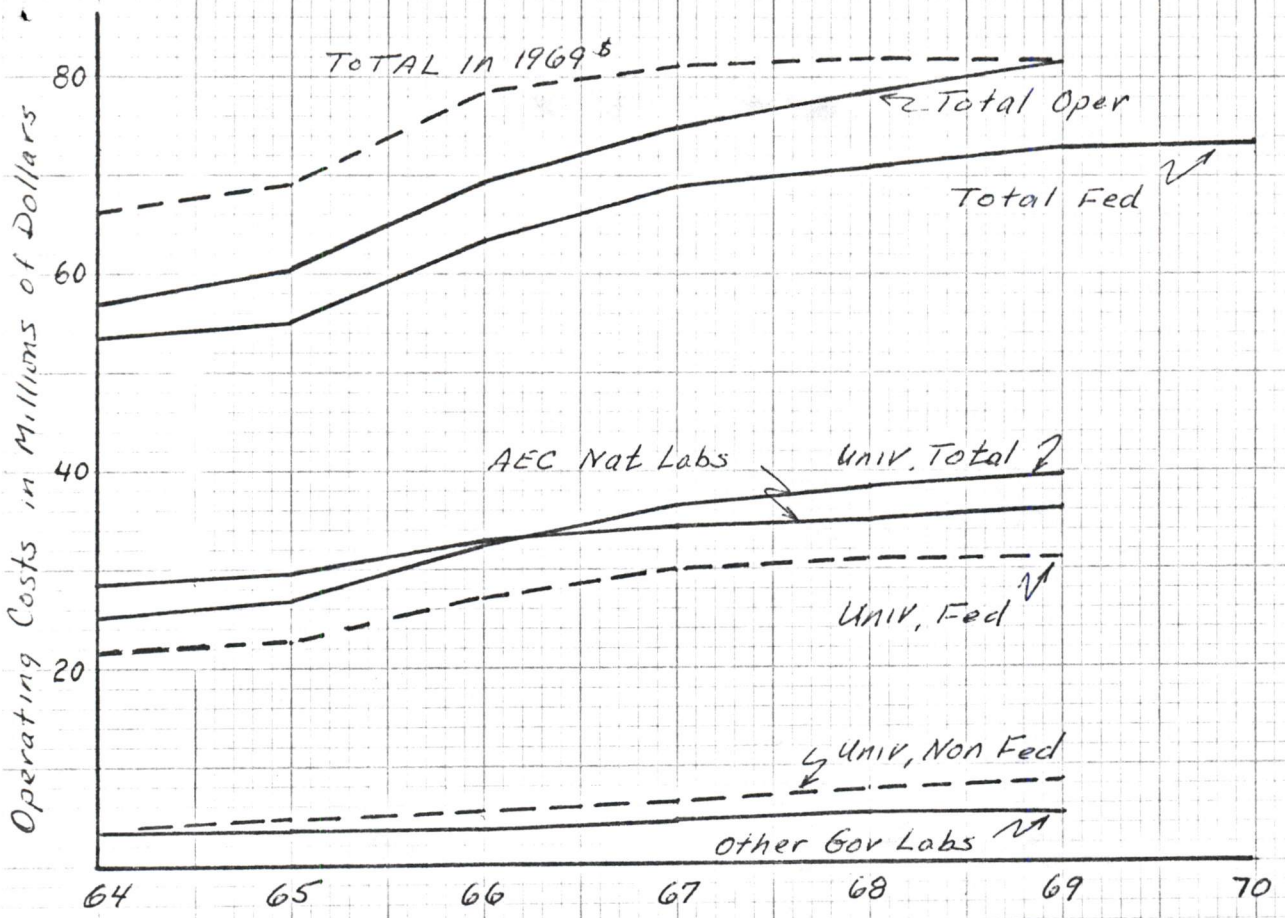
The medium energy physics program of AEC involves work at energies above 50 MeV and less than 1000MeV, or for complex projectiles, more than 10 MeV per nucleon. For purposes of this Report, it is useful to subdivide the medium-energy program into two categories, one which we call "Intermediate" (I) - largely based on cyclotrons in the range of 50 to a few hundred MeV, and the other "high energy" (H) referring to instruments above this range, to 1000 MeV. For the latter category (H), we have included only one half of the total budgets, as a measure of the fraction of the programs devoted to the nuclear physics program under survey here. The other part is in the purview of another Panel.

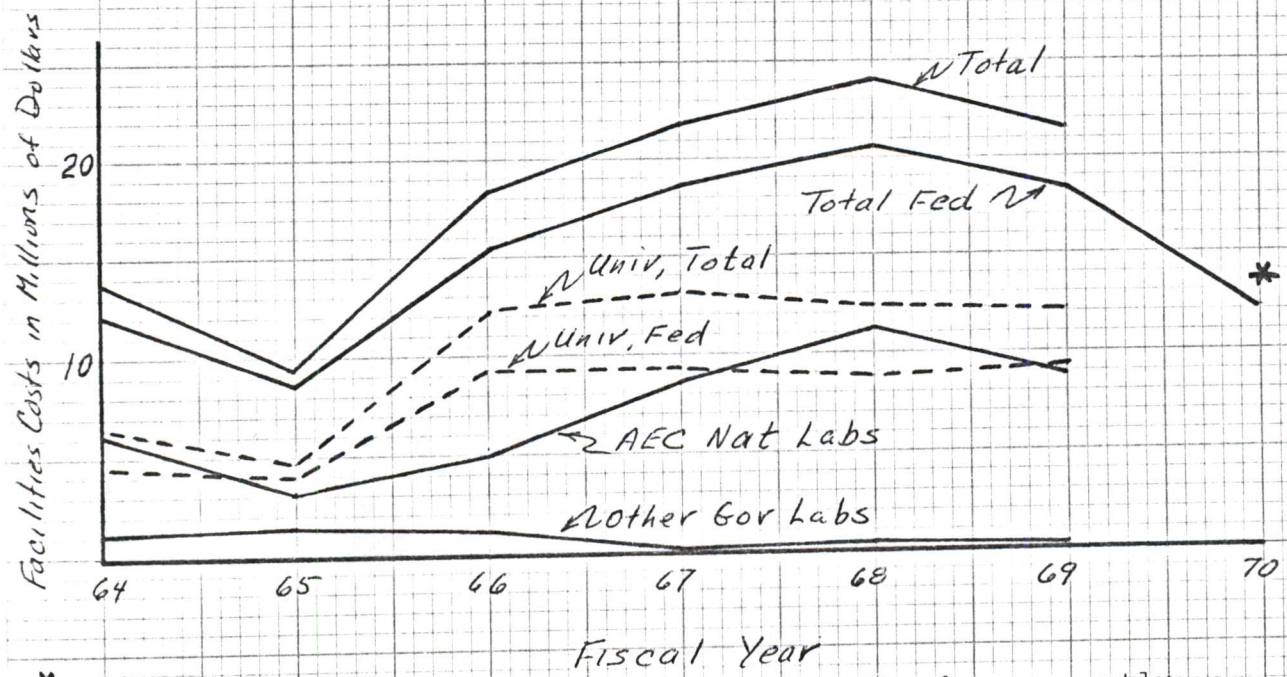
It should be emphasized that certain agencies, e.g., AEC (CHEM), here included as contributing to basic nuclear physics research may have additional important reasons for their support that are *beyond the scope of this Report.*

As in Table VI-1, "Operations" here includes minor capital equipment -- generally about 10 percent -- required to support an on-going operation. "Facilities" are generally such items as new accelerators, computers or other major equipment which appreciably expand the capability of a project.

Insofar as they are known to us, industrial contributions to support of basic research are included in the category "Non-federal", in Table VI-1.

FIGURE VI-2





* Facilities costs project to zero in about 1973, when presently authorized installations will be complete. No new authorizations are presently in sight.

THE INSTITUTIONAL STRUCTURE OF NUCLEAR RESEARCH

An institutional structure for research in basic nuclear physics has gradually developed over the past 25 years that simultaneously encourages an intense and productive research effort, the training of young nuclear physicists, and fruitful ties to other scientific fields and to our technology. In this section a brief summary of this structure, its institutions and sources of support is provided.

Sources of Funds

The several sources of funds for basic nuclear research reflect the many applications of nuclear physics. One of the chief missions of the U.S. Atomic Energy Commission is to sponsor research into all aspects of nuclear science. The largest share of basic nuclear research funding comes from this source -- about $57 million in operating funds in FY 1969. The Low-Energy Physics, Medium-Energy Physics and Chemistry Programs of the Division of Research sponsor basic nuclear physics at universities and at the AEC's national laboratories. The Division of Military Applications sponsors within two of the AEC laboratories such basic nuclear research as is consonant with its special mission.

The National Science Foundation has dual missions of supporting basic research and education . Its operations budget for nuclear physics in the university laboratories has grown gradually -- from $2.7 million in FY 1964 to $9.7 million in Fy 1969. It is the second largest source of funds for basic nuclear research.

The Department of Defense pioneered in the support of pure nuclear physics research in the universities, but its support has been cut back over the years since 1965. It has, however, maintained a strong interest in its in-house facilities. The basic nuclear part of this interest has been included in the tables. The National Bureau of Standards and the NASA nuclear facilities carry the mission-motivated interest in nuclear physics of these agencies -- a part of which is in basic nuclear research. Industry supports a very small basic nuclear program.

The separation between sources of support for basic nuclear physics carried on as part of the main mission of the AEC Division of Research or the NSF, and as an adjunct to another mission of the AEC Division of Military Application or the Defense Department agencies, may become increasingly important during funding exigencies, since the bases for establishing priorities are likely to be quite different in the two cases.

The Research Institutions

The university laboratories together with the AEC national laboratories constitute by far the greatest part of the basic nuclear research effort. The mission-oriented laboratories form the remaining research effort. The manner in which these laboratories function and the nature of their contributions to the objectives of the research program are somewhat different, although the fundamental motivation -- to advance nuclear science -- is the same. In considering their separate functions, it is natural to focus on the differences, but it is important to keep in mind that there are considerable overlaps between them. Both the differences and the overlaps are essential ingredients in a

balanced overall program.

Both universities and research institutes have demonstrated that they are successful institutional forms for pursuing scientific research goals. In the massive federally supported nuclear research effort which grew up after World War II, both institutional directions were followed quite successfully. The national program has been characterized by a fairly even division of funds and scientific manpower between the two, and there have been no major changes in this division.

University Programs

In the case of university laboratories, it has long been recognized that the educational and research aspects must go hand in hand. Without an active and viable research program, advanced education is stultified. Consequently, the approach to nuclear research in the universities has tended to emphasize projects in which graduate students could usefully participate, projects with time scales of a year or two, utilizing apparatus which could be managed by small teams. In general, the needs of many university laboratories were met by the smaller and more easily managed accelerators -- mostly electrostatic generators that still provide a broad range of research opportunities. There are, however a few university laboratories that run sophisticated and highly instrumented installations with large staffs and budgets.

The distribution of federal support for university programs in nuclear physics measured in terms of federal operating funds expended in FY 1969,

as shown in Table VI-3a, b, ranges from small projects to large programs comparable in size to those undertaken at the national laboratories. The number of universities having programs costing less than $100,000 per year is sizable, however, the funds in these programs are less than 4 percent of the total federal budget for universities and represent about 9 percent of the scientific man years of effort going into the national basic nuclear physics program. About 70 percent of federal funds and 60 percent of the scientific manpower are used in the programs of 22 universities. The cost of maintaining a scientist in the larger programs is about double that in the smaller groups -- reflecting the costs of larger and more complex facilities.

The funds for operation of the university laboratories, as shown in Table VI-3a, come mainly from the Federal government, but there is considerable additional support fron non-federal sources, especially in the smaller programs. In 1969 about 20 percent of operation funds were provided by non-federal sources, but the largest programs are almost wholly federally supported.

TABLE VI-3a

DISTRIBUTION OF BASIC NUCLEAR RESEARCH FUNDS AND MANPOWER IN UNIVERSITIES

FY 1969

Range of Oper. Funds	No. of Univ.	Fed. Oper. Funds	Total Oper. Funds	$ non-Fed. / $ Fed.	Scient. Man Years Expt.	Theo.	Tot.	Total Cost per SMY
< $ 0.1 M	33	$ 1.11 M	$ 1.95 M	0.76	35	20	55	$35 k
0.1-0.3	21	3.50	5.76	0.64	83	32	115	50
0.3-0.5	9	3.53	5.12	0.45	80	10	90	57
0.5-0.8	9	5.42	6.94	0.28	103	25	128	54
0.8-1.2	8	7.93	9.82	0.24	107	37	144	68
1.2-2.1	5	8.47	8.89	0.05	114	19	133	66
TOTAL	85	$30.0 M	$38.5 M	0.28	522	143	665	$58 K

Table VI-3a gives the distribution of operating funds and manpower for nuclear research among universities. The basic data were obtained from a census of all federal grants and contracts for 1969, supplemented by a questionnaire distributed to a large fraction of the active research groups. For this Table, all of the individual projects in a given university have been grouped together. In addition, projects in the immediate neighborhood of a major university facility have been included with the larger group. The resulting entries thus represent size distribution of more or less independent and self-sufficient research units. Particularly among the smaller units, there will be some who operate primarily as users of distant facilities: for the smallest class, with budgets < 0.1 M, about half are of this character.

Total federal operating funds here represent the total of grants and contracts, exclusive of facilities or construction funds. Non-federal funds were obtained from the questionnaires. To correct for non-respondents, the ratios (Non-federal/federal funds) were determined for representative members of each class and the total federal funds then multiplied by these ratios. The corrections required were about a factor of two for projects < $100 k, 20 percent for the class $100-300 k, and negligible for larger projects.

The number of scientific man years was obtained from the questionnaires, with non-respondents dealt with by assuming a constant cost per SMY within each class. Again, for the two smallest classes, the corrections were about a factor of two and 1.2 respectively. Of the total 665 SMY, 598 represent actual questionnaire reports, so the total is probably correct to about 10 percent for projects having federal support in 1969. The indicated division between experimentalists and theorists is much less certain.

TABLE VI-3b

Size Distribution of University Projects, FY 1969

Range of Oper Funds	No. of Projects	Total Fed. Oper Funds	Median Oper Funds
< $100 k	96	$ 4.1 M	$ 35 k
100 - 300	29	4.6	130
300 - 500	13	5.3	420
500 - 800	13	8.2	600
800 - 1200	8	7.9	900
TOTAL	159	$30.1 M	$ 75 k

Table VI-3b shows the distribution in size of university nuclear research projects, measured in terms of federal operating funds expended in FY 1969. A "project" here means an individual grant or contract with a named principal investigator. In a few of the larger projects where significant particle physics is carried on, only half of the funds are entered here.

The total operating funds given here differ by about $1 M from those of Table VI-1 because the present figures are based on the 1969 census of individual projects while those of Table VI-1 are based on adjusted summary data provided by the federal agencies.

It is worth noting that while the project sizes in nuclear physics have a broad distribution, the number of small contracts is especially large. In fact, one-half of the total number of university projects operate at less than $75 k per year and their total expenditure amounts to $2.8 M, or less than 10 per cent of the total for universities. However, we should also note that not all of these small projects operate independently. In fact, as shown by the distribution in Table VI-3a, by far the largest number are either associated with or at least contiguous with larger groups.

The AEC National Laboratories

The AEC national laboratories carry out basic and applied research in support of the the agency's mission. The Division of Research sponsors basic nuclear research at the Ames, Argonne, Brookhaven, Oak Ridge, Lawrence (Berkeley) laboratories and at the new Los Alamos Meson Physics Facility. The Division of Military Applications, as part of its large nuclear programs at Los Alamos and Livermore, has sizable, mission-connected basic nuclear programs. The Division of Reactor Development and Technology has important projects at the national laboratories; these programs are not classified here as basic nuclear physics but are very closely related. The close relation between nuclear physics and its numerous applications in our society is reflected in this organizational arrangement.

The 1969 operating funds for basic nuclear research at the AEC national laboratories -- about three-quarters from the Division of Research -- are just a little less than the total Federal and non-federal operating support of universities. The national laboratories are large and complex organizations made up of many sizable projects. The distribution of the sizes of these projects and the scientific manpower they require is given in Table VI-4. The tendency toward larger-sized projects at the national laboratories is consonant with their mission.

The AEC laboratories have taken on nuclear research programs that closely involve large costly instruments and complex or long time-scale operations. Instrumentation and accelerator design and development work,

as part of the forefront research effort, has been an integral part of the programs. The importance of ensconcing this work in a strong basic research program cannot be overemphasized. Similar considerations apply to another traditional mission of the national laboratories; the construction, management and operation of special facilities that otherwise could not be available to the national community of scientists. For example, the Los Alamos Meson Physics Facility now under construction is beyond the capacity of any one university group. Such facilities are shared with outside scientists carrying on independent research -- as user-groups. The successful operation of such installations requires the sophisticated backup that can only be realized by an in-house research effort that is itself of the highest quality. The research activities are not divorced from the training of young scientists, for post doctoral training is part of the program of most of the national laboratories.

Special emphasis as noted for the national laboratories and, in the previous section, for the university groups, should not obscure the close coupling of purpose and scientific talent. In fact, the close working relations which have developed have greatly strengthened the role both communities can play in the future of nuclear physics. The success of the new national facilities, which will loom large in the nuclear effort, is predicated on this cooperation.

TABLE VI-4

Size Distribution of Laboratory Projects, FY 1969

Range Of Oper. Funds	No. of Projects	Total Oper. Funds	Median Oper. Funds	SMY	Cost per SMY
< $100 k	33	$ 1.7 M	$ 50 k		
100 - 300	45	8.5	200		
300 - 500	21	8.0	380		
500 - 800	10	5.9	580		
800- 1200	7	6.6	950		
1200- 1800	4	5.9	1500		
Total of Above	120	$36.6 M	$ 200 k	---	---
(Not classified:		$ 5.3 M)			
TOTALS		$41.9 M		505	$82 k

Table VI-4 shows the distribution in size of projects at national and government laboratories. A "project" is here somewhat loosely defined as the minimum unit easily distinguishable in the budget and having some degree of independent management within a major division of the laboratory. The DMA laboratories have been omitted from the listing because their organizational structures did not lend themselves easily to the present categorization.

Comparison with Table VI-3b shows that the administrative groupings tend to be much larger in the laboratories than in universities, with a median size of about $200 k as opposed to the universities' $75 k. A part of this difference comes about because many of the laboratory groups are involved in operating large facilities (see Table V-1, Chap. V).

Mission Oriented Government Laboratories and Industrial Laboratories

The mission oriented laboratories of the DOD, NASA, and the NBS play a small but significant role in the total basic nuclear research enterprise,one that permits rapid exploitation of ideas and results that are applicable to the mission-determined problems of the parent organizations. The industrial nuclear laboratories have similar aims. All of these laboratories contribute to nuclear knowledge; most importantly they form a bridge between nuclear science and its applications. This overlap of interests is essential to insure a vigorous interchange of people, ideas, and knowhow between mission-oriented and basic activities, a feature which has been very important in the success of the U.S. program. The importance of this coupling is developed in detail in Chapter III.

USERS-GROUP AND COLLABORATIVE PARTICIPATION

The description of nuclear physics research in terms of separate laboratories and separate projects is especially appropriate because the prevalent pattern has been a research group with its own in-house accelerator and equipment. The reasons for this pattern are inherent in the nature of nuclear experimentation. The general situation is that the experiment is carried out as a unit, using the accelerator and auxiliary equipment until completion. This close coupling of accelerator time and experiment time is the basic reason for the large number of facilities -- each utilized to near-capacity by its own staff -- required by the nuclear programs.

This prevalent pattern is, however, not the only one in nuclear research. A number of large facilities at the national laboratories and the largest of the university-connected laboratories have nuclear research programs initiated and carried out by outside scientists. As nuclear physics research moves toward the use of large facilities -- the new Los Alamos facility or the Brookhaven tandem Van de Graaff -- the users-groups arrangements appropriate to such large installations will become more the rule.

In discussing participation by outside groups, one may distinguish two different modes: as collaborators with the in-house staff directly cooperating on an experiment and not requiring any special arrangements; as a users-group carrying out research independently of the in-house scientists and sharing only the accelerator and some major auxiliary equipment. Such users' arrangements are a very important part of particle physics and optical and radio astronomy, research. Users-groups require special arrangements if their activities are a sizable fraction of the work at a facility: logistic and technical support must be arranged; support staff to take care of the operation and maintenance of the facility are required so as not to burden the in-house staff with the whole of the "house-keeping chores," The physical layout of the laboratory must be such as to make it possible for visitors to set up their experiments independently, without interfering with on-going runs. The new major facilities take these needs into account. Existing facilities, especially in the larger laboratories, although not designed for this purpose could be restructured for users-groups,

but at the expense of considerable money and effort. On the other hand, collaborative participation can be effected immediately since it would simply entail merging with on-going efforts.

With the exception of certain unique facilities, there is only small usage in the current nuclear programs, about 10 percent of the time, of facilities by groups from other institutions. Even in these instances, a part of this small outsider usage is on a collaborative basis with the in-house staff.

A natural question that arises at this time of funding exigencies is whether a new pattern of research style is required. Except for the largest, nuclear facilities are keyed to utilization by a research group with a ~~very~~ few principal investigators. From the viewpoint of carrying out nuclear research at these moderate sized facilities most efficiently, nothing is gained by splitting the manpower between institutions except increased travel and equipment duplication costs. There would be a gain in a users-group participation in a moderate sized facilitity were it staffed well below its capacity, but no adequately funded nuclear laboratory is now in this position. However, were funding cuts administered so as to cut staffs in an across-the-board way, such a situation might be produced. From the standpoint of cost-effectiveness, it would then be more advantageous to keep some laboratories fully staffed and to drop others completely. There are, however, ~~other~~ considerations beyond simple cost-effectiveness.

Institutions and scientists cut off from active research possibilities, lose touch with their field in a way that is not easily reversible. Collaborative participation goes some of the way toward a palliative solution if some additional funding for travel and salary is available -- but if required on a massive scale this might well prove too burdensome to be workable.

Special situations for users-groups or collaborative participation might well offer special opportunities that must be measured against other needs and priorities: the opening of research facilities to emerging institutions that could not otherwise attract a staff, opening research opportunities to good younger scientists at smaller institutions, and encouraging industry-university interactions. Should funding constraints close off research opportunities to some universities, the educational opportunity that would be lost might be partially saved in this way. The new, major facilities are based on utilization by many separate groups each having one or several principal investigators. Users-group participation is then the natural mode, and is, indeed, predicted for these installations.

SCIENTIFIC REVIEW MECHANISMS -- THE NEED FOR NUPAP

A variety of mechanisms operates to insure high quality in the national research program. These all depend on the rigorous judgments of the informed research community marshalled in informal and formal ways.

It has been the useful custom to convene ad-hoc committees to review at the national level the need for specific new large-scale programs

and to help define the form and direction of such programs. Other ad hoc groups have from time to time been asked for an overall assessment of the field of nuclear physics; this Panel is the latest of such groups. These direct uses of the nuclear community seem to us a necessary review mechanism for the whole program of nuclear research.

At the same time, this Panel believes that a longer perspective might be achieved if a continuing panel were formed to review and report on the field. In a time of funding constraints it is especially true that sizable new programs affect all the programs in the field, both future and ongoing; this makes it important to assess the whole field on a continuing basis. We concur, then, with the recommendations of the Pake Committee that a Nuclear Physics Advisory Panel be formed to advise all government agencies supporting the field. We do not specify the administrative arrangements for this body; however, it is essential that they be such as to permit direct and easy communication with the funding agencies. We urge that this proposed Panel have available an information-gathering capability, in order ~~so as~~ to insure a continuously updated expertise. It is vitally important that the membership of this Panel be appointed on a rotating basis, and that it represent all aspects of the field and its practitioners.

FUTURE DIRECTIONS

We stand today with an impressive nuclear physics establishment, one that has the intrinsic capacity to make still further important contributions to the science and its applications. Viewed as a system for producing new nuclear knowledge and trained young scientists, we have a capital investment of several hundred million dollars, and a cadre of scientists numbering over 2,000. What this investment and staff ~~has~~ have produced in the past and ~~is~~ are producing now has been well documented; it can scarcely be doubted that it has much more to contribute.

Before discussing plans for the future of nuclear physics, we need a summary of the present program and the facilities now being constructed or devised, together with their budgetary needs.

Present Program

The program that has grown over the years is multifaceted, and is based on a broad range of experimental facilities that provide the necessary spectrum of complementary approaches to the study of nuclei. As discussed in in Chapter II on the science of nuclear physics, such a many-sided program is an intrinsic necessity because of the very nature of nuclear studies.

In Chapter II, we have discussed how the different parts of the program combine toward the objective of building a full picture of nuclei. In reviewing the present program it is important to correlate ~~these~~ this objectives with the nuclear research activities and facilities.

Table VI-5 shows the distribution of nuclear projects according to their main research activity or facility base.

The facilities and the physics are, of course, closely intertwined. Much of the precise and in-depth work on the structure and dynamics of low-lying nuclear excitations has come from the Van de Graaff facilities which have the necessary precision and variability of energy and projectiles; exploration into the intermediate energy regions beyond have primarily used cyclotrons. For example, very interesting experiments demonstrating high-lying excitations corresponding to removal of nucleons from deeply buried shells are mainly cyclotron work. Neutron facilities are actually a very diverse class including nuclear reactors, which with time-of-flight instrumentation provide neutrons with well defined energy over a broad range. This diversity corresponds to the wide utility of neutrons in nuclear experimentation -- both basic and applied, ranging from simple production of new radionuclides to direct use in studies of nuclear dynamics.

Heavy-ion work, we have seen, is still in its early stages of exploration. The interaction between massive amounts of nuclear substance is largely unknown; knowledge is increasing as the capability for accelerating heavier ions to higher energies is slowly being extended. Heavy ions can be applied to the measurement of nuclear properties and states that cannot be reached with other techniques. In the U.S. program the important special application to new super-heavy elements awaits completion of the upgrading of the Berkeley heavy-ion accelerator, (HILAC).

Electron accelerators have been the means for probing the nucleus through the delicately informative electromagnetic interaction as already discussed in Chapter II. High-energy electron facilities have been especially useful in providing the earliest information on the short-distance structure of nuclei. As beam energies have been extended, this distance scale has become finer and finer. The complementary short-wave length probing with strongly interacting nucleons and nuclear studies, with mesons ~~form the~~ comprise the nuclear research field of the present high-energy facilities. The Los Alamos facility, now under construction will greatly extend the capabilities in this direction.

Theory groups, while listed separately because of their separate funding pattern, play an important role in all of the research directions already described besides the purely theoretical problems. Of great significance is the fundamental work on the basic theoretical problem of quantitatively connecting already well established nuclear information with the primary force between nucleons. Theorists are especially important to a field as broad and diverse as nuclear physics in helping to provide the essential unifying component.

The non-accelerator based activities round out the program in special ways.

This briefly outlines the scope and distribution of effort of the nuclear program as it now exists. Together with the facilities coming into operation (described in the following section) it illustrates the broadly based program which we consider essential for rapid progress in nuclear

physics. It is necessary in planning future programs to appreciate the range in the quality of facilities within each of the categories; for there is a wide range in accelerator capability and instrumentation sophistication. Under the constricted budgets of the past several years, the needed up-grading of equipment has been impossible in many laboratories. We believe that it is important to carry forward the present work as part of future programs; it seems necessary that these investigations exploit the most powerful instrumentation and facilities available. In our discussions we shall assume this point of view in responding both to the possibilities of increasing funding and the exigencies of decreasing budgets.

New Facilities Coming Into Operation

Concomitant with the evolution of the program just described has been a recognition of an impending need for a reach into quite new, and hitherto inaccessible regions of study. For some years now, more powerful and more versatile accelerators have been under construction in the U.S. and abroad and the years 1969 - 1973 will see the completion of about $130M worth of advanced facilities in the U.S. alone (Table VI-6).

A review of the largest of these projects is necessary to illustrate their importance in the future nuclear programs. The LAMPF (Los Alamos Meson Physics Facility) is a high intensity proton linear accelerator designed to attack the high energy or short-distance frontier with high energy nucleons and mesonic probes. With its enormous beam intensity and copious production

TABLE VI-5

DISTRIBUTION OF BASIC NUCLEAR RESEARCH PROJECTS BY ACTIVITY, FY 1969

Project Type	No. of Projects	Operation and Research Cost Federal	Sc Man[c] Years
Primarily Accelerator-Centered			
1. Neutron Facilities	12	7.7	80
2. Potential-Drop Machines	64	19.5	350
3. Cyclotrons	21	14.2	190
4. Heavy-Ion Accelerators	2	3.1	15
5. Electron Accelerators	10	5.8	60
6. High Energy Facilities	4	2.1	20
	113		
Non-Accelerator Centered			
7. Theory	48[a]	5.0	195
8. Nuclear Spectroscopy	25	3.9	65
9. Nuclear Chemistry	30	4.9	95
10. Accel. Devel., Inst .	6	3.8	45
11. Nuclear Data	4	0.9	15
12. Other	15	1.8	40
TOTALS	241[b]	$72.7 M	1170

a. There are 48 separately funded theory groups with an operating budget of $4.0 M (Federal) and 150 SMY; another 45 SMY and ($1.0 Federal) are theorists that are part of the accelerator-based groups.

b. This total is smaller than the total number of "projects" as defined in Tables VI-3B, 4 because we have here grouped together all of the projects attached to a given accelerator.

c. Scientific man years are estimated totals, including both federally and non-federally supported scientists (see Table VI-1).

Table VI-5 subdivides the field of nuclear physics research according to kind of activity, as determined by the general nature of facility employed. Such distribution is necessarily crude, but is useful insofar as different accelerator types represent distinct experimental capabilities and different approaches to the nuclear problem. Thus neutron facilities are generally - but not always - used to measure cross sections and to study details of energy level structure, while electron accelerators are generally - but not always - used to study electromagnetic interactions. The ordering of the various accelerator categories is very roughly by energy range, but is also somewhat historical, in the sense that future programs will tend to place relatively more emphasis on the higher energy facilities.

Also listed are some general categories of non-accelerator centered activities: those for which immediate access to an accelerator is not essential, or for which the major part of the work is done off-line.

Some more specific comments:

1. Neutron Facilities. 7 major reactors are included. However, 3 electron linear accelerators are also considered to be engaged primarily in basic neutron research and are entered here. The Los Alamos (Nevada) nuclear explosion project is included, as is a part of the Nevis synchrocyclotron operation.

2. Potential-Drop Machines. Included here are 1, 2 and 3-stage Van de Graaffs and Dynamitrons. More than half of these are single-stage machines with terminal voltages $\leq$ 6 MeV, accounting for about $ 2.6 M of the total funds. A good many small machines have been omitted here as either not funded or being used as injectors for larger installations.

3. Cyclotrons. The list includes 7 active fixed-frequency machines, all 15 years or more old. The major portion of effort and cost is devoted to the AVF cyclotrons ranging from 50 to 260 inches in pole face diameter. The largest of these, the Indiana machine, is not yet in operation and has been listed as an accelerator development project.

4. Heavy Ion Accelerators. Although many other machines accelerate heavy ions, we have included here only the Yale and Berkeley HILAC's. The latter is presently undergoing an extensive conversion program.

5. Electron Accelerators. Included here are the linacs, ranging from 22 to 1200 MeV, and 1 synchrotron. Three of the linacs have been considered to be primarily neutron facilities. Only one half of the Stanford operation is included in the cost estimate.

6. High Energy Facilities. Six synchrocyclotrons are included of which two are now retired: costs have been divided by two. LAMPF costs (again 1/2) are carried as "accelerator development".

7. *Theory*. *To provide an assessment of the total effort devoted to theory, we have included not only separately funded groups, but also an (admittedly rough) estimate of expenditures by theoretical groups operating within experimental contracts or grants. Included in the table are some 64 university groups, spending $3.0 M and 7 groups in national laboratories, spending $2.0 M.*

8. *Nuclear Spectroscopy*. *These are groups working mainly with radioisotopes, produced in a variety of facilities.*

9. *Nuclear Chemistry*. *Nuclear physics work, mainly on radioisotopes and fission, supported under AEC chemistry contracts. Chemistry groups working directly with specific accelerators have been listed in the facilities categories above.*

10. *Accelerator Development and Instrumentation*. *Six groups, including LAMPF and Indiana developments.*

11. *Nuclear Data Compilation*. *Four groups, spending about $900 k. The CINDA operation is not included.*

12. *Other*. *Astrophysics* ($400 K), users groups ($400 K) and *projects not otherwise categorized* ($1.0 M).

of secondary particles, LAMPF will provide a new capability for nuclear structure and meson physics explorations. The Nevis cyclotron modification program is also designed to tackle these questions but in limited scope because of its more modest beam intensity.

The MIT and Stanford electron accelerators will investigate short-distance nuclear phenomena with high-energy electron scattering, an approach that is complementary to the LAMPF and Nevis investigations. The converted Lawrence Radiation Laboratory heavy-ion linear accelerator (super-HILAC) will make possible work with very heavy ions -- mostly in a search for heavy and super-heavy elements. The physics of heavy-ion studies has excited the interest of the nuclear community, as is evidenced by the large number of proposals for new heavy-ion facilities. The new Brookhaven National Laboratory double-tandem Van de Graaff installation will extend the range of precision heavy-ion studies now possible, in addition this unique facility will extend to higher energies the flexible, high-precision investigations that have proved so profitable with the lower-energy tandem Van de Graaffs. The capability at energies intermediate between this region and the high energy region will be enhanced by the Indiana and Maryland cyclotrons with beams of light and heavy-ions. The Oak Ridge National Laboratory electron accelerator (ORELA) is already in action in high intensity high-quality neutron studies.

In summary, this complex of new facilities already approved and under construction, constitutes a consistent effort to advance the field in new directions, in a deliberate and prudent way. However -- and herein lies a major difficulty -- these accelerators will be expensive to operate. As shown in Table VI-6, it is expected that by 1975, about $30M per year will be required for operations and nuclear research associated with just these instruments. This is some $16M per year more than was spent in 1969 in program buildup at these facilities (or in the facilities they will replace). To put the matter in another way, the cost per scientific man year for the new facilities -- including users -- will be nearly $100 k, as compared to the approximately $60 k per man year average for the present program.

We note here a practical problem of funding distribution which can have important consequences for our budgetary considerations. Several of the most costly installations under discussion have capabilities in nuclear and other branches of science. In order to restrict ourselves to the nuclear physics purview of this panel, we have dealt here only with the nuclear part of their programs, estimated to average about one half (see caption to Table VI-1). The significance of the budget categories used in this Report depends upon whether part or all of these new facilities is included. To cover the latter eventuality we have included a corresponding entry in Table VI-6. The total costs in this case rise from $18.1 M per year in 1969 to $41.9 M in 1975, an increase of $25 M instead of the $16M cited earlier.

TABLE VI-6

BUDGET ESTIMATES
FOR NEW FACILITIES UNDER CONSTRUCTION
IN FY 1969

	FY 1969			Full Operation	
	Constr. Cost	Oper. Cost[c]	SMY	Est. Oper. Cost[c]	Est. SMY
1. Neutron Facilities					
ORELA[a]	$ 4.8 M	$ 0.7 M	7	$ 1.3 M	14
2. Potential Drop Machines					
BNL (3 stage)	12.0	1.7	9	2.9	35
Other Accel (7)[d]	13.0	2.0	42	4.2	68
3. Cyclotrons					
Md. and Ind.	17.1	1.0	21	2.1	28
4. Heavy-Ion Facilities					
LRL HILAC	2.7	2.6	11	3.6	15
5. Electron Accel.					
Linacs (4)[b]	19.3	2.9	35	6.1	73
6. High Energy Fac.[a]					
Nevis	3.9	1.0	8	1.2	10
LAMPF	56.0	2.1	15	6.8	43
LAMPF users		0.1	1	2.2	25
TOTALS	$128.8 M[e]	$14.1 M	149	$30.4	311
With full cost of High Energy Facilities		$18.1		$41.9	

a. One-half of operating cost and SMY.

b. Includes the Stanford Superconducting linear accelerator which also qualifies as a "high energy facility."

c. Federal Dollars, 1969 Value.

d. Two of these were state financed.

e. About 10% is non-federal.

Table VI-6 presents the estimated costs, in FY 1969 dollars, of operation and research for major new facilities which were under construction or just completed in FY 1969. Costs listed include operation and maintenance of the facility, and costs of the directly associated *research program, including capital equipment. Expenditures in FY 1969 represent development work, partial operation, or current research on a facility which the new equipment will replace. For consistency with earlier tables we have listed only half of the costs involved in high energy facilities (Stanford, Nevis, LAMPF), on the assumption that only about half of the programs lie in the purview of this Panel. Only half the operations cost of ORELA is included here to reflect our estimate of the portion of the total program to be designed as "basic" nuclear physics.*

Estimates for full operation assume some reasonable optimum level but not necessarily the maximum possible. For example, the LAMPF figures assume 15 shifts per week (of which 3/8 are here assigned to nuclear physics). The estimates also assume adequate, but not luxurious, technical and* materiel support -- about on the *1967 scale of the larger laboratories.*

For some of the facilities listed, full operation is possible almost immediately. For others, notably LAMPF, the programs will build up gradually, until 1975 or 1976. Within the accuracy of the estimates, a linear increase in annual funding to $30 M per year in 1976 would permit full utilization of these facilities, subject to availability of other support for the half of the high energy facilities not assigned to nuclear physics. Full support of these facilities would cost about $12 M more, making a total of $42 M in 1976.

** The full cost of operation and maintenance of LAMPF is assigned to basic particle and nuclear physics* research, but approximately *one quarter of the beam time will be used for applied research.*

Future Facilities*

There are well defined and important directions in which nuclear physics should move that will require complex machines and large laboratories beyond those outlined so far. Among the most pressing and most fully designed are heavy-ion facilities, for which there have been about a half dozen proposals. Such facilities would greatly extend the capabilities of the super HILAC or the other facilities now beginning exploration in this field. To maintain the momentum already built up in this field, two national installations (costing about $25 million each to construct and $8 million per year each to operate) should be initiated as soon as possible. If they were to be funded in FY 1972, they could be in partial operation by 1975 or 1976.

At about the same stage in design are large 30 and 40 million volt tandem electrostatic accelerators which could provide quite respectable heavy-ion performance and extend the precision and flexible characteristics of these machines into a quite new and important energy region. Facilities incorporating such machines would cost about 15 million dollars to build and some 4 million dollars a year to operate.

New developments in superconducting accelerators are less advanced. The Stanford superconducting linear electron machine should be in operation by 1972. Studies to use such superconducting machines to accelerate positive ions, rather than electrons, are actively under way. If these promising possibilities are brought to fruition, numerous

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*See discussion in Chapter V

very interesting directions for nuclear phyics will be opened. These machines may prove to be the way to produce high fluxes of heavy mesons, such as kaons, for nuclear structure studies. They might be the means to extend high-energy and heavy-ion work. Collective, or electron-ring, accelerators also offer exciting new possibilities that should be exploited, as seen in the discussion in Chapter V. By 1975, at least developmental prototypes of such accelerators should be underway.

The potentialities inherent in very intense neutron generators both for power production applications and for basic nuclear physics have aroused strong interest in the past. The exploratory work of E. O. Lawrence in the 1950's demonstrated that the technology of that time was not adequate for a practical device. The Canadian study of such a facility in the 1960's, under W. B.Lewis foundered on funding considerations. Recent advances in accelerator technology would seem to justify a renewed study program to examine the practicality of such a facility in this decade. The results of such a study program would indicate the consequent development policy. Because the main thrust of the development effort work would be on power production applications, the expectation is that the funding should stem mainly from outside the basic science program sources. However, the nuclear research made possible by such a capability would be a natural part of the basic program.

FUNDING PATTERNS AND THEIR CONSEQUENCES

In the succeeding sections the consequences for nuclear physics of different funding patterns are outlined. In response to the various budget opportunities or constraints, very considerable reorientations of the research areas and research patterns are envisaged as necessary. The reorientations take nuclear physics into a new set of frontiers with new facilities, while continuing to mount the multifaceted program basic to the science. In order to make this exercise as realistic as possible a definite six year period, 1969 to 1975, is used for discussion. Although 1969 is almost three fiscal years ago, it still forms a sensible basis for discussion, since the problems of today are well stated in those terms and almost unchanged in scope. It is our estimate that this period of five to six years will see massive realignments in the nuclear physics establishment, realignments forced by changes in the field itself, superimposed on those determined by the various budget options. If the field is adequately supported, these changes will take place smoothly, and the character of the establishment will probably change only slowly in the succeeding period. If on the other hand, severe budget constraints are imposed for several years, a period of recovery and rebuilding will be required before nuclear physics can again press forward with full vigor.

A Future Budget Matched to the Opportunities in Nuclear Physics

Exploitation of the opportunities now available to nuclear physics requires that we move in all the directions previously discussed: the extension and regrouping of the present program, vigorous exploitation of the new frontiers, and aggressive capitalization on the possibilities now in the early stages of development. What should the research program be in 1975 to achieve these goals?

In laying out concrete plans to bring these about, it has become clear that we will be moving to bigger and more expensive installations -- in dollars and in scientists -- in following the directions dictated by progress in the science. Many limitations crowd in upon us if we are to proceed prudently. Among them is the natural limitation in numbers of scientists available; judging from the experience of past years we can extend our highly qualified scientific manpower by as much as 8 percent a year. However, to accomplish our goals will require more than simple addition of new people. A considerable reorientation of the present program, with both cutbacks and extensions, as well as some change in our style of research. will be necessary. We outline below a 1975 research program that fulfills the goals and obeys the constraints. Such a program would require an increase in the scientific manpower of 8 percent a year, 11 percent a year increase the purchasing power of the operating budgets over those in 1969, and about 180 million dollars of new capital facilities.

As we have seen, the broad based effort of the present program must be continued but with facilities that incorporate the best of nuclear technology. Therefore the present program is to be maintained in part by funding the most productive and best laboratories so as to enable them to operate under optimal conditions; this immediately requires an increase over their present budgets for these groups on the order of 10 percent. At the same time, some of the laboratories, lacking forefront equipment but not scientific leaders, should be permitted to move into the forefront of research efforts with new accelerators and instrumentation now becoming available. It will be seen in the detailed tables that these new laboratories are quite sizable, with large annual budgets of dollars and scientists. They should be considered as regional or national centers with very full users-group participation. The remaining installations in neither of these two classes should be dropped or operated at a minimum level, their scientists being funded mainly as users at the new laboratories. The net results of this plan are that, by 1975, the present program will be extended, then will be bigger and fewer laboratories, each with more men and money; the number of separate and competing research groups may, however, not be significantly different than in the present program. The majority will be outside users rather than resident.

The details are set out in Table VI-7, but some illustrations might be useful. As an example, consider the most numerous of nuclear projects, the Van de Graaff based groups. A new generation of electrostatic accelerators, capable of providing a significant extension

in energy range
and of the kinds of particles accelerated, is now becoming feasible. Three such installations by 1975 would provide the strength to exploit the opportuniti offered by the new accelerators. Each of these would require a sizable laboratory with an estimated operating budget of $4 million dollars and some 45 to 50 scientist man-years annually; about half of these scientist man years would be contributed by users from other institutions. These installations, together with 18 of the most productive Van de Graaff laboratories would form the national effort in this area of nuclear physics with an annual operating budget of about 28 million dollars and 380 scientist man-years. This is to be compared with the present 64 projects funded at $19.5 million and 350 scientist man-years annually.

Similar considerations apply to other categories. The neutron work at some of the reactors and at the best of the linac laboratories should be fully supported. It appears that the national capability for energy-selected neutr will need further expansion, and allowance for such expansion has been included in the budget.

Heavy-ion work is presently being extended by the conversion of the Berkeley HILAC machine. The nuclear community has expressed strong interest in and has formulated plans for heavy-ion facilities that would complement this machine, and we believe that two of these new installations would adequately support the national effort when taken together with the limited but important capabilities in this field of the large electrostatic acceler and cyclotrons. Each such machine would support about 55 scientific man-years of effort, of which about a quarter would represent users-groups.

The high energy facilities now being constructed at Los Alamos (LAMPF) and as part of the conversion at the Nevis Laboratory will provide partly complementary and partly competitive new capabilities. The 184-inch cyclotron at Berkeley, with its higher energy can also contribute to this capability. The LAMPF especially is an intrinsically costly operation, and will channel a large share of the nuclear effort into this high energy direction. The half of the LAMPF program here assigned to nuclear research will require some 43 scientific man-years annually of in-house effort and 25 scientific man-years in users-groups.

As has been indicated by the examples above, a sizable fraction of the scientists utilizing the larger facilities will be users, in the sense that their home bases will be elsewhere, and that they will make use of the facility for relatively brief periods. For many of the research teams in this category, it will be important to maintain some modest facility at home base, for checking out instrumentation, for training student participants, and possibly for pursuit of small scale independent research programs. It seems likely that a large fraction of the presently existing small Van de Graaff and cyclotron facilities would be kept active in this way, albeit with very much smaller budgets than they presently require. Machines of the size of the smallest two-stage tandems can in principle be maintained and operated without large technical staffs, and hence with small fixed costs. The normal budget allocation for an active user group might well include some allocation for home-based activities of this kind which would significantly strengthen their user operation.

The non-accelerator based activities require little further comment. The growth envisaged in these activities fits well within their own potential and that of the whole program.

The development of prototypes of the super-conducting linacs for the acceleration of a variety of nuclear projectiles and of the electron-ring or collective accelerator has been budgeted. Either or both of these may, by 1975, be sufficiently developed to make possible their incorporation in nuclear facilities. These new possibilities together with those generated by the research discoveries of the next few years have been budgeted under "Future Facilities" in what must be considered a very rough estimat

Also in this category of facilities not yet ready for detailed specification are possible new instruments specifically designed to exploit applications to other sciences. The uses of nuclear instrumentation for atomic physics, solid-state studies, and astrophysical work are obviously growing fields which may well require further development on a relatively large scale. Such applications may well require funds to carry them to the demonstration stage.

Finally, we have included a number of small projects, with a total annual operating budget of only 3 million dollars and 50 scientist man-years, to continue in a deliberate way the small group structure that has been the style of nuclear research in past years. These groups would be attacking nuclear problems that do not require the largest installations. While they could be attached to such laboratories, it seems worthwhile to keep them quite distinct for as long as possible, simply because nuclear physics grew well

under such a regime in the past and we should not throw away the mode of past successes as we move into a more frenetic future. Such a dissemination of university research facilities is important also in maintaining the broad-scale character of education opportunities.

The program elements listed in Table VI-7 add up to an annual operating budget of about 139 million dollars in 1975, not quite double that of 1969. Such a rate of expansion in a highly productive enterprise, closely coupled to both our educational systems and to technology, seems prudent.

A continuation of an annual growth of 7.5 percent in terms of 1969 dollars since 1967 would have produced the exploitation program which we have discussed here for FY 1975. However, because the growth rate has decreased since 1967 were we to begin in FY 1972 to build toward this capacity in FY 1975, a growth rate in the intervening period of 15 percent would be required.

We emphasize again that the program which we have outlined is one which has been based on the potential of the field and on the projected availability of the necessary manpower in it. We recognize that in the competition for federal funds it may well be unrealistic to expect the attainment of any such growth rate. At the same time we believe it is unrealistic to think that nothing is lost as this full program is given up ~~given up on smaller programs~~. The expansion of the highly profitable nuclear enterprise, closely coupled to our technological and educational systems, seems an eminently ~~in accord~~ prudent investment. ~~with [illegible]~~.

TABLE VI-7

ELEMENTS OF AN INCREASING BUDGET
1969 - 1975
(In Dollars of Constant Value)

	FY 1969			FY 1975			
	No. of Facilities	Operation and Research Cost	Sc.Man Years	Est. No. of Facilities	Est Operation and Research Cost	Est. Sc.Man Years	Est. Constr. Costs 1970-75
1. Neutron Facilities	12	$ 7.7 M	80	6	$ 10 M	100	$ 8 M
2. Potential-Drop Machines	64	19.5	350	21	28	380	55
3. Cyclotrons	21	14.2	190	10	16	180	40
4. Heavy-Ion Accelerators	2	3.1	15	3	16	125	53
5. Electron Accelerators	10	5.8	60	6	12	120	14
6. High Energy Facilities	4	2.1	20	3	13	120	45
7. Theory		5.0	195		12	360	
8. Nuclear Spectroscopy		3.9	65		3	50	
9. Nuclear Chemistry		4.9	95		8	115	
10. Accel. Devel., Instr.		3.8	45		4	50	
11. Nuclear Data		0.9	15		1.5	30	
12. Other		1.8	40		2.5	50	
13. Future Facilities				2	10	70	
14. Small Scale Ventures				20	3	50	25
TOTALS	113[a]	$72.7[c]M	1170	71[a]	$139[c]M	1800	$240[b]M

a. Here and in subsequent tables we enumerate facilities only.

b. About $60 M of this sum represents facilities, already authorized before 1969.

c. Federal Dollars, 1969 Value

Table VI-7 is designed to indicate how one might best exploit the nation's nuclear research capability to achieve the *goals of advancement of knowledge, education, and technology outlined in the text. As will appear, it is our estimate that, even without explicit financial constraints, the program does not involve unreasonable expenditures, but only a moderate increase which should be easily attainable in an environment of general economic growth.*

This is a manpower limited budget. The number of scientific (PhD-level) man-years devoted to basic nuclear research in 1969 was about 1170 (Table VI-5). About 200 nuclear physics PhD's were granted in this year, about 10 per cent of the number of PhD's in the field; assuming a comparable rate for the next several years, and noting that some will leave the field by choice, and that others will teach part time, we estimate a net increase of 6 to 8 per cent SMY per year, with a total reaching possibly 1800 in six years.

The priorities as we envision them, for either a manpower-limited or a dollar-limited budget are the following:

To exploit recently constructed facilities which give access to high-energy interactions (500-1000 MeV) and to nuclei far outside the normal stability region.

To restore and strengthen the broad base of multi-faceted programs which provide breadth to the attack on nuclear problems and represent the principal channels into education.

To follow up the entry already made into the intermediate energy region of 50-200 MeV.

To anticipate the needs for new equipment to exploit the results of the present preliminary explorations.

In the Table we present some rough, but considered estimates of how these objectives might be met. Although we have again, as in Table VI-5 caricatured the nuclear physics community mainly by its machines, it should be stressed that the considerations that enter the allocations are in fact oriented to quite specific research objectives, as discussed in some detail in Chapter II. The broad change in emphasis which is illustrated in Table VI-7 and Figure VI-3 reflects our assessment of the changing needs and interests of the field. The detailed allocations reflect also what we believe would be the probable response of the existing research groups to the opportunities available for exploitation.

Items 1, 2 and 3 in Table VI-5, corresponding to the categories "neutron facilities," "potential drop machines," and "cyclotrons" embrace a large part of the traditional multi-faceted attack which yields precise and essential information on nuclear structure and the course of nuclear reactions. At

the same time, the class contains a subset, characterized principally by the higher energy Van de Graaffs and cyclotrons which represents a frontal attack on the newly-opened intermediate energy region. We expect both of these kinds of endeavors to prosper, but probably with little net change in the total manpower. Our projections are based on the assumption that a fairly large number of outmoded facilities will be abandoned and that perhaps six major groups will install new facilities in the class of the 30-40 MeV electrostatic accelerators or the more advanced cyclotrons. Anticipating the opening of new fields in neutron physics with the ORELA machine, we have included provision for another neutron facility on approximately the same budgetary scale. This would not necessarily be a new accelerator; it might very well take the form of a conversion of some existing facility.

Of the total operating budget of $54M in 1975 for Items 1, 2, 3 we estimate that somewhat more than half would involve use of new facilities, including those now under construction (Table VI-6), and the remainder would be devoted to a selection of the most versatile of the presently existing installations. The total cost of the new facilities would be about $100M.

A redistribution of this kind, carried out over the next five years would at once ensure a prudently intensified exploitation of the low energy, high precision field and make possible the systematic pursuit of problems in the intermediate energy field where exploration has just begun. Most of the proposed new installations will also contribute importantly in the heavy ion field.

Implicit in the budget and manpower estimates is the recognition of a trend toward a number of well-supported comparatively large regional centers. Such a policy is a new departure for nuclear research, and not without hazard; some ameliorating provisions can easily be made under the assumed constraints.

Items 4, 5, 6 in Table VI-7, "heavy ions," "electrons," and "high-energy facilities" provide the main thrust into the thus far almost untouched regions of high-energy interactions, and of interactions involving very heavy ions. Because these fields are new, and because we expect that their exploration will be lucrative, we expect a sizable increase in manpower, from about 95 SMY in 1969 to 365 SMY in 1975, with a concomitant increase in annual operating expenditures from $11M to $41M.

In the heavy ion field, we are already proceeding with the Berkeley Super HILAC: in addition, we believe there will be need for at least two complementary major heavy ion facilities with precise and easily varied energies and beams of the kind described in Chap V, Sec. 3. These facilities will cost about $25M each to build, and the operation and research programs

will amount to perhaps $8M annually for each including user programs. (It is, in fact, not likely these instruments could reach full operation by FY 1975. We have therefore budgeted only $6 M each for operations in this year, but 2M more will be required for e in FY 1976 or FY 1977.)

Three major linear electron accelerators are presently under construction: their completion will cost about $4M (FY 1970 included) and their operations will add about $4M to the annual budget. We anticipate that further development of this field will require two more high-energy, high-intensity accelerators in this class, costing about $10M to construct.

We have included three *high-energy facilities also capable of producing useful beams of mesons; one of these is the Los Alamos Meson Physics Facility (LAMPF) which should be ready for operation in 1972. These installations are expected to be available about half-time for basic nuclear physics research. Recognizing the importance and interest of the fields to which these machines give access, we propose that* they be scheduled *for maximum operation, at an increase of about 20 percent in the costs indicated in Table VI-6 (in which costs were estimated for 15-shift-per-week operation). Completion of LAMPF will cost about $45M (FY 1970 included).*

In Table VI-7, only half of the operating cost of high energy facilities (including the Stanford electron linac) has been attributed to the nuclear physics budget. If the full costs were included, the total annual budget would increase by $12 M.

Items 7 through 12 of Table VI-7 require little comment. We have assumed for most of these categories an increase in manpower and cost approximately proportional to the totals for 1975. Nuclear spectroscopy will probably be reduced somewhat as the focus shifts to heavy ion reactions in which the relevant activities are more properly described as nuclear chemistry.

Item 13, "Future Facilities," represents an allowance for activities only seen in general outline at this time. With the LAMPF, the heavy ion facilities, the several cyclotrons, electrosta accelerators *and electron accelerators just discussed, qualitatively new kinds of phenomena will surely be observed. What new physics these ventures will lead to is hard to predict, but it is certain that new discoveries will bring new needs, needs for more powerful or more precise, or more versatile accelerators than are presently designed. Also to be anticipated are needs for special installations designed to exploit applications of nuclear physics to technology or to other sciences. While in the spirit of this Report, such activities would not be called "basic nuclear research", a realistic view would argue that new applications often need to be carried at least to the demonstration stage before funds from other sources can be commanded. In the recent past such "demonstrations" have included accelerators dedicated to work in atomic physics, astrophysics and solid*

state studies. The future may well bring even more interesting applications, and some monies should be set aside to permit their exploitation.

At the same time, we can also see the development of new accelerator technologies, some parts already well in hand, and others still in early stages. Current developments of superconducting accelerators for positive ions, and of collective electron ring accelerators are examples that can be expected to reach fruition in a short time. With due apologies for the fact that firm predictions cannot be made five years ahead in a field just venturing into new territory, we suggest allocation of an operating budget of the order of $10M per year by 1975 for advanced development and prototype construction of two new major machines, most probably to be in the higher-energy and heavy-ion fields. A study of the potentialities of intense neutron generators is included.

Item 14, "Small Scale Ventures". We alluded earlier to some trepidation about the consequences of a general trend toward concentration of resources in the larger laboratories. Clearly such a trend is inevitable as the cost of equipment continues to mount, and surely the arrangement has advantages in facilitating close communication and mutual support among physicists. Still it is important for the vitality of the science that provision be made for some innovative small group operations and for the support of talented young people in small institutions. Indeed, it is one of the attractive virtues of nuclear physics that trailblazing work can still be done with modest equipment, and the identification of people who can make contributions in this way will remain an important challenge for the funding agencies. An allocation of about $3M -- about 2 percent of the total budget -- for this purpose in 1975 would hardly be excessive.

The present budget envisions an expenditure for operations and research in 1975 of $139M (1969 dollars) per year, an increase of a factor of 1.9 over the 1969 figure. This represents an annual increase of 11 percent per year (plus inflation) over the six years. *If the whole federal support of basic science research were to increase at this rate, it would amount to about 1/3 of 1 percent of the gross national product in 1976.*

Consequences of a Level Budget

In the present climate of shrinking support for science, it is only realistic to examine the consequences of doing with significantly less than the growing budget that we recommend. We shall, therefore, examine first a level budget -- level in dollars of constant purchasing power -- and then one decreasing at the rate of 7-1/2 percent a year, for the period up to 1975. We assume that the realignments forced by budget constraints should take place in such a way as to maximize the prospects for survival nuclear physics as a field of research. This means, we believe, that the new lines would be pursued, even at the cost of profound changes in the style of research of the nuclear physics community as a whole.

The level budget, which we examine first, already illuminates the problems. As noted before, a number of new unique facilities designed to open new areas of nuclear physics are now under construction and will come into operation in the next several years. Their importance to the nuclear community can be assessed by the large number of experiments being proposed for them. Further, heavy-ion facilities to make possible a full range of heavy-ion physics have been planned by many groups.

It is important that we go ahead in the new directions. It is also important for us to go ahead with the broad base of programs now under way. The question is to what extent both can be done with a level budget.

The new facilities and their research programs (listed in Table VI-6) are estimated to cost some 30 million dollars annually in operating money, 16 million above the 1969 levels. These estimates will, of course, require adjustment in the light of actual experiences with the program. If, however, we accept them for now, 16 million must be taken from the operation of the present program if a level budget is to be maintained (Table VI

30 percent. If a new heavy-ion facility is to be included, the reduction in the other programs is still more severe. Such a cut, especially coming on top of the stringent budgets of the last few years, cannot be faced without drastic consequences. This then is the outline of the problem imposed by the level budget.

If the new ventures are passed by, the ~~field of nuclear physics~~ quality of our research program will surely not survive. A science can only maintain its vigor and make its contributions if it moves forward to meet the opportunities it has uncovered. But the present programs too contain complementary opportunities important to the development of the field. Can the more than 30 percent reduction that a level budget enforces be contained and still leave these programs viable? Our survey of the nuclear community indicates that were a cut of this magnitude distributed uniformly, the groups based on the more major facilities would move beyond a "critical" point to a drastically reduced level of research productivity. A new philosophy is clearly required. ~~if the field is to survive~~. The constraints outlined seem to force us inexorably to the idea of maintaining the essentials of the present program with a smaller number of laboratories, but funding them as fully as efficiency demands. Since it is clear that, if only a fraction of the laboratories in each of the major areas can be supported, they must be the best ones, the criteria for these level budgets is determined. The results of such an alignment are presented in Table VI-9 -- which is to be compared with the present distribution, as well as with the possibilities offered by the full budget of Table VI-7.

A complexity occurs in these budget estimates because the federal classification of support is in some cases not necessarily made according to discipline. As a particular example, the LAMPF facility will carry on in approximately equal measure both nuclear physics and other disciplines outside the scope of this nuclear physics survey. Just what is meant by a level federal budget, as far as nuclear effort is concerned, depends on whether half the expanding operating costs of LAMPF are included or the full amount is included. The two possibilities are studied separately in this and the following sections. The differences for the nuclear program are considerable. Thus, LAMPF will have an annual operating budget, exclusive of users, of $13.6 million, up from the $4.2 million of 1969 (all in dollars of 1969 buying power). Half of this difference, or $4.7 million in annual operating budget is a large perturbation. For example, more than 25 of the smaller laboratories could be operated on this amount of money.

Many of the problems of balance in the field under this level budget, and even more so in the more constricted budgets, are intensified by the very large expenditures required for the LAMPF facility. It is to be noted that the Bethe Panel[1] that recommended the construction of LAMPF included in its recommendations the following: "We recommend that for the next few years approximately 30% of the new construction budget in nuclear structure physics, and later on about 20 to 25% of the operating budget, be used for a Meson Factory. We feel, however, that this should not reduce the support of nuclear structure laboratories now in existence or under construction, and we, therefore, recommend an increase of the total support for nuclear structure physics. We feel especially justified in making this recommendation because part of the use of a Meson Factory is for high-energy physics, to replace (at least in part) the facilities which would otherwise have been provided by MURA".

A marked retreat from the possibilities offered by the full budget is obviously necessary. Some 65 facilities have been deprived of federal support; 400 fewer scientists can be funded. The high energy nuclear projects are budgeted adequately, but at somewhat reduced levels compared to maximal operation. The new electron facilities now under construction are planned for, but it has been necessary to drop some on-going effort to make budget room available. Heavy ion work would be expanded above the present program with the converted Berkeley HILAC and by one new national heavy-ion facility. However, other important possibilities on the nuclear horizon

[1] Report of Ad Hoc Panel to the Office of Science and Technology, March 1964

have been put off. The Van de Graaff program is continued with only a fraction of the most productive and best of those laboratories presently operating or just coming into operation; the new generation of electrostatic accelerators cannot be included. The future neutron facility proposed in the full budget is dropped. Similar cuts are necessary in all other parts of the nuclear program. Development work on new possibilities for nuclear accelerators has been put off.

It is important to note again when we speak of the "best" ~~that in limiting the support of~~ laboratories we mean ~~to~~ the best in quality ~~it is the "best" that is meant~~ and not necessarily the largest. In the budget presentations that follow this point is emphasized by giving, in some categories, a range in the number of facilities supported. The exact number will depend on the size of the actual laboratories selected.

By these drastic measures involving the closing off of many facilities, uprooting many scientists, and depriving the science itself of full potential we can, in principle, achieve a level budget. This budget attempts to open the areas which progress in nuclear physics requires, while maintaining the necessary multifaceted base, but we have given up depth and diversification to a degree ~~whose~~ the dangers of which are hard to estimate. A heavy price has been paid, that we have tried to hold to a minimum. With only one new facility, that for heavy-ion studies, to be started in the five-year period, we cannot say that an adequate base has been established for the future we confidently expect from the new fields now being opened.

Compared to the present program, an increased portion of funding has gone into the new fields of higher energies and heavy-ions -- a change in direction imposed by the needs of the science itself. However, as a result there has been drastic reduction in the number of facilities being supported in nuclear physics. The high energy and heavy-ion facilities are large, expensive installations that will involve large in-house efforts, as well as many user-groups. The remaining diversified program is

mounted with only a small fraction of the present laboratories. While this drastic reduction in number of facilities does not necessarily mean a proportional reduction in independent and competitive research groups, it should be recognized that a new pattern is thereby arising. There has been a move from almost total in-house research toward a large users-group effort at major facilities. However the fact that the number of facilities has been cut in half, with the removal of federal support for more than 60 facilities, has serious long-term implications. The many negative aspects will be discussed later. It is certainly very serious that the scientific manpower that could be maintained by the program is sharply reduced, by some 20 percent below the number in the present one -- since, in general, it is the smaller facilities, costing less per scientist, that have been dropped.

The effect on scientific talent is only partly reflected by the fact that 20 percent, or 400, fewer scientists could be funded. In the intervening years, several hundred additional nuclear physicists will be trained, thus increasing the number forced out of the field. Putting aside the personal heartaches and the fierce morale problems, one can ask cold questions. ~~How efficiently~~ To what extent can a large transfer into other scientific fields be effected? Will economy measures in other areas, in fact, permit these transfers? At best, a large reorientation and relearning effort would be required, and in the massive transfer of people the efficiency of the scientific enterprise as a whole would surely suffer. We can only conclude that the level budget brings with it the danger of dissipating an important national resource.

Great precautions will have to be taken so that, in spite of the contraction of the overall basic nuclear effort, its vitality is maintained with the continuing recruitment and support of bright young scientists. Post-doctoral positions must be maintained in suitable numbers. Permanent positions and funding must be devoted to new people as well as to new lines of research. The maintenance of opportunities for young nuclear scientists in the face of overall contractions will not be an easy matter for either younger or the older practitioners, and is a problem for which we have no special prescriptions.

The changes in the pattern of nuclear research efforts toward the style of big physics and away from the smaller scale in-house way-of-study will have other profound if less dramatic effects. The rich experien afforded by in-house graduate training will be greatly diminished. Students will not have the full benefit of pursuing all aspects of an experiment from start to finish, The need for programming every move in advance means the loss of some of the speculative daring that has characterized nuclear physics research.

The loss to less specialized scientific education can also be profoun The close presence of an active accessible scientific effort is an important ingredient in the education of a modern man -- for whom scientific literacy should be one of the basic skills. The continuing education of working scientists too will suffer. No small part of the cross-fertilization between sciences will be removed as the number of research facilities is sharply contracted.

But the most severe loss for the country is simply the slowdown in the rate of progress of the science of nuclear physics -- leading to an inevitable reduction in the direct and indirect discoveries and applications that have been touched upon earlier in this report. The bare bones of the losses are to be seen in the data of Table VI-9 -- the reduction in the scientific manpower that can be devoted to many of the areas of nuclear physics. The loss in scientific productivity is almost certain to be much greater than simply proportional to the manpower decrease. Scientific investigations must maintain a pace if their active pursuit is to be credible. For example, an important discovery may take on the order of five years to fully explore; the working scientist knows it is worthwhile to keep at this area by the rate at which new developments appear. If this stream is slowed by a factor of two, say, the five years would at least double and become a large fraction of a scientific lifetime. Even worse, the dragging pace will destroy the cohesion and drive necessary if an exploration into the unknown is to be successfully sustained. Many new ideas, new facts, new insights, must be brought together before a new substantial forward step is made; this is especially true in nuclear physics which is heavily dependent on a base of systematic studies of nuclear phenomena over a wide range of nuclear species and parameters. The drop in real scientific productivity, as measured finally in major accomplishments, is then likely to be the product of the decreases of the separate contributing factors and many times more serious than just proportionate with the manpower cuts. Wise management and judicious choices of the

areas likely to be fruitful will undoubtedly help towards minimizing the losses. But severe losses there will be.

This analysis has been predicated on the assumption that these stringent budget conditions will apply to the indefinite future beyond the 1969-1975 analysis period. If we knew that an expanding situation were to follow this time period, another course of action might be well advised: hold to the scientific manpower at all costs and plan for an expansion in the future. Our charge here has been to analyze the more lugubrious prospects of a steady state.

TABLE VI-8

CONSEQUENCES OF A LEVEL BUDGET

	FY 1969			FY 1975		
	No. of Projects	*Operating and Research Cost*[b]	*SMY*	*No. of Projects*	Estimated *Operation and Research Cost*[b]	Estimated *SMY*
Existing New Facilities:	*18*	$ *14.1 M* *(18.1)*[a]	149	*18*	$ *30 M* *(42)*	310
Other Present Programs:	223	*58.6* *(58.6)*	1021	223	*43* *(35)*	750
	241	$ *72.7 M* *(76.7)*	1170	241	$ *73 M* *(77)*	1060

[a]*Numbers in parenthesis include full cost of high energy facilities*

[b]*Federal Dollars*, 1969 Value

Table VI-8 illustrates the problem brought about by the prospect of a level budget in combination with the impending accession of major new facilities. As was indicated in Table VI-6, about $130 M of new facilities are coming into operation in the period 1969-1972. In 1969, the operating and research costs associated with these facilities, or with *the instruments they replace was $14 M out of a total budget of $72.7 M. By 1975, the "new" facilities will require $30 M for what we have called "full operation," typically 15 shifts per week.*

Excluding the projects identified in Table VI-6, the rest of the nuclear physics program -- some 212 projects -- spent $58.6 M in 1969. By 1975, under a level budget, this *number will be reduced to $43 M, a loss of nearly 30 percent.*

The situation is further exacerbated if the full cost of high-energy facilities is carried on the nuclear physics budget. As shown in Table VI-6, the needed increase between 1969 and 1975 is then $24 M, and the rest of the program drops from $59 M in 1969 to $35 M in 1975.

This projection makes no allowance for future facilities, such as the urgently needed heavy ion accelerator which would cost an additional $8 M per year in full operation.

TABLE VI-9

ELEMENTS OF A LEVEL BUDGET

(In Dollars of Constant Value)

	FY 1969			FY 1975		
	No. of Facilities	Operation and Research Cost[a]	Sc.Man Years	No. of Facilities	Estimated Operations and Research Cost[a]	Estimated Sc. Man[b] Years
1. Neutron Facilities	12	$ 7.7 M	80	5	$ 6.0 M	60
2. Potential-Drop Machines	64	19.5	350	18-24	17.0	250
3. Cyclotrons	21	14.2	190	7	9.5	120
4. Heavy-Ion Accelerators	2	3.1	15	2	8.0	55
5. Electron Accelerators	10	5.8	60	4	7.0	70
6. High Energy Facilities	4	2.1	20	2	10.0	75
7. Theory		5.0	195		4.5	150
8. Nuclear Spectroscopy		3.9	65		2.8	45
9. Nuclear Chemistry		4.9	95		3.2	50
10. Accel. Devel., Instr.		3.8	45		1.5	20
11. Nuclear Data		0.9	15		1.0	18
12. Other		1.8	40		1.0	20
13. Small Scale Ventures	3			10	1.5	25-35
TOTALS	113	$72.7[a]M	1170	48-54	$73.0[a]M	958-968

[a]Federal Dollars, 1969 Value

[b]Including User-Groups

Table VI-9 presents a possible strategy for dealing with a constant funding level, while still pressing forward with exploitation of the new facilities. Rather than accepting a uniform attrition of 30 percent or more in all the other programs, we have chosen drastic curtailment of the number of projects. For the survivors, we have allocated moderately comfortable operating levels, in the hope that they will thus be able to operate efficiently and possibly accommodate a fair number of outside collaborators. It is to be emphasized that no magic has been performed: we have still lost many good *facilities and highly trained scientists. As compared with Table VI-8, in fact we have not only many fewer facilities, but fewer man-years, because the facilities chosen here are the relatively more expensive ones.*

As in Tables VI-7 and VI-5, we again present the budget in terms of specific classes of facilities. Again we caution, however, that it is a research program and not a complex of facilities that is under discussion. Thus, for example, the indicated allocations to potential-drop machines and cyclotrons include several groups who are clearly pointing to the heavy ion field, so the character of the program proposed has changed more than would be indicated by a casual comparison of the figures with those of 1969. In fact, most of the new facilities of Table VI-6 which are included in Table VI-9 will *introduce profound changes in the meaning of our somewhat arbitrarily chosen categories.*

1. Neutron Facilities: In addition to some of the more versatile reactors, provision is made for ORELA and some modest synchrocyclotron operations to provide moderate energy neutrons. The new neutron facility included in the full budget, Table VI-7, must be dropped here.

2. Potential-Drop Machines:

Allowance is made for 18-24 facilities to span the diversity necessary for the broad multifaceted attack necessary to the nuclear progra including some work with intermediate weight ions. A range in the number of facilities is given, the exact number will depend on the size of the actual laboratories selected. The new advanced electrostatic accelerators have been put off to the future.

3. Cyclotrons: Again, as with the potential-drop machines, some variety in capability is afforded by the multiplicity of installations; again some will enter the heavy ion field.

4. Heavy Ion Accelerators: The only new major facility which seems possible to press for under a level budget is a single heavy ion accelerator instead of the two of Table VI-7, estimated to cost $25 M to construct *and $8 M per year for operation and research, including users. Since it is unlikely that such a facility could be in full operation as early as*

1975, we have assumed operations costs of $4 M. This will rise to $8 M by 1976 or 1977. Provision is made here for continued full scale operation of Super HILAC. If, in the years following 1975, the level budgets prevail, the extra $4 M per year would require reallocations. Much would depend on what has been *learned in the interim. If additional funds cannot be commanded by the results and prospects, the questions of contracting* the heavy-ion effort onto the one new facility as against *cutting back the remainder of the field would have to be examined again.*

5. *Electron Accelerators: Four of the five machines of Table VI-6 are supported here with sufficient funds to permit full operation, with some user participation. One of these, the Stanford superconducting linac, will operate at 1 GeV or more and qualifies as a "high energy" facility.*

6. *High Energy Facilities: One half of operating costs of LAMPF and one smaller facility are included. The scale of* operation has been reduced from the full schedule of Table VI-7 *to a 15 shift-per-week level.*

13. *Small Scale Ventures: The allowance for flexibility in this category is sharply reduced.*

A Level Budget Under More Restrictive Conditions

In preparing the previous allocation of resources, it was assumed that the entire national nuclear physics program would be reoriented to maximize the scientific output of basic nuclear physics. It may well be that the mission-oriented laboratories will find that they cannot redirect their activities, since they have other criteria to consider. If we consider only the federal funding agencies for which basic nuclear research is the main mission -- the Division of Research of the AEC and the NSF -- the same general program must be produced on a smaller base. Instead of being able to work in the framework of the entire $72.7 million of the 1969 budget, let us constrain ourselves to consider $10.7 million as fixed in mission-connected purposes.

In addition, in order not to multiply the number of tables to the point of confusion, we also include here the assumption that the full operating costs of the new high energy machines are charged to this budget. In the previous budget only half of the expanding operating costs of the facilities were included in forming the overall constraint.

A possible budget that obeys these contraints is given in Table VI-10. It is deliberately turned in such a way as to exploit the new frontiers, for that is something ~~which~~ nuclear physics must do. The new ventures themselves are, however, limited, and there is little base for future technologies. All of the difficulties posed by the unrestricted level budget are only further increased.

TABLE VI-10

ELEMENTS OF A LEVEL RESTRICTED BUDGET -- EXCLUDING MISSION CONNECTED BASIC RESEARCH AND INCLUDING FULL COSTS OF HIGH ENERGY FACILITIES

FY 69 Dollars

	FY 1969			FY 1975		
	No. of Facilities	*Operation and Research Cost*	*Sc. Man Years*	Estimated *No. of Facilities*	Estimated *Operation and Research Cost*	Estimated *Sc. Man Years*
1. *Neutron Facilities*	*7*	*$ 4.0 M*	*44*	*3*	*$ 3.8 M*	38
2. *Potential-Drop Machines*	*57*	*16.5*	*310*	*9-13*	*10.0*	*135*
3. *Cyclotrons*	*17*	*11.0*	*137*	*6*	*7.5*	*80*
4. *Heavy-Ion Accelerators*	*2*	*3.0*	*15*	*2*	*8.0*	*55*
5. *Electron Accelerators*	*7*	*3.5*	*32*	*3*	*7.0*	55
6. *High Energy Facilities*	*3*	*4.0*	*26*	*1*	*13.2*	*44*
7. *Theory*		*4.0*	*168*		*4.0*	*140*
8. *Nuclear Spectroscopy*		*3.6*	*60*		*2.8*	*45*
9. *Nuclear Chemistry*		*4.4*	*83*		*2.6*	*40*
10. *Accel. Devel., Instr.*		*5.8*	*60*		*1.0*	*15*
11. *Nuclear Data*		*0.9*	*15*		*0.9*	*18*
12. *Other*		*1.3*	*35*		*0.7*	*18*
13. Small Scale Ventures				5	0.5	10-15
TOTALS[a]	93	62.0[b]M	985	29 - 33	62.0[a]M	693-698

[a] *Note that both the 1969 and 1975 programs differ from those outlined in Table VI-9 by excluding the mission connected basic research included in the latter.*

[b] *Federal Dollars, 1969 Value*

Table VI-10 assumes again a level budget, but now with two additional constraints: we suppose that basic nuclear research funds now expended by primarily mission-oriented agencies -- AEC (DMA), DOD, NASA, and NBS will be largely directed to the kind of nuclear physics best suited to performance of their missions, without explicit regard for the furtherance of the science. We suppose additionally that the full operating and research costs of the several facilities with energies in the range 500-1000 MeV -- here designated "high energy" -- will be borne by the basic nuclear physics budget.

In 1969 the support of basic nuclear research by the AEC division of Research (Chemistry and Physics) and NSF was $62 M, including the $10.2 M full cost of the high energy programs, (Table VI-2). The problem then is to estimate a 1975 budget for $62 M, including the full cost of operation and research for LAMPF and such other high-energy facilities as will be needed. We shall assume that the part of the present program that cannot be redirected, DMA, DOD, etc., will remain about as it is now, so these operations will help to give some balance to the program not immediately evident in Table VI-10. Still, because of the radical redirection forced by the budget constraints not all of the non-disposable operation can be used this way. This loss in flexibility, coupled with the sizable increase in the costs of high-energy facilities charged to the budget, necessitates drastic reductions beyond those in Table VI-9. Some indication of the adjustments involved are given in the following notes:

6. High Energy Facilities The full cost of LAMPF is taken to be $13.6 M in-house, plus $2.2 M for users of 3/8 of 15 shifts per week. To compensate this increased cost as compared to the budget of Table VI-9, it is necessary to restrict LAMPF operations to about 10 shifts per week.*

5. Electron Accelerators The full cost of the Stanford S.C.L. machine has been included, and one other machine dropped.*

4. Heavy Ion Accelerator Our conviction of the need for a new instrument in this class is sufficiently strong that we include it even in this constrained budget. For a transition period, it will presumably be possible to operate both Super HILAC and the new machine. Beyond this transition period, if additional funds cannot be commanded by the results and the prospects, the question of contracting the heavy ion effort onto the one new facility as against cutting back the remainder of the field would have to be re-examined.*

** It should be emphasized that references here to specific installations are exemplary only, for purposes of making budget estimates. Obviously, the determination of which machines are to be closed down and which will survive will be an agonizing process which will require detailed consideration of each case. The point here is only that the tendency of a restricting budget will generally favor the more expensive installations.*

2.3 Potential-Drop Machines, Cyclotrons: Heavy inroads have been made in these categories, only partially made up by instruments in the DMA-DOD sector. With the high cost of the new instruments, the number of projects and scientists involved has been drastically curtailed, with a significant loss in breadth.

1. Neutron Facilities: As compared with Table VI-9, two major reactors have been removed from the budget. This loss will be ameliorated to some extent because of the obvious interest of AEC (DMA) in pressing forward with neutron work.

Consequences of a Declining Budget

In order to portray the effects on basic nuclear research of a declining level of support -- measured in dollars of constant purchasing power -- a possible response to a budget decrease of 7-1/2 percent per year from 1969 through 1975 is examined here. This extreme situation is quite conceivable; for example, a 2-1/2 percent annual decrease on top of a 5 percent inflationary rate would lead to such a result. Two allocative budgets have been prepared; That outlined in Table VI-11, paralleling that of Table VI-9 and reorienting the whole national nuclear program is discussed first.

The problems that must be faced are sharp amplifications of those posed by the level budget. The nature of these problems can be briefly recapitulated. New facilities designed to attack new opportunities in nuclear physics are under construction; further, a heavy-ion facility is being sought to exploit the field. These are expensive ventures, requiring a sizable share of the budget. At the same time, it is important to continue the exploration of the areas for which the present multi-faceted program was designed. Under the conditions of the level budget it was seen that if the new ventures were to be funded, the cuts inflicted on the multi-faceted program were so severe that a new philosophy appeared advisable. Instead of an across-the board contraction, the multifaceted program was to be based on only a fraction of the laboratories now involved.

This declining budget aggravates the problems, removes more of the flexibility and cuts deeper into the life of the field. There can be no alternative to basing the multi-faceted program on a very much smaller fraction of the best laboratories. In addition, we must cut back on the new ventures with significant loss of strength in both the high-energy and heavy-ion fields. In the budget outlined in Table VI-11, the new ventures are attacked on a minimal level and the remaining program distributed as prudently as possible. The multifaceted program is barely preserved; it is certainly perilously close to extinguishment.

The budget leaves us with only 24 facilities compared with the 113 now at work. Only about half of the scientists now in basic nuclear research can be supported. The strong network of active nuclear laboratories would be dismembered. Even more important, the resource of a strong group of active nuclear scientists would be dissipated. These are acts whose effects will be felt over a very long term. It will not be easy to recreate the institutions, for a laboratory closed temporarily is not simply reawakened. Scientists are created only by a long educational process. The situation that would be brought about by such a declining budget is far worse than the already bad one of the level budget. It would bring the field to near disaster and cut the contributions nuclear physics now makes to the many areas of our society to a comparative trickle.

The disastrous effects on education, both specialized and general, are far worse than those judged by any extrapolation from the level budgets.

In-house research facilities would be very few and far between. The nuclear research remaining would have moved very largely into a users-group pattern at relatively few facilities. The nearness to an ongoing scientific research effort that is an important ingredient to the intellectual background of modern society and a modern university, would almost disappear.

Far worse for the national welfare is the effect on the field of nuclear physics, and, consequently, on its contribution to science and technology. The attempt has been to allocate the resources available so as to leave the field in the most viable form possible within the constraints. The attacks on the new frontiers of the science are the sine qua non of such attempts. But how thinly spread are the resources! The new ventures can only be minimally supported, Further, the multi-faceted base program outside the new ventures has been cut in scientific manpower support by a factor of two. As we have argued in the level budget case, the effect on research productivity is very much greater than simply proportionate. The cut in the number of independent facilities is in part made up by the formation of users groups directed toward the utilization of the new facilities; nevertheless, so great is the cut necessary that one must expect a very great loss in vitality that cannot now be estimated.

Let us squarely face the fact that should these budgets come to pass, an enormous gamble would have to be taken. In the allocative scheme outlined here, the gamble is based on following the new directions as fully as possible and thinning out the rest of the program to the best that can be mounted with the remaining resources. The gamble is that more will be gained in the unknown areas already partly explored. It has been pointed out repeatedly that by the very nature of nuclear physics to cut off the multi-faceted diverse program is to kill the field. To cut off new frontiers is by the very nature of science also guaranteed to kill the field. We have tried to tread the middle ground, to minimize the risks and the losses necessitated by the constrictions such budgets would mean, but there are still very considerable risks and losses remaining.

More Restricted Conditions

If the mission oriented laboratories are to be omitted from any reallocations, an additional level of constriction is reached within which a broad program is extremely difficult to achieve. Table VI-12 describes a possible response to such a situation. For this restricted case the new ventures must be slashed more deeply than before. Even the modest new heavy-ion facility is given up. The high-energy commitment too must be drastically pared; we can only proceed by allocating as much as will still permit the diverse remaining part of the field to function. This may well leave the one high-energy facility that can at all be contemplated below minimal operation. We can only suggest that other sources must supply the extra amounts necessary to enable at least minimal operation. Alternatively, we can

cut back substantially on the high-energy effort, give up the newly constructed LAMPF, and limit the projected scope in this area to an exploratory one.

All of the losses and risks outlined in previous budgets are strongly enhanced. The field would have to be drastically pared to fit within the constraints. Coverage would be shallow. Almost all research flexibility would disappear. Half of the scientific manpower and most of the separate facilities would be cut away.

The question of still further cuts in funding support would have to be faced in an entirely new way. It would no longer be possible to keep a multi-faceted effort in nuclear physics. Instead it would appear wiser to opt for a decreasing reach, drop whole categories of nuclear research, and bargain with the world for a smaller place in the overall international effort.

TABLE VI-11

DECLINING BUDGET

	FY 1969			FY 1975		
	No. of Facilities	Operation and Research Cost[a]	Sc. Man Years	Est. No. of Facilities	Est. Operation and Research Cost[a]	Est. Sc. Man Years
1. Neutron Facilities	12	$ 7.7 M	80	3	$ 4.0M	40
2. Potential-Drop Machines	64	19.5	350	12-17	12.0	170
3. Cyclotrons	21	14.2	190	5	6.0	65
4. Heavy-Ion Accelerators	2	3.1	15	2	5.0	30
5. Electron Accelerators	10	5.8	60	2	4.0	40
6. High-Energy Facilities	4	2.1	20	1	9.0	70
7. Theory		5.0	195		3.5	140
8. Nuclear Spectroscopy		3.9	65		1.0	20
9. Nuclear Chemistry		4.9	95		2.0	40
10. Accel. Devel., Instr.		3.8	45		1.0	15
11. Nuclear Data		0.9	15		0.8	15
12. Other		1.8	40		0.7	15
13. Small Scale Ventures				3	0.3	5-10
TOTALS	113	$72.7[a]M	1170	28-33	49.3	665-670

[a]Federal Dollars, 1969 Value

Table VI-11 *paints the lugubrious picture of a declining budget, decreasing at 7.5 percent per year in purchasing power, to a level of $49 M (1969 dollars) in* 1975. *In this projection, as in Table VI-9, we assume that the entire amount is at our disposition, and that only half of the costs of high energy facilities are to be included.*

If we maintain our determination to exploit the frontiers of nuclear physics, a declining budget forces an extreme centralization of facilities. Just how extreme this process needs to be is indicated by the treatment of individual categories outlined below.

1. *Neutron Facilities: Only 3 survive, probably including ORELA. All three are comparatively well supported and some allowance is made for accommodation of users.*

2., 3. *Potential-Drop Machines, Cyclotrons:* 12 - 17 *installations selected from the* best and most *versatile of the existing* laboratories. Several of these will *stress the heavy ion field.*

4. *Heavy Ion Accelerator: We cling to our conviction that a new accelerator is vital for the future development of this field, but the new facility contemplated is only a modest venture in this new direction. Under this budget there is no possibility of the full scale new facility discussed previously. Because of the great importance of heavy-ion nuclear physics and the need to go further into this field we press for, as a minimum, a facility of intermediate capability. We have not investigated the precise design that would meet these intermediate needs. It might be speculated that an intermediate design would involve conversion of an existing facility.*

5. *Electron Accelerators:* Two *installations are budgeted, to cover the regions of high energy, high intensity* electrons and hopefully, monochromatic photons.

6. *High Energy Facilities: Again LAMPF and one complementary facility represent hopes for the future, and they are held in this budget at a respectable operating level.* However, it should be noted that the large expenditures required by these facilities will be taking the field close to the point of serious imbalance between the different areas of nuclear research.

The degree of centralization forced by this budget may be appreciated by noting that of the 113 accelerator installations listed in Table VI-5, only 28 - 33 remain. Of the others, most will have to be entirely or very nearly abandoned, although some few may be kept in operation on non-federal funds.

TABLE VI-12

ELEMENTS OF A DECLINING RESTRICTED BUDGET

		FY 1969			FY 1975		
	Facility Type	No. of Facilities	Operation and Research Cost	Sc. Man Years	Est. No. of Facilities	Estimated Operation and Research Cost	Est. Sc. Man Years
1.	Neutron Facilities	7	$ 4.0 M	44	3	$ 3.5M	35
2.	Potential-Drop Machines	57	16.5	310	8-12	8.5	140
3.	Cyclotrons	17	11.0	137	3	4.0	50
4.	Heavy-Ion Accelerators	2	3.0	15	1	3.0	20
5.	Electron Accelerators	7	3.5	32	2	3.5	35
6.	High Energy Facilities	3	4.0	26	1*	9.0	30
7.	Theory		4.0	168		3.2	130
8.	Nuclear Spectroscopy		3.6	60		1.0	20
9.	Nuclear Chemistry		4.4	83		1.8	35
10.	Accel. Devel., Instr.		5.8	60		1.0	15
11.	Nuclear Data		0.9	15		0.8	15
12.	Other		1.3	35		0.7	15
13.	Small Scale Ventures				3	0.3	5-10
	TOTALS	93	$62.0[a]M	985	21-25	40.3	545-550

[a]Federal Dollars, 1969 Value.

Table VI-12 bears the same relation to Table VI-11 as does VI-10 to VI-9. It is assumed that only AEC (RES) and NSF funds can be rearranged, that the full cost of high-energy facilities is to be included in the budget, and that the annual attrition is 7.5 percent in purchasing power. By 1975 this means that we have $40 M with which to construct a nuclear research program. As in Table VI-10, the program is assisted by certain assumed operations on the part of the nondisposable sector. In this projection, in which the survival of the field is very much at hazard, there will be no room for parallel or overlapping efforts.

The constraints of Table VI-12 have finally led to the abandonment of the new heavy ion accelerator: Instead we rely on Super HILAC and one or two of the remaining tandems or cyclotrons to maintain some hold on this field. Similarly, it has become necessary to reduce the effort in the electron accelerator field.

In the high energy field, LAMPF has been reduced to less than 60 percent of a normal operating budget. Considering the high fixed costs of this installation, we are probably near the point where the machine should be shut down unless other funds can be found to support the operation and step only lightly into the field of high energy nuclear investigations with a small facility at an annual operating budget of approximately $2 M. This would permit a limited entry into this important area without causing a prohibitive unbalance of the whole program.

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CHAPTER I

SUMMARY

Introduction

The nucleus is an important part of our physical world, the world that we touch and manipulate, the world that touches and manipulates us. We must know about it. Had our knowledge of the nucleus done nothing for us as yet, we would still have to study and probe its features and potentialities. But the nucleus and nuclear science have already made enormous contributions -- in big and little ways, through spectacular breakthroughs and steady developments, in its earliest times and the last years -- to a wide range of human endeavors. Much still lies ahead.

The spectacular discovery of fission phenomena and their use in harnessing nuclear energies came early in the development of nuclear physics when the gross qualitative facts about the nucleus were being uncovered. What they meant for the opening of new sources of energy, for the nature of war and peace, for industry and medicine is now well known. Over the succeeding years, the explorations to learn more about the nucleus have generated a steady flow of ideas, inventions and applications which have repaid the cost of the explorations many times over. Nor are we now at an end in the science or its potentialities for man.

Status Of The Field

Where in its development does nuclear physics now stand? The revolutions in experimental means of the last two decades, but especially of recent years, have made it possible to discover and measure the fundamental properties of natural nuclei and those made in the laboratory. An empirical model has emerged that provides a central framework in which to fit the constantly emerging facts. But much more than an empirical understanding has been achieved. A firm connection between the fundamentals of nuclear structure and the fundamental forces between nucleons is being built. These advances, in what may be called "classical" nuclear physics, point to a deeper set of questions about the structures of nuclei and the nature of nuclear dynamics. The answers can be found by picking apart and by building up nuclear states or modes of motion with the nuclear projectiles of the new generation of versatile accelerators. To accomplish this, ~~a spectrum of~~ complementary approaches based on a range of experimental facilities are is intrinsically necessary.

New Frontiers

Other, and quite different frontiers are now apparent. The characteristics of the deeply hidden, short-distance properties of nuclei are little known. New high-energy electron and proton facilities, which will provide the short-wavelength miscroscopes needed to explore them soon will be in operation. Intense beams of mesons will probe aspects of the nucleus

now only dimly seen. The presently known nuclear world is only a small fraction of what could be open to us. The means are now known by which to produce and study some 6000 nuclear species instead of the 300 found in nature and the 1300 more we have been able to produce so far. Superheavy elements beyond our periodic table may exist. Heavy ion facilities provide entry into this field. Even more importantly, they provide the capability needed to open studies of the almost unknown interactions of massive amounts of nuclear substance with one another, as well as to vastly extend the studies of nuclear excitations. Nuclear science, building on a solid base, is prepared to move out of its confines in many directions. We cannot know what will be discovered there, but it is very unlikely that all the profitable possibilities have already been discovered or that they lie in the small domain so far known.

The development of the science, then, requires a diverse multifaceted effort and thrusts in several new directions. As a mark of the continuing vitality of the field, surprises occur at an undiminished rate -- that is, entirely new and unexpected classes of phenomena important to the science itself and rich in applications continue to emerge.

Impact on Technology

There are profits to be garnered at every step of the way. It is not just that nuclear power is a billion-dollar industry; it is that small refinements in the knowledge of nuclear properties can lead to annual savings of hundreds of millions of

dollars. New designs for nuclear research accelerators turn into sources of radiation treatment for the 300,000 cancer patients who need them each year -- sources that are more efficient medically and less costly to operate. Advanced accelerator concepts, for example, the cryogenic accelerator, point to technological applications in the field of power transmission. The constant flow of systematic information on the properties of isotopes continuously opens new doors. Technetium-99 is a case in point. The importance for medical uses that lies in the properties of this isotope, which were established worked out in the 1950's, was recognized by 1964 and is now being turned into one of the most important diagnostic ~~weapons~~ tools of nuclear medicine. High-resolution semi-conductor detectors, developed by nuclear physicists in the 1960's to measure nuclear radiations more accurately, have been put to work in medical programs, in the analysis and monitoring of bomb tests of our country and those of international competitors, and in the important field of isotopic analysis by nuclear activation methods. ~~In part,~~ It is possible to put dollar values on some of these applications ~~can be described~~ monetarily: the operating budgets of medically-used accelerators total some $30 million ~~dollars~~ a year; the nuclear instrumentation business earns $100 million ~~dollars~~ a year and saves industry many times that; radio-isotopes are a 30-million-dollar-a-year industry, and the products and equipment involving their use are worth several hundreds of millions of dollars a year. But the importance of nuclear applications cannot be reduced to a balance between these hundreds of millions

a year in economic activity and the 70 millions invested annually in basic nuclear research. The patients saved, the national defense of the country, and the unshackling of mankind from his otherwise limited energy resources ~~form~~ are another even stronger testimony to the ultimate values involved.

Impact on Other Sciences

Nuclear physics is a basic part of physical science and, like every healthy and developing science, enriches and feeds on the stream of ideas and techniques that it shares with other sciences and with technology. The nuclear nature of astronomical energy sources makes nuclear astrophysics an intrinsic and important part of any attempt to study our universe. The very nature of the nuclear forces led naturally into the development of elementary particle studies and still forms a fundamental link with the discoveries in this field. The theoretical tools of many-body problems connect nuclear physics, solid state physics and statistical physics. The experimental tools of nuclear technology connect with all the physical sciences, earth sciences, and life sciences, as well as with a host of applications ranging from those in archaeology and forensics to art. Nuclear physics plays a central role in the science that most critically influences the course of development in our times. ~~dominates our times~~.

Funding Patterns and Their Consequences for Nuclear Physics Research

We report on nuclear knowledge, whether acquired in chemistry or physics, or, indeed, in any other department. We sketch the accomplishments of nuclear physics and their meaning for man, and the opportunities for further advances that are now at hand. To fully exploit these opportunities, will require ~~an~~ increase in the people and money devoted to nuclear research. ~~The~~ A reversal of the downward budgetary trends of the last three years which such ~~a de-velopment~~ an increase would represent can keep this country in the preeminent position it now holds in all aspects of the science. If, on the other hand, budgets are kept at constant buying power, or reduced, many opportunities cannot be exploited.

We believe that it is essential that the new ventures immediately before us be pursued ~~with all~~ vigorously. At the same time, it is vitally important that we maintain the breadth of present programs, for the very nature of nuclear investigation tells us that there is no single experimental approach that can provide all the answers. The extent to which we can pursue the new venture and at the same time keep the essential breadth of the present programs depends sensitively on the level of funding and the manner in which available resources are distributed.

In Chapter VI of this Report, we analyze a budget that would permit full exploitation of the opportunities now before us in nuclear physics. Aggressive explorations in the use of high-energy nuclear probes, heavy ion physics, and prudent

expansion of the present multifaceted program based on conventional accelerators are the major components of this program. We find that there exists already an adequate base of facilities to support most of this ambitious effort, and that the rate at which the new fields can be explored is limited primarily by manpower. Such a program, actually requiring only quite modest annual increases in funding levels, would insure, we believe, an active and productive enterprise with the prospect of important new discoveries, and many benefits to science and technology.

With the full realization that expanding budgets for nuclear science are not likely in the immediate future, we have also considered the effects of a budget held at level purchasing power. Under this constraint, the new and expensive ventures considered necessary for the viability of the field ~~must~~ would have to be carried out at the expense of drastic contraction of the rest of the ongoing programs. When details are worked out in realistic terms, ~~it develops that~~ A any reasonable distribution of effort among the various kinds of programs results in forcing the shutdown of many facilities and forcing many talented people out of the field. The remaining program is heavily concentrated in relatively few of the best and most versatile facilities, obliging highly productive groups to change to a user's mode of operation. It is important to note that our comment on in limiting the number of supported facilities to the best, ~~it is~~ "best" means best in quality ~~that is meant~~ and not

necessarily the largest. If the basic work funded by mission-oriented agencies cannot be included in reallocations, the effects are still more severe in the basic segment. A variant of the level budget is presented to illustrate the consequence. In either case, much of the potential of the field cannot be exploited, and, at best, sizable dislocations of institutions and people occur.

Finally, the effects of a budget declining at the rate of 7.5 percent over a six-year period are studied. Many of the new ventures must be given up, and the multifaceted program is severly truncated. The number of institutions and scientists that can be supported is drastically cut. Two variants are examined, as in the case of the level budget. Again, if the mission-connected basic work cannot be realized, the effects are more drastic ~~exacerbated~~.

Paradoxically, this possible ~~invitation to~~ famine comes just as nuclear physics has presented a feast. The importance of maintaining a broad-scale attack on nuclear problems is clear in terms of the potential results both in new nuclear knowledge and in practical applications. Nuclear physics is important to the future of our civilian power needs, the strength of our national defense, a growing host of technological benefits, and our scientific understanding. We must argue that we cannot afford to slip in any major area of the nuclear sciences. The stakes -- scientific and practical -- in this gamble with the future are simply too great.

The dismemberment of the nuclear enterprise has already begun. It could be seen a year ago in the difficulties the most recent graduates experienced in finding places to use their scientific talents to maximum effect. The makeshift reactions of the nuclear laboratories to avoid disruption of their vital programs are at hand. Only a reversal of the budget declines can save the situation; but further contractions appear to form the pattern of the immediate future.

Ken,
FYI,
from Gordon

file

1/11/74

What Is Computer Science?

Professors of computer science are often asked: "Is there such a thing as computer science, and if there is, what is it?" The questions have a simple answer:

Wherever there are phenomena, there can be a science to describe and explain those phenomena. Thus, the simplest (and correct) answer to "What is botany?" is, "Botany is the study of plants." And zoology is the study of animals, astronomy the study of stars, and so on. Phenomena breed sciences.

There are computers. Ergo, *computer science is the study of computers*. The phenomena surrounding computers are varied, complex, rich. It remains only to answer the objections.

Objection 1. Only natural phenomena breed sciences, but computers are artificial, hence are whatever they are made to be, hence obey no invariable laws, hence cannot be described and explained. Answer. 1. The objection is patently false, since computers and computer programs are being described and explained daily. 2. The objection would equally rule out of science large portions of organic chemistry (substitute "silicones" for "computers"), physics (substitute "superconductivity" for "computers") and even botany, (substitute "hybrid corn" for "computers"). The objection would certainly rule out mathematics, but in any event its status as a natural science is idiosyncratic.

Objection 2. The term "computer" is not well defined, and its meaning will change with new developments, hence computer science does not have a well-defined subject matter. Answer. The phenomena of all sciences change over time; the process of understanding assures that this will be the case. Astronomy did not originally include the study of interstellar gases; physics did not include radioactivity; psychology did not include the study of animal behavior. Mathematics was once defined as the "science of quantity."

Objection 3. Computer science is the study of algorithms (or programs), not computers. Answer. 1. Showing deeper insight than they are sometimes credited with, the founders of the chief professional organization for computer science named it the Association for Computing Machinery. 2. In the definition "computers" means "living computers"—i.e., the hardware, their programs or algorithms, and all that goes with them. Computer science is the study of the phenomena surrounding computers. "Computers plus algorithms," "living computers," or simply "computers" all come to the same thing—the same phenomena.

Objection 4. Computers, like thermometers, are instruments, not phenomena. Instruments lead away to their user sciences; the behaviors of instruments are subsumed as special topics in other sciences (not always the user sciences—electron microscopy belongs to physics, not biology). Answer. The computer is such a novel and complex instrument that its behavior is subsumed under no other science; its study does not lead away to user sciences, but to further study of computers. Hence, the computer is not *just* an instrument but a phenomena as well, requiring description and explanation.

Objection 5. Computer science is a branch of electronics (or mathematics, psychology, etc.). Answer. To study computers, one may need to study some or all of these. Phenomena define the focus of a sci-

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This letter ap
22, 1967, pp.

ence, not its boundaries. Many of the phenomena of computers are also phenomena of some other science. The existence of biochemistry denies neither the existence of biology nor of chemistry. But all of the phenomena of computers are not subsumed under any one existing science.

Objection 6. Computers belong to engineering, not science. Answer. They belong to both, like electricity (physics and electrical engineering) or plants (botany and agriculture). Time will tell what professional specialization is desirable between analysis and synthesis, and between the pure study of computers and their application.

Computer scientists will often join hands with colleagues from other disciplines in common endeavor. Mostly, computer scientists will study living computers with the same passion that others have studied plants, stars, glaciers, dyestuffs, and magnetism; and with the same confidence that intelligent, persistent curiosity will yield interesting and perhaps useful knowledge.

Some Computer Scientists at
Carnegie-Mellon University
Pittsburgh, Pennsylvania

Allen Newell
Alan J. Perlis
Herbert A. Simon

This letter appeared in *Science*, vol. 157, no. 3795, September 22, 1967, pp. 1373-1374.

Technology assessment: what it is, where it is

Recent legislation established an Office of Technology Assessment to help congress better evaluate proposed laws. How OTA will operate, problems that it faces—plus a look into the origin of the technology assessment movement is discussed here

by Gabor Strasser
Battelle Memorial Institute

Efficient resource management is rapidly becoming one of our major concerns. Resources are strained by the combined effects of population increase and the ever-rising expectations of peoples everywhere. The gap seems to be increasing between our aspirations and what we can afford. For the sake of world order, this gap must be arrested and then reduced.

There are all too many respectable goals and objectives to do justice to them all. This is due as much to overall resource limitations as it is to conflicting objectives and the lack of appropriate institutional mechanisms to resolve such conflicts in some orderly, acceptable fashion. Our current, somewhat fragmented approaches to our problems only work acceptably when available resources substantially exceed the demands that we place upon them. As our resources and demands for such resources come into balance, or turn negative, the necessity for efficiency, overall understanding and better management becomes obvious. This is the problem we are facing today.

Emergence of technology assessment

It appears to some that all of a sudden, out of nowhere, technology assessment has burst upon the national scene. This perception is only partially correct. Indeed, technology assessment has recently come into "vogue" more than ever before. The primary impetus for this was the passage of a bill resulting in Public Law 92-484, known at the "Technology Assessment Act of 1972," creating the Office of Technology Assessment (OTA) within the Congress of the United States. The "all of a sudden" part, however, is incorrect. The beginning of the technology assessment movement can be traced to the mid-1960s.

Since the technology assessment movement has reached a critical turning point with the establishment of the Office of Technology Assessment in Congress, this is a propitious time to recap past events, assess the present situation, and to speculate about the future.

How did we get here?

Reason for technology assessment. In recent years we have become increasingly concerned about the deterioration of certain aspects of the quality of human life. Due to unforeseen, deleterious side effects, certain innovations like DDT, which have done a great deal of good in some ways, have degraded or endangered our lives in others. The pollution of our lakes and streams assaults our senses. Rapid population growth and the concentration of people in urban regions have created severe disharmonies.

Concept. Since technology plays a highly significant as well as visible role in the solution of many

Bausch & Lomb high intensity grating monochromators

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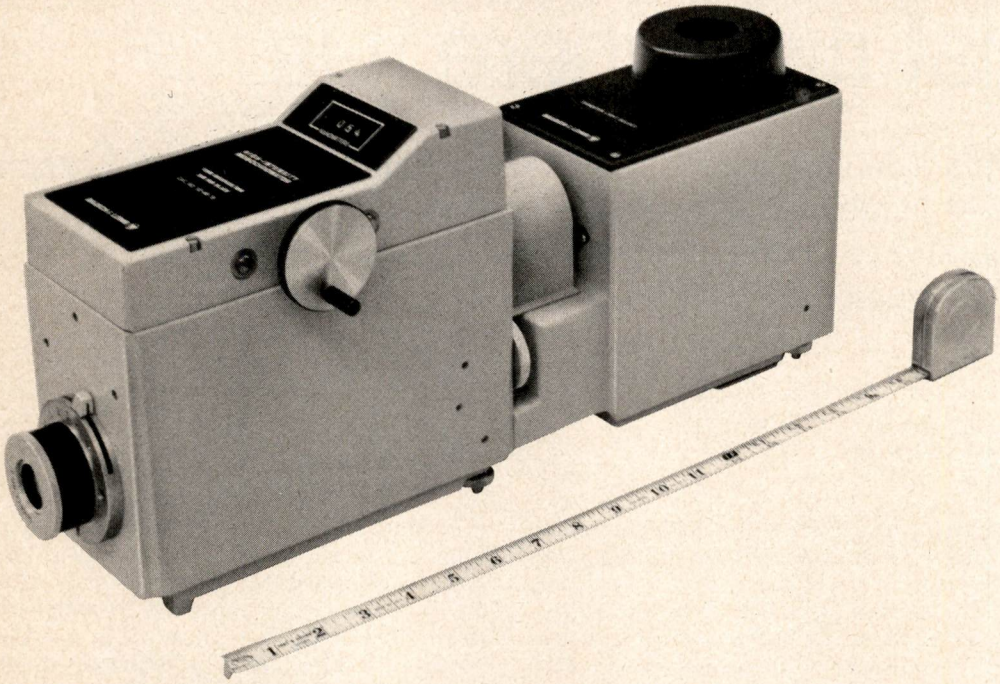
PSAC



Thousands of these Monochromators are in use in a wide variety of applications, including studies in Luminescence and Fluorescence, cancer research, cell composition, body fluids, plant and insect studies and many others. They are also widely used in industry for both research applications and quality control.

Without knowing *your* specific application we can't predict how beneficial these monochromators can be for you. We can, however, list some of the features which you can easily translate to benefits for yourself.

1. Small size (only 20" x 4½" x 7½") complete with integral light source.
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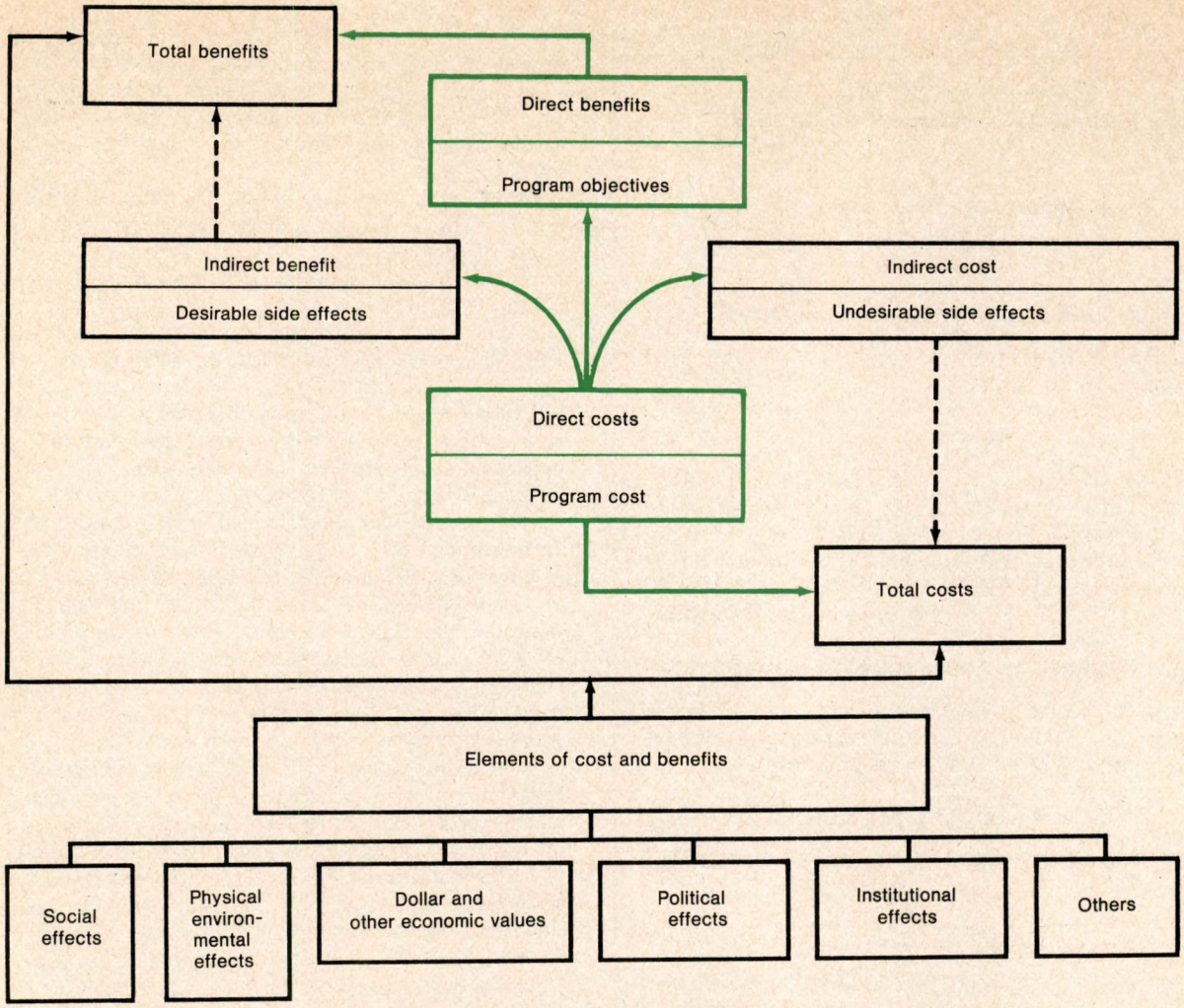

Fig. 1. Elements of program costs and benefits are shown in this chart.

of our problems, there has arisen a desire to better "preplan" the use of technology. The objective of this preplanning is to minimize the potential deleterious side effects of our actions. This has given rise to the technology assessment concept.

Context. But what we do or do not do is really up to our sociopolitical system, not to our scientific-technical establishment, however extensively many of our industrial products and government programs may depend on science and technology. Furthermore, science and technology represent only one set of the many "enabling mechanisms" that help us attain our objectives. Others lie in such areas as economics, management, labor, political science and institutional arrangements. It is the integrated use of these enabling mechanisms, under the direction of our sociopolitical system, that can make the difference between success and failure. It is a mistake to look primarily at technology when something has gone wrong. It is also wrong to search primarily for technological solutions, since the best solutions generally involve a combination of technology and other means, or even a combination of nontechnological means without any new techology.

Definition. For this reason, most authorities broaden the concept of technology assessment to include a great deal more than what ordinarily comes to mind when we use the term technology assessment, namely: a systematic planning and forecasting process that delineates options and costs, encompassing economic as well as environmental and social considerations, that are both external and internal to the program or product in question, with special focus on technology-related "bad" as well as "good" effects.

Label. Hence the label of "technology assessment" was found to be wanting, since it implies a narrower interpretation than what we mean by the concept today. This has caused considerable confusion. One manifestation of this confusion is a concern by some that we may be talking about technology arrestment, rather than assessment. It was generally felt, however, that it is too late now to change the label without further compounding the confusion. Instead, we decided to give "technology" a much broader interpretation than Webster has given it. In short, we view "technology" in "technology assessment" as variety of "things" whether these are "technical" or not, in the strictest sense of the word.

Where are we now?

The fundamental concept of technology assessment is not new, not even in its broader interpretation. What is new, however, is that today's problems that need some form of technology assessment have become more numerous, more severe and more complex. Also public awareness of these problems

Public Law 92-484
The Technology Assessment Act of 1972

establishing the

Office of Technology Assessment (OTA)
in the
United States Congress

13-Member Technology Assessment Board

Chairman: Sen. E. M. Kennedy (D.-MA)
Vice Chairman: To be selected.

Members

Sen. C. P. Case (R.-NJ)	Rep. J. W. Davis (D.-GA)
Sen. P. H. Dominick (R.-CO)	Rep. C. S. Gubser (R.-CA)
Sen. E. F. Hollings (D.-SC)	Rep. J. Harvey (R.-MI)
Sen. H. H. Humphrey (D.-MN)	Rep. C. A. Mosher (R.-OH)
Sen. R. S. Schweiker (R.-PA)	Rep. O. E. Teague (D.-TX)
	Rep. M. K. Udal (D.-AZ)

12-Member Technology Assessment Advisory Council

In addition to the Comptroller General and the Director of the Congressional Research Service Library of Congress. the 10 public members are yet to be appointed.

Office of Technology Assessment

The Director, Deputy Director and the rest of the staff are yet to be appointed.

Budget of OTA

At this time, it is not expected that OTA will receive any funds prior to having its budget authorized together with the rest of the Congressional appropriations.

Fig. 2. Organization of Office of Technology Assessment and individuals appointed to date are tabulated here. Completion of appointments and budget authorization are expected to be announced later this year.

has become more acute, and insistence that something be done about them has become more vocal.

Scientists and engineers are often surprised when they find that problems of urban blight, social unrest, environmental pollution, inadequate educational opportunities and health care deficiencies do not respond neatly to scientific and technological initiatives. Even the systems approach, which worked so well in the 1950s and 1960s for developing complex missile systems and for putting men on the moon, simply cannot be used here for at least two important reasons:

1. The objectives are much more diffused, relating less to tangible "hard" science and engineering, than to the more elusive, subjective aspects of the social sciences.

2. The disciplines involved are much more heterogeneous, and we have not yet learned how to orchestrate them for coordinated assaults on our problems. The apparent need for technology assessment as an integral step in the planning, organizing and implementing of our activities today is an outgrowth of changes that have been taking place over the past several decades, some of these are mentioned below:

a. Technology and management techniques are providing more and more leverage, often with more severe consequences, shorter lead times, and greater impacts.

b. Mistakes made are becoming more and more costly; there is an increase in the irreversibility of many of our actions.

c. There is less damping; our environment is becoming less forgiving of abuses.

d. Our goals are becoming more complex and call for increasingly complex interdisciplinary approaches to be used.

Framework. We are used to talking about a resource or a program cost being committed to the achievement of program objectives (Fig. 1). These may be called direct costs and direct benefits, in that they represent the intended causes and effects. In the process we can have two kinds of side effects —desirable and undesirable. Since these are unintentional effects, they may be termed indirect. The desirable side effects together with program objectives add up to the total benefits, whereas program cost and undesirable side effects add up to the total costs. What is defined here as indirect, an economist might call external costs and benefits.

Total benefits and total costs really consist of a combination of social effects, physical environmental effects, dollar and other economic values, political effects, institutional effects and various others. However, these terms are incommensurable and therefore we need some sort of social, environmental or urban indicators that are relevant, useful and acceptable to the public. We do not have such indicators today.

In the past, enterprises have forged from program cost to program objectives while spilling their "external" costs into the social and physical environments. The real challenge is to achieve an equitable balance among internal and external costs and benefits without causing unacceptable disruptions in our economic, social and poltical systems. Now that our demands are approaching, or in some cases have already outpaced the supply of available resources, better planning, management, efficiency and understanding are imperative. Technology assessment, as perceived today, can help us move in these directions.

Who should do technology assessment? The answer is simply "everybody" whose contemplated actions may unintentionally but adversely affect the environment, physical or social, in which he operates. Why? It is a simple matter of striving not to cause indiscriminate damage to the environment in which we live. The government has an obligation to see to it that beneficial programs in one area do not cause more damage in another to the net detriment of the public. and hence its markets, as the "exploiter" of the public's physical and social environments. Hence, it is difficult to argue with the concept. It is when we begin to talk about implementations that the issues become controversial.

Once institutionalized, will technology assessment turn to technology arrestment? It should not, if we keep two conditions in mind, both of which are consistent with the spirit of the technology assessment concept.

1. Wherever institutionalized, a technology assessment function must not be even akin to some regu-

latory function. It should be viewed as some staff function, to generate unbiased assessments, by laying out options and "costs" for the public to scrutinize and for the government to study and act upon. An improvement in the quality of public debate, legislation and program management, through a better understanding of the many variables at play, will be the true measure of the effectiveness of a technology assessment function.

2. Technology assessment must not stifle basic research, scientific innovations or creativity. Rather it should help us gain badly needed insights into our world of ever-increasing complexity, so that, in turn, our decisions and actions could become more reasoned and hence more rational.

Most of the people who oppose the technology assessment concept fall into one of two categories. There are those who, for cause, feel threatened by it. Others lack faith in our system to keep technology assessment, once it becomes institutionalized, from being subverted into technology arrestment by overzealous bureaucrats. Neither group can admit the real cause for its concern. This is perhaps the primary reason why much of the dialogue on technology assessment is so confused today.

Office of technology assessment (OTA). Near the end of 1972, Public Law 92-484, the Technology Assessment Act of 1972, created an Office of Technology Assessment within the Congress of the United States. Here is what is significant about this development. Perhaps for the first time, our legislative branch, which authorizes and appropriates all Federal funds, and which makes the laws that govern us all, could have within its midst a high-caliber, sophisticated, analytical capability, to help it understand the multitude of issues of ever-increasing complexity, which congress must resolve and act upon. The potential national marginal utility of such an office is inestimably great!

Where are we heading?

Organizaton of OTA. Public Law 92-484 calls for a 13-member Technology Assessment Board, including six senators and six congressmen, equally divided among democrats and republicans. During an odd-numbered congress a senator serves as the chairman, and a congressman as the vice-chairman. During an even-numbered congress the roles are reversed. There is also a Director of the Office of Technology Assessment who serves as the 13th member of the Technology Assessment Board.

In addition, there is a 12-member Technology Assessment Advisory Council, comprised of 10 public members, the Comptroller General, and the Director of the Congressional Research Service of the Library of Congress. (Fig. 2). As a result of such congressional activities in the legislative branch, there is considerable action in industry and the various departments and agencies of the executive branch. This is understandable. If OTA will function in the true spirit of the technology assessment concept, congress will have the opportunity to raise considerably the quality of hearings and public debates, in which both industry and the executive branch have to participate.

Institutional anchoring and credibility of OTA. It is too early to speculate on the fate of OTA. However, even with incomplete knowledge one can perceive some of the prerequisites for a successful OTA.

First, OTA will have to get institutionally "anchored" to the existing system. New organizations are rarely readily accepted by the old entrenched ones that they join.

Second, OTA will have to earn the respect of a kaleidoscopic variety of constituents through proving its credibility, by laying out sound options and sets of likely consequences as impartially as the "value-free" nature of such consequences will permit, and by refraining from taking unique stands on issues that should be left to members of congress, but making it easier for them to do so more rationally. And, finally, by assuring for cause that it, OTA, will not be likened in any fashion to regulatory agencies.

OTA is indeed faced with some Herculean tasks. Its success to get institutionally rooted, and to build the respect and credibility it needs, will depend in no small measure on the subjects it will be asked to assess initially. Should OTA confront, too early in the game, highly controversial, emotionally charged topics, where "battle lines" have already been drawn, and powerful people have already taken virtually irrevocable positions, then OTA will get "swamped" and dismissed as an "ineffective instrument."

On the other hand, should OTA get involved at the other end of the spectrum with safe trivia, then it will be viewed as irrelevant, and simply "written off." Initially, OTA will have to address issues in the middle of the spectrum, where the subject is important enough to command attention, but not so important or controversial, due to past history, as to jeopardize the demonstrability of OTA's utility. OTA will need some early "wins." By "wins" I mean public recognition of its utility.

I do not wish to conclude on a note that could be interpreted as a position on my part that OTA should stay away from important issues. Quite the contrary! But first things first. I am talking about getting OTA into a position to be able to address important issues, but without being threatened in the process for the wrong reasons. I believe that it is in our collective interest to make OTA succeed. I hope it will be supported by government and industry for the right reasons, rather than be opposed for all the things that could go wrong with it.

Obsolescence of some of our institutional systems intereferes with necessary improvements in the ways we manage our various resources. Technology assessment may be viewed as one of many necessary initial steps to come to grips in some systematic and realistic manner with some of the kinds of trade-offs that are essential to the solution of today's and tomorrow's problems.

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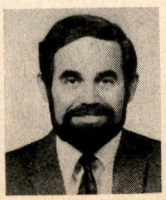

Gabor Strasser is director of Planning at Battelle in Columbus, Ohio. Previously he served in the Office of Science and Technology of the Executive Office of the President, Washington, D.C., and was Executive Secretary of the President's Science and Technology Policy Panel.

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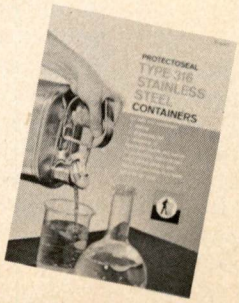

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28 April 1972, Volume 176, Number 4033

SCIENCE

The President's Message on Science and Technology

The nation's first presidential message on science and technology, which went to the Congress late last month, affirms many of the policies long advocated by the scientific community. For example, the President specifically stated that all federal departments and agencies will support basic research. He also called for stronger efforts to improve the scientific and technological basis for setting federal standards and regulations in antipollution efforts and public health. By virtue of presidential endorsement, such statements become national policies and constitute directives to the federal agencies.

The message is a landmark. It represents the foundations for a coherent science policy for the United States and clear-cut recognition that science policy is an integral part of our overall national policies. The message is therefore enormously important to those who comprise the nation's scientific and technological enterprise. It is backed by budget actions, among them a proposed 12 percent increase in university R & D support and a $700-million increase in R & D related to domestic concerns such as energy, transportation, and environment.

The nation's new R & D thrusts point toward problem-solving on the domestic front as the fastest growing component of the fiscal 1973 budget (some 15 percent this year as opposed to a 9 percent growth in defense R & D). To power these thrusts, the President called for the creation of new partnerships among the various sectors of our society so that domestic R & D can be really effective. Cooperation between the federal government and universities is already well established. It must be augmented by cooperative arrangements with industry and local governments. These new elements are needed to crystallize the results of research for the benefit of society and to broaden the all-too-narrow base of university R & D support.

The message also proposed that the federal government stimulate private investment in R & D through cost sharing, patent licensing, encouraging research associations, and making venture capital more readily available to small, innovative companies. These federal catalysts, along with the forging of new partnerships, will give the R & D enterprise of the 70's a different look. We foresee a new synthesis of science and technology, one in which enhanced fundamental research will, as always, provide new potential for development, but where applied research and development will also stimulate and enhance fundamental work.

Also recognized in the message is the expanding role and need for international cooperative efforts. In addition to the traditional camaraderie of individual scientists, international problem-solving is seen as a new source of cooperation among nations, particularly in meeting environmental, health, and energy problems common to all. The President clearly intends that the United States shall take the initiative in many of these cooperative efforts.

Finally, the message is pro-science and pro-technology. It recognizes that search for knowledge and exploration of the unknown are fundamental human drives in the best traditions of American life. It states clearly that we as a society require more—rather than less—technology to improve both our standard of living and our quality of life. The President projects a bright future for science and technology, but his message challenges us to meet that future not only in the interests of our disciplines but also of our society and the world community.

—EDWARD E. DAVID, JR.

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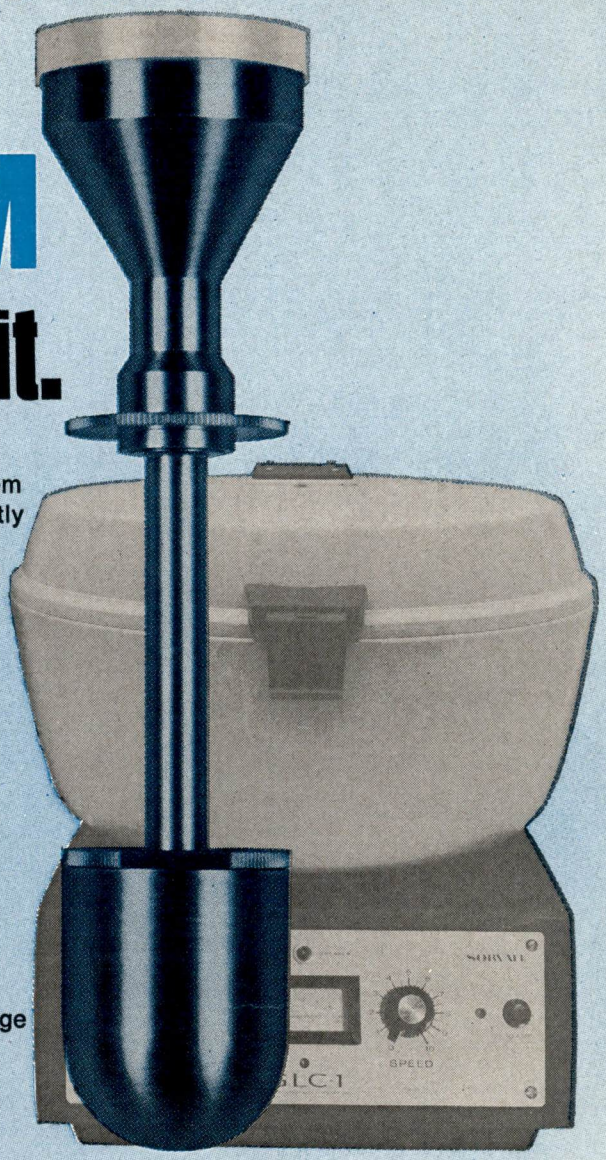

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20 August 1971, Volume 173, Number 3998

SCIENCE

A Shift to the Production of Services

We in the United States are in transition to what some are calling the postindustrial society. One characteristic of the transition is a shift from the production of goods to the production of services. That shift is made possible only by the increasing effectiveness with which we have been able to produce goods. We now produce far more food with less than 5 percent of our work force than we did in 1890 with more than 40 percent. Further, the plenitude of industrial and consumer goods we now produce, plus all mining and construction, require about the same one-third of our work force as did the relatively much lower output of 1890. It therefore has been possible to increase the number of those working in the service sector from about 25 percent in 1890 to above 60 percent today. That shift has been made both because we could make it and because we wanted to do so. We wanted more health services and more people in education. We wanted to move to the cities, with all that implies in the way of government and governmental services.

The ever-increasing pay scales generated in industry, possible only because of steadily increasing productivity, have spread to all other work areas in our society, whether productivity could increase or was increasing there at an acceptable rate. This development was a reasonable one so long as the productivity gains in agriculture, industry, and the public utilities were sufficiently large to justify increasing rates of pay. Now that the services sector employs far more than half of the work force, we no longer can expect the rising productivity of agriculture, industry, and the public utilities to be sufficient to carry the burden for all of our society.

This shift in effort from goods production to services production results in a constantly increasing proportion of our total work force being engaged where, in general, we simply have not learned how to be as effective as we are in goods production. As a consequence, each year we have relatively less total effort available to apply to seizing new opportunities or solving national problems. I suggest that this shift is related to a large portion of the increasing frustration about our apparent inability to improve our institutions at the rate we think we should.

The work areas in which we have enjoyed high annual increases in productivity per person have been in the private sector, where the profit system automatically forces management to recognize increasing costs either by increasing prices or improving productivity, or both. In general, competition limits severely the ability to increase prices; consequently, a constant effort is exerted to improve productivity. The private sector has been reasonably successful in using innovation, capital, and management to improve effectiveness and reduce costs.

One of the most complex tasks we face in the United States and one that almost certainly will involve major overhaul in our institutions is satisfying the increasing demand for such services as education, health care, and many others, with improved effectiveness and markedly decreased costs. Probably, we need to find ways to provide a much larger proportion of these services through the private, profit-making sector. Where that is not possible, we must evolve effective substitute mechanisms in the public sector. The creation of the new U.S. Postal Service is one approach. I hope that the October 1971 symposium of the National Academy of Engineering, "Application of Technology to Improve Productivity in the Service Sector of the National Economy," will suggest others. We will need them all.—P. E. HAGGERTY, *Texas Instruments Incorporated, Dallas, Texas*

The battle to control U. S. science policy

Engineers and scientists are squaring off for a showdown over their respective roles in R&D

The bastions of U. S. science and technology—the National Academy of Sciences and the National Academy of Engineering—are snarling at each other these days. The battling has grown so bitter that the two groups may split apart completely when they hold annual meetings next month.

To many outside science and engineering, their hassling may sound like the pettiest kind of professional bureaucratic squabbling. In fact, it is a new chapter in the centuries-old standoff between academicians and technicians. And the outcome could shape the direction of the country's research and development.

At issue between the two groups is the engineers' demand for a bigger voice in the National Research Council, which, since its founding in 1916, has been very much the creature of the National Academy of Sciences. Back in 1964 when the National Academy of Engineering was set up, it, too, was supposed to have the National Research Council as its "operating arm." But the engineers' influence in the council has been blocked.

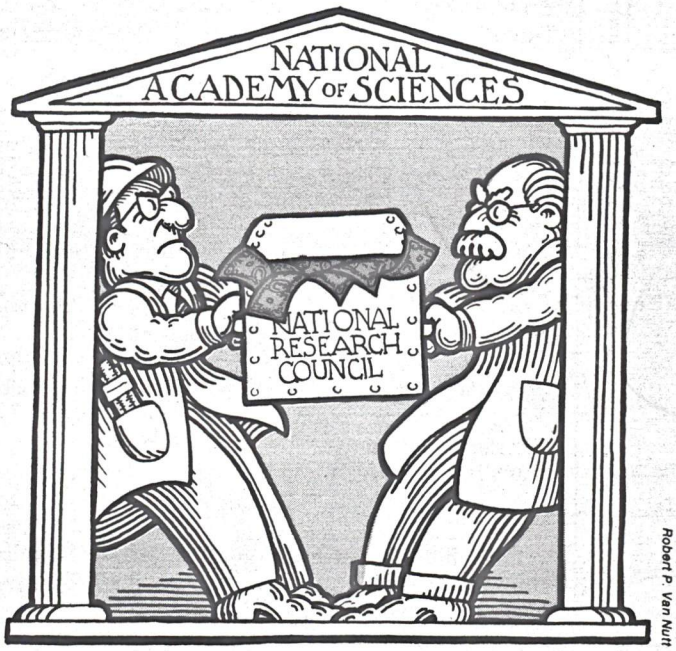
Wide influence. The council is not an obvious powerhouse among Washington institutions. It has a budget of only $35-million a year and a staff of only 700. But it is the body to which both the President and Congress look for advice on science and technology. As such, it has an influence far beyond the size. In the years ahead, the council's advice will have a lot to do with how billions of dollars of federal and corporate funds are spent for such things as energy production, transportation, health care services, antipollution programs, and population growth research.

But no members of the National Academy of Engineering sit on the council's governing body unless they also hold membership in the National Academy of Sciences—and there is only a handful of these. With the exception of the NRC's engineering division, the engineers' group has no control over appointment of the council's committees or staff, over approval of its reports, or even over what help the council solicits or accepts from government agencies.

The engineers lived quietly with this situation for years, but now their annoyance has turned to anger. Says Eric Walker, former president of the National Academy of Engineering and now vice-president for science and technology at Aluminum Co. of America: "I've been saying for the last three years that the only recourse is separation if the National Academy of Sciences keeps insisting on running the council's governing board."

Two schools. The fight has its roots in the essentially different views of the world held by scientists and engineers: the search for knowledge, on the one hand, and the application of it, on the other. In the two academies, this difference is sharply accentuated. Most members of the NAS are on university faculties. Most NAE members are corporate employees. NAS members, scientists like to point out, work on Research Council projects for $1 a day plus travel expenses, but NAE members expect, but do not get, substantial consulting fees for their efforts. Says one NAS staffer: "The engineers see nothing unusual about appointing to their panels people with special corporate interests in the very areas they are studying." George Kistiakowsky, a vice-president of the NAS and a former Presidential science adviser, says: "My concern is that the NAE is becoming an academy of industrial management."

The engineers reply that if there is any conflict of interest, the scientists are as guilty of it as anyone else because they seek to channel money into their own pet fields. Eugene Fubini, an NAE member and former group vice president of IBM, says: "Both sides have their value systems. But I believe engineers are better at grasping scientific principles than scientists are at understanding engineering."



Robert P. Van Nuff

The tug-of-war is over the National Research Council.

The engineers also complain that the Research Council, under the domination of the NAS, often does not get about its work in a businesslike way and produces its reports far too late for them to be useful to government policymakers.

Countercharges. A basic charge that the engineers level against the NAS and the Research Council is that the scientists persist in developing impractical solutions to the problems they investigate. And the scientists, naturally, charge that the engineers are always too ready to grasp at current knowledge for quick answers.

Even some NAS members agree with this kind of criticism. Says an NAS staffer: "I find it amazing that [NAS President Philip] Handler will not bring in an outside management consultant to assess the council's problems. He insists on running the whole thing himself, as if he were still running his old biochemistry department at Duke University."

Harvard biochemist Matthew Meselson, an NAS member, charges that the Research Council's basic problem is "corruption." Says he: "I don't mean corruption in the usual sense. It's more a corruption through comfort and affluence. People at the council don't want to rock the boat. They don't want ideas from people too far out, and they're suspicious of younger members."

Without some kind of a shake-up at the NAS and the Research Council, the engineers seem bound to go their own way, and everyone involved would, in the end, lose because of such a split. Says Harvey Brooks, dean of the School of Physics & Engineering at Harvard: "A break between the academies would put them into competition." According to others, it would dilute the content and pollute the credibility of both academies' advice to the government. ■

The battle to control U. S. science policy

Engineers and scientists are squaring off for a showdown over their respective roles in R&D

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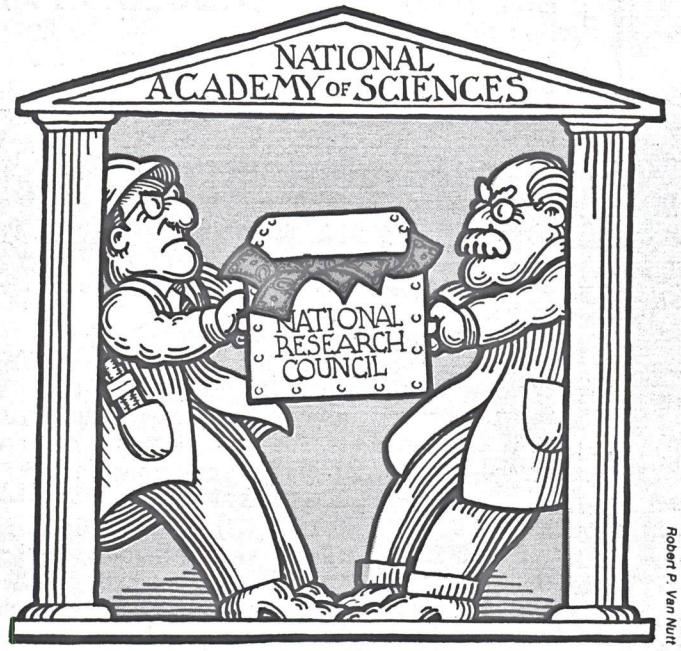

Robert P. Van Nutt

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But no members of the National Academy of Engineering sit on the council's governing body unless they also hold membership in the National Academy of Sciences—and there is only a handful of these. With the exception of the NRC's engineering division, the engineers' group has no control over appointment of the council's committees or staff, over approval of its reports, or even over what help the council solicits or accepts from government agencies.

The engineers lived quietly with this situation for years, but now their annoyance has turned to anger. Says Eric Walker, former president of the National Academy of Engineering and now vice-president for science and technology at Aluminum Co. of America: "I've been saying for the last three years that the only recourse is separation if the National Academy of Sciences keeps insisting on running the council's governing board."

Two schools. The fight has its roots in the essentially different views of the world held by scientists and engineers: the search for knowledge, on the one hand, and the application of it, on the other. In the two academies, this difference is sharply accentuated. Most members of the NAS are on university faculties. Most NAE members are corporate employees. NAS members, scientists like to point out, work on Research Council projects for $1 a day plus travel expenses, but NAE members expect, but do not get, substantial consulting fees for their efforts. Says one NAS staffer: "The engineers see nothing unusual about appointing to their panels people with special corporate interests in the very areas they are studying." George Kistiakowsky, a vice-president of the NAS and a former Presidential science adviser, says: "My concern is that the NAE is becoming an academy of industrial management."

The engineers reply that if there is any conflict of interest, the scientists are as guilty of it as anyone else because they seek to channel money into their own pet fields. Eugene Fubini, an NAE member and former group vice president of IBM, says: "Both sides have their value systems. But I believe engineers are better at grasping scientific principles than scientists are at understanding engineering."

The engineers also complain that the Research Council, under the domination of the NAS, often does not get about its work in a businesslike way and produces its reports far too late for them to be useful to government policymakers.

Countercharges. A basic charge that the engineers level against the NAS and the Research Council is that the scientists persist in developing impractical solutions to the problems they investigate. And the scientists, naturally, charge that the engineers are always too ready to grasp at current knowledge for quick answers.

Even some NAS members agree with this kind of criticism. Says an NAS staffer: "I find it amazing that [NAS President Philip] Handler will not bring in an outside management consultant to assess the council's problems. He insists on running the whole thing himself, as if he were still running his old biochemistry department at Duke University."

Harvard biochemist Matthew Meselson, an NAS member, charges that the Research Council's basic problem is "corruption." Says he: "I don't mean corruption in the usual sense. It's more a corruption through comfort and affluence. People at the council don't want to rock the boat. They don't want ideas from people too far out, and they're suspicious of younger members."

Without some kind of a shake-up at the NAS and the Research Council, the engineers seem bound to go their own way, and everyone involved would, in the end, lose because of such a split. Says Harvey Brooks, dean of the School of Physics & Engineering at Harvard: "A break between the academies would put them into competition." According to others, it would dilute the content and pollute the credibility of both academies' advice to the government. ■

Nixon's Science Adviser: Genesis, Progress of a Surprise Appointment

The appointment of Edward E. David, Jr., as chief presidential science adviser evoked surprise because David was not a member or protégé of the fairly small group that had dominated the upper levels of government science advice since Sputnik.

Unlike his five predecessors in the job, all of them radar or nuclear researchers during World War II who then continued in or went on to academic careers, David, age 45, spent his career in an industrial research organization, Bell Laboratories. At the time of his appointment, announced 19 August, he headed a group of 200 researchers as executive director for research in the communication principles division. And, though he had a fair number of contacts with the science-government relationship through service on advisory groups, these were all at a relatively low level and did not include membership on the President's Science Advisory Committee (PSAC), which, traditionally, has been the preparatory body for presidential science advisers. PSAC, a part-time, self-perpetuating body which is customarily chaired by the president's science adviser, has traditionally played an unofficial but central role in selecting the man who is to serve the president on a full-time basis. But in David's case, it was not brought into the selection process, and his appointment apparently surprised most of its members as much as it did anyone else.

Thus, there is curiosity about David's route to the job, as well as an interest in clues as to how he will fill it. On this latter point, the early evidence is that he will fill it vigorously rather than passively and that, at his relatively youthful age, he is determined to make his mark in national science affairs. Significantly, upon accepting the appointment, he resigned from Bell, which was a matter of choice rather than necessity. All of his predecessors went on leave from their universities when they took the job, except for DuBridge, who retired after a long career as president of California Institute of Technology.

As for the genesis of his appointment: David was picked by members of President Nixon's personal staff without consultation with the then-incumbent, Lee A. DuBridge. DuBridge had indicated a wish to retire before September 1971, when he will be 70. But, more important, both for the timing and the selection process, the White House staff felt little confidence in the manner in which DuBridge ran the Office of Science and Technology (OST) and its surrounding committees and advisory groups. Justifiably or not, Nixon's immediate staff held the OST operation responsible for a series of politically painful matters, ranging from allegedly poor advice on the selection of appointees for high federal research positions to the general impression that budgetary niggardliness under Nixon was seriously injuring American science. It was also noted that DuBridge had lost contact with important elements of his own constituency, notably an influential segment of PSAC which felt that he had violated PSAC etiquette by voluntarily speaking out in support of the administration's position on the antiballistic missile. Furthermore, long memories on the Nixon staff observed that PSAC included several regular or associate members who were deeply involved in organizing the scientific community against Nixon in the 1960 election. (DuBridge identifies himself as a Republican but has never been involved in party affairs.) Among this enduring group of advisers was one who, when in the employ of the Eisenhower administration, flatly rejected a suggestion that he assist Nixon's 1960 campaign for the presidency. And here, 10 years later, it was noted by some of those who had labored to bring Nixon to the presidency, a number of these one-time anti-Nixon activists were still trooping into the White House as policy advisers. Metaphysicians of science policy inevitably applaud this continuity as evidence of a sound system for procuring the best scientific and technical advice, regardless of party considerations. And perhaps it is. But for veterans of Nixon's Long March, it was somewhere between incredible and deplorable.

In this context, there was no inclination to ask the White House science advisory apparatus to assist in finding a successor when it was time for DuBridge to go. Conducted by Nixon's staff, the search turned toward various individuals who had come to the attention of the White House in the course of a search for talent after the new administration took office. Now, just who it was that had put in the name of Edward E. David, Jr., is not certain, but it was virtually certain that his name would turn up on the list of prospective recruits for high scientific or technical positions. First, David met the minimum requirement of being a Republican, though, like DuBridge, his party relationship was nominal. Equally important, however, David was a star member of that esteemed collection of talent known as Bell Telephone Laboratories, which, for at least a quarter of a century, has always had one or another of its top executives closely associated with the government's most important scientific and technical activities. As one longtime academic science adviser observed, "There is no organization, academic or industrial, that can match Bell for the length of its high-level connections in Washington." At the beginning of World War II, for example, Bell president Frank B. Jewett, who was also president of the National Academy of Sciences, helped organize the wartime research effort. His successor, J. B. Fisk, was chief of research for the Atomic Energy Commission during the critical early postwar years, chaired the U.S. technical delegation to the Geneva Test Ban Conference in 1958, and also served on PSAC until 1960. B. McMillan, Bell's vice president on military systems, was undersecretary of the Air Force from 1963 to 1965; W. O. Baker, Bell's vice president for research, is enmeshed in government advisory bodies, ranging from PSAC to the Liaison Committee for Science and Technology of the Library of Congress.

Which, if any, of these suggested David's name to the White House is not known, but the most frequent guess is that it came from Baker.

As early as last May, David held conversations with members of the

AAAS Won't Absorb Science Service

The AAAS directors, at their regular quarterly meeting this past weekend, decided not to use AAAS funds to bail out financially troubled Science Service Inc. Instead, the directors offered to provide "consultation and management services" under contract if Science Service desires such help.

The action fell far short of the assistance sought by the nonprofit publishing organization, which is probably best known for its popularized weekly magazine, *Science News*, and for its conduct of the annual Science Talent Search, sponsored by the Westinghouse Educational Foundation. Science Service, whose board includes many distinguished scientists, has operated for roughly half a century, but in recent years deficits have soared to the point where the organization's continued existence is threatened (see *Science*, 18 September). According to records filed with the Internal Revenue Service, Science Service reported losses of $45,540, $189,609, $208,498, and $365,371 in the four successive fiscal years ending 31 March 1969. The records also show that Science Service has been selling off assets to make ends meet. Records for the most recent fiscal year are not available, but Science Service is said to have cut its deficit to around $100,000 for fiscal 1970. Moreover, rigorous economy measures are said to have brought the organization close to the break-even point in recent months.

In an effort to gain enough financial backing to survive the current crisis and to allow room for future expansion, Science Service appealed to the AAAS to merge or otherwise assume its financial obligations. That hope was dashed this past weekend when the AAAS directors voted down a proposal "that the AAAS accept the assets, liabilities and responsibilities of Science Service" and commit up to $500,000 for that purpose from AAAS resources. Unwilling to turn their backs completely on troubled colleagues, however, the directors expressed their willingness "to accept from Science Service a contract for one year to provide consultation and management services to be negotiated." The board charged its chairman "to ensure that AAAS does not incur liability for the debts of Science Service" and urged him to complete contract negotiations "at the earliest possible time." Board members are said to have felt sympathy with Science Service's efforts to reach the young and the lay public, but a majority of the board felt that the organization's precarious finances might prove an endless drain on the AAAS treasury.—P.M.B.

White House staff, though apparently there was neither a job offer nor even a mention of any particular position. It is not clear just what it was that suddenly precipitated the decision leading to DuBridge's departure, but late in July David was asked whether he would take the job of White House science adviser. David says that, before he accepted, he discussed the job with several "key people" in the White House. "If I hadn't been assured of their support," he said in an interview with *Science*, "I wouldn't have taken the job. I said to the White House people that I wouldn't take the job to downgrade science. I was satisfied after talking cold turkey that they agreed."

David warmly praises his predecessor for leaving him what he describes as a "solid foundation" and also for having done "a terrific job of educating people about problems of science policy." He rejects the widely held view that under DuBridge the office declined in influence and that DuBridge was, in effect, suddenly eased out. But there are those in a position to know who say that plans for David's hiring and DuBridge's departure were simultaneously disclosed to DuBridge by the White House staff and that the affront was then diplomatically papered over with an effusively worded, publicly released "Dear Lee" letter from Nixon.

In any case, with the change announced 19 August, David proceeded toward his new post in a fashion which indicates that he realized that his appointment broke with tradition and that it would be desirable quickly to establish links with the various persons and organizations that have been important in the affairs of the office he heads. As he put it, "I made sure I had contact with the constituencies." One of David's first steps was to get together with past presidential science advisers, in a meeting held at his doctoral alma mater, M.I.T., and hosted by Eisenhower's first fulltime science adviser, M.I.T. board chairman James R. Killian, Jr. Among those present were George Kistiakowsky, the Harvard chemist, who also served under Eisenhower; Jerome B. Wiesner, M.I.T. provost, who was Kennedy's adviser; and Donald F. Hornig, president of Brown University, who served Kennedy and Johnson. The only occupant of the office not present was DuBridge, the explanation being that he and David had held conversations earlier. David also met with the Council of the National Academy of Sciences (he is a member of both the NAS and the National Academy of Engineering). Meetings were also held with PSAC and several of its advisory panels.

Though it might be expected that some old-time members of the advisory system would feel chagrined by David's appointment, the fact is that, even in conditions of strict anonymity, there seems to be a good deal of confidence in the choice. One reason is that David's professional ability is held in high regard. Another is that few of the old-timers feel at home with the Nixon administration, but they feel rapport with David and believe, or at least hope, that he can provide the link that has been missing between science and government since Nixon took office.

David is going about his duties in a quiet but apparently surefooted way. There are reports that since he took office a formal understanding has been reached under which OST will automatically be consulted by the Office of Management and Budget on matters concerning science, technology, and many educational affairs. It is known that under DuBridge the consultative process was considerably diminished. David simply says, "We've worked out some understandings, but essentially it's a process that depends on confidence and good relations. We'll have to see how it works." Others say, however, that the understandings are specifically embodied in a memorandum and that David took the job only after it was agreed that his office would be given

an opportunity to play a role in the formulation of budgets.

David said that he considers "high priority" problems to include unemployment in the aerospace industry, "gyrations" in support of basic research, the relationship between biomedical research and medical service, and national energy needs. "But you know," he said, "we don't control events here. We're in a position to take a broad view and to make recommendations to people who do. But I'm not sounding off on anything until I know my way around a good deal better. What I can say is that I took this job with the assurance that there is backing in the White House for doing a lot of things that are necessary for improving our science and technology and for making use of them for national needs. There is a real willingness to do what is necessary." David added that he sees himself dealing with four constituencies: the science and engineering communities, the White House staff, the government research organizations, and the public. "But I'm not here as a lobbyist for any of them. I'm here, in my view of it, to provide the best advice available concerning the problems that come under this office."

Considering the political preoccupation of the Nixon administration, and the budgetary pressures that restrict its choices, it is doubtful that the relatively obscure Office of Science and Technology can become a central point for re-ordering priorities to the satisfaction of any of David's constituencies. Not even a blend of Fermi and Talleyrand could do that from the slim power base that is OST. But 3 hours of conversation with David, plus the recollections of people who know him, do not suggest that he came to Washington to sink out of sight passively.

—D. S. GREENBERG

Cyclamates: House Report Charges Administrative Alchemy at HEW

At a Saturday morning press conference in October 1969, Robert Finch, then Secretary of Health, Education, and Welfare, announced that cyclamate artificial sweeteners—which Americans were consuming at the rate of 16 million pounds per year—had been found to cause cancer in rats and would no longer be sold as foods. Following Finch's announcement HEW established regulations permitting the sale of foods containing cyclamates as nonprescription drugs; but this decision was reversed in August of this year, and all sales of cyclamates were banned.

This curious series of events led the House Intergovernmental Relations Subcommittee, headed by Representative L. H. Fountain (D–N.C.), which has long been critical of both HEW and the Food and Drug Administration, to investigate the regulation of cyclamates. The subcommittee's report,* released last week, provides some interesting insights into the administration of FDA and its parent organization, HEW.

Cyclamates were first marketed in the early 1950's, but their use, like that of saccharin, was confined to diet foods used mainly by diabetics and severely obese persons. In 1958, on the basis of early clinical trials and their limited use, cyclamates were placed on the Generally Recognized as Safe (GRAS) list of products so that no restrictions were imposed on their use.

About 1960 cyclamate consumption soared, mainly because of clever marketing techniques of soft drink companies. The subcommittee's report notes that, at the time of their increasing popularity, cyclamates had not been subjected to the rigorous screening tests that normally would have been applied to a food additive consumed in large quantities by healthy people.

A series of studies, many of them financed by the sugar industry, revealed a variety of possibly harmful effects of cyclamates. At hearings on cyclamates before Fountain's subcommittee testimony revealed that, as early as 1962 and increasingly after 1962, the FDA had reason to believe that cyclamates were not generally recognized as safe. FDA officials testified that, indeed, cyclamates should have been removed from the GRAS list long before they had been, but offered no explanations.

Cyclamates finally were removed from the GRAS list by Finch—not the FDA—when cancer was added to the list of possible side effects. Rats fed high doses of cyclamates at Abbott Laboratories, the principal manufacturer of the artificial sweeteners, developed a rare type of kidney tumor. This result, later confirmed in FDA and other laboratories with much lower doses of cyclamates, forced HEW to invoke the 1958 Delaney Amendment to the Food, Drug, and Cosmetic Act, which prohibits the sale of any food component shown to cause cancer in man or animals. There is still no evidence that cyclamates cause cancer in humans.

Finch, according to the Fountain report, did not want to eliminate the sale of products containing cyclamates completely, and he announced at the October press conference that cyclamates would remain available to people with such conditions as obesity and diabetes.

One can only speculate on Finch's reasons for stating unequivocally at that time that these products would continue to be sold. An FDA official mentioned in his testimony before the Fountain subcommittee that California fruit growers had just completed the canning season at that time and that a significant portion of fruit had been canned with cyclamates, but the subcommittee's report does not mention this factor. A few months after the cyclamate ban, the Washington *Post* reported that HEW was planning a legislative strategy for the elimination of the Delaney Amendment.

After Finch made his announcement in October, HEW convened an ad hoc Medical Advisory Group on Cyclamates, and after studying the available data the advisory group suggested that cyclamates remain available to people with conditions such as obesity and diabetes, the course of action that Finch had already stated would be followed.

FDA was then asked to find some

* Copies of both the Report on the Regulation of Cyclamate Sweeteners and the transcript of the Hearings on Cyclamate Sweeteners which preceded the report can be obtained free of charge from the House of Representatives, Intergovernmental Relations Subcommittee of the Committee on Government Operations, Washington, D.C. 20515.

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EXECUTIVE OFFICE OF THE PRESIDENT
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FEDERAL BUDGET FOR SCIENCE AND TECHNOLOGY - FY 1973

The budget of the United States for Fiscal Year 1973 provides an increase of $1.4 billion in scientific research and development funds and a number of important policy trends.

The R&D total (see Special Analysis R) provides an increase of $700 million for civilian-oriented programs including energy, health, education, environment, urban problems, transportation, and other areas, an increase of nearly 15 per cent.

Another increase of $761 million is requested for defense research and development, including the military aspects of the Atomic Energy Commission. This represents an increase of 9 per cent.

Overall, the R&D program amounts to $17.8 billion as compared to $16.4 billion in FY 72, an increase of 9 per cent. It represents an increasing commitment of science and technology to the service of man and continues a trend which has, since 1969, produced a 65 per cent increase in civilian-oriented R&D.

Here are the highlights:

> R&D on safe, efficient and pollution-free transportation, $666 million, some $210 million more than last year's $456 million, an increase of some 46 per cent.
>
> Research to reduce loss of life and property from fires, earthquakes, severe storms, floods, and other natural disasters, $136 million. This is $43 million more than FY 72's $93 million, an increase of 42 per cent.

Advanced work on educational research and development in HEW, $197 million. Last year's total of $142 million goes up by nearly 39 per cent.

Some $93 million will be obligated for additional cancer research. This augments an additional $100 million approved in FY 72 and which brought last year's anti-cancer funding to $337 million. The FY 73 obligation will be $430 million, an increase of 27 per cent.

An additional $88 million is being obligated for work on clean, abundant energy sources for a total of $480 million. As last year's total was $392 million, this is an increase of more than 22 per cent.

Defense-related R&D, including AEC defense programs, increased $800 million to $9.4 billion. Last year's total for such work was $8.6 billion, thus reflecting an increase of 9 per cent.

As a result of the foregoing and other programs, research and development commitments to colleges and universities will rise by $237 million to a total of $2.257 billion. Last year's total was $2.02 billion, thus representing an increase of 12 per cent.

Important new efforts include $40 million for National Science Foundation and National Bureau of Standards experiments in stimulating industrial innovation and productivity; $3 million for NSF to begin work on what will be the world's most advanced radio telescope, the VLA (very large array); new emphasis on National Aeronautics and Space Administration efforts to bring the benefits of space research to communications, weather, earth resources, aeronautical and other programs; and, new commitments to improve the survivability of our sea-based strategic deterrent.

In the State of the Union message, the President mentioned a number of areas where progress is to be sought. He referred to:

Disaster Loss Reduction: Where efforts can be made to improve earthquake-proof building designs as well as

fire-detection and fire-fighting improvements through technological advances.

Abundant, Clean Energy: New emphasis on near-term devices such as the fast breeder reactor while simultaneously pursuing the cutting edge technology; magnetic confinement and laser-induced thermonuclear fusion, cryogenic generation and transmission of power, coal gasification and solar energy.

Developing Safe, Fast, Pollution-Free Transportation: The development of personal mass transit facilities which offer means of getting large numbers of people from one place to another quickly and safely; the investigation of dual mode facilities which have the convenience of personal vehicles, but which are adaptable to a guideway; further development of quiet jet engines by NASA and DOT and STOL aircraft by NASA.

Curbing Drug Traffic: The development of ways to halt illegal traffic in drugs, both at the source and the ultimate user end, and the rehabilitation of drug users.

Effective Emergency Health Care: Ways of integrating communications, transportation and medical care facilities in order to save lives through fast, closely-coordinated action in emergencies.

Other areas which this year's augmented R&D program encompasses include:

Finding new waysof tunneling through the earth in support of both energy transmission, housing and transportation programs. (NSF)

Noise reduction from truck and bus tires and mufflers. (DOT)

A National Institute of Education and a National Foundation for Higher Education. (HEW)

Development of high energy density batteries for use in vehicles and power systems. (AEC)

A four-agency study (EPA, FDA, NIEHS & NSF) on the health effects of pollutants as bases for further refinement of environmental regulation and standards setting.

Coal gasification development programs to utilize our vast reserves of coal to provide convenient, clean fuel. (DOI)

Dry cooling towers for thermal power reactors. (AEC)

Here are the policy highlights:

Among the most significant is the decision to take a more strategic approach to R&D. The Domestic Council's recently-completed exploration of new technological possibilities inaugurated last year in collaboration with the Office of Science and Technology was a significant first step. It helped identify possibilities where government efforts could create new jobs, stimulate industrial production and innovation, enhance overseas trade, and more directly meet the needs of man and the nation.

Another significant policy trend is continued channeling of the total R&D effort toward civilian needs. To meet national requirements expeditiously, science and technology can be focused more directly on domestic problems as the successes of the goal-oriented space and defense programs of the 1960's have shown.

A third policy trend is the strengthening of fundamental research support in order to maintain a solid foundation under the nation's applied sciences and high technology.

Fourth is a decision to utilize the capabilities of the high technology agencies such as NASA, AEC, and NBS to deal with domestic problems and meet long-range national goals, but without diverting them from their primary missions. To mesh with these high technology capabilities, the domestic mission agencies' R&D will be strengthened.

The fifth policy action is the decision to initiate in NSF and NBS experimental incentives programs to stimulate industrial R&D and its application.

DEFENSE

The Department of Defense will increase its research and development funding by $767 million in FY 73 in order to maintain research, development, test and evaluation programs adequate to meet the nation's future needs. This includes an increase of $123 million for research. Oceanography, biomedical research, atmospheric sciences, electronics and materials are important areas of interest. The Navy R&D budget is up 14 per cent, the Army's 11 per cent, and the Air Force 9 per cent. By way of policy, there also have been decisions to do more test and evaluation before going ahead with the purchase of major weapons.

In development, the main thrusts are in stronger sea-based deterrents and in improving tactical capabilities. There is a major effort to develop advanced warfare systems for conventional general purpose forces.

New development programs include a lightweight fighter prototype, VTOL/STOL aircraft and advanced electronic warfare systems.

SPACE

The NASA budget remains at nearly the same level as FY 72. But the budget for space sciences research is at an all-time high -- up 25 per cent to $554 million. The space agency's applications research program increased $17 million to $201 million and will focus on such things as communication, earth resources, weather and other man-oriented satellites and programs.

NASA has provided for a new generation Orbiting Solar Observatory -- OSO-I -- and has also developed a modified approach to the investigation of the outer planets. It calls for the launch of missions to Jupiter and Saturn in the 1977-78 period, using Mariner or Pioneer type spacecraft. There are options for similar flights later in the decade. During 1973 a more extensive plan for exploration of the outer planets will be formulated.

The two Viking automated landers planned for Mars in 1975 received 30 per cent more funding for a total of $230 million. NASA will also continue development of the High Energy Astronomy Observatory.

In manned flight, Apollo Missions 16 and 17 are to take place as scheduled this year, thus terminating the Apollo lunar landing series. The next manned flights will be to Skylab, a three-man, reusable space station which will be visited by three separate teams of astronauts for periods up to 56 days next year.

The next chapter in manned space flight will open with the advent of the Space Shuttle flights in the late '70s. This project was approved by the President January 5 and calls for a reusable, two-part launch vehicle/orbiter. The costs of launching payloads can be reduced from $600-$700 per pound to $100 per pound by such craft at presently anticipated launch rates. The overall cost of the development program is estimated at $5.5 billion over the next six years.

A number of alternative advanced propulsion technologies will be examined, including a small nuclear engine, for possible use in connection with unmanned outer planets missions and other applications in the 1980s.

THE ENVIRONMENT

Federal R&D efforts in pollution and environmental problems are aimed at determining the effects of pollutants on living systems and understanding the dynamics of the environment as the bases for new control technologies and rational standard-setting and regulation. Environmental research and development are not confined to EPA alone. Other federal agencies are coming to realize that effective pollution control must be built into engineering and other systems from the ground up rather than being after-thoughts. The FY 73 Budget for R&D reflects this philosophy in that agencies with special expertise are being asked to address present and potential pollution issues directly.

EPA is undertaking several new or expanded efforts as well as beginning construction of a new laboratory at Cincinnati, Ohio.

One effort is designed to help define pollution control objectives and work out cost-effective solutions. Special emphasis is attached to a program for determining the biological effects of pollutants and other environmental contaminants as one of the bases for setting standards and regulation. This program will be carried out in EPA, FDA, National Cancer Institute and the National Institute of Environmental Health Sciences of NIH, and NSF. There has been a budget increase of 34 per cent for this work with a total of $154 million, some $39 million more than last year. An important element is the new National Center for Toxicological Research at Pine Bluff, Arkansas, set up at Presidential initiative last year and supported by both EPA and FDA.

EPA and others will continue, in collaboration with industry, to develop and demonstrate technologies for controlling the oxides of sulfur in fossil fuels and smelting ores. NASA and DOT will address such problems as aircraft noise pollution. EPA will reorient its solid waste program to focus on economic and institutional constraints affecting refuse disposal and recycle systems. Meanwhile, the Department of Transportation will continue its studies of the environmental effects of aircraft and the Defense Department -- with EPA -- will continue the development of the low-pollution, stratified charge engine for automotive use.

The Department of Agriculture will have additional money to work on the pesticide problem. Pesticide research, including an integrated approach to pest control, is being increased by $6.7 million.

ENERGY

The Federal effort on civilian energy R&D will approach $480 million in FY 73, up $88 million from the previous year. These funds, which include projects in several agencies -- AEC, Interior, EPA, NSF, TVA, and Commerce -- will advance the three priority technologies announced by the President in June. They finance new starts or greatly accelerate ongoing efforts. Work on the liquid metal fast breeder reactor, pipeline quality gas from coal, sulfur oxide control technology, nuclear fusion and magnetohydrodynamics will expand. New thrusts will be given to solar energy, industrial gas from coal, dry cooling towers for power plant waste heat, high energy storage batteries, and advanced underground electric transmission lines.

HEALTH

The nation's health bill reached $75 billion in 1971 and is continuing to rise. The federal government will spend an estimated $25.5 billion on health in FY 73 -- some 10.3 per cent of all federal outlays and a quarter of the total national health costs.

Major objectives of present and projected federal programs are: to reduce health cost inflation, improve the efficiency, quality and accessibility of health care and to develop new knowledge to reduce the incidence and effects of diseases or eliminate them entirely.

The Health Services and Mental Health Administration will increase R&D related to the organization for the delivery of health care. New methods will be sought to increase the efficiency and, where appropriate, utilize new technological advances. To stimulate formation of Health Maintenance Organizations (HMOs), the Administration will seek improved approaches to management and delivery and advance the use of preventive medicine.

Biomedical research, a cornerstone for the delivery system, will be fostered by the budget of the National Institutes of Health which will increase 12 per cent to about $1.4 billion. The increase includes:

> $93 million for a continuation of the cancer research program (total for the National Cancer Institute, $430 million);
>
> $22 million for the National Heart and Lung Institute for programs aimed at cardiovascular, sickle cell, and lung disease (total for the Institute, $254 million); and
>
> $4 million for research training grants and fellowships (total, $186 million).

A special effort will be devoted to stimulating local communities to improve care for medical emergency or accident victims. Morbidity and mortality could be reduced if better organization permitted the application of existing knowledge and technology to this problem.

Two other crippling and often fatal national problems are drug abuse and alcoholism. Funds for R&D in both these areas will increase in FY 1973.

INTERNATIONAL SCIENCE

International cooperation is a key part of our overall R&D programs. Much of our current effort is directed toward building mutually beneficial relationships between our domestic programs and parallel interests abroad. We are seeking, with other nations, technical solutions to the complex problems of modern societies. The State Department's coordinating and focusing role is being strengthened; the NSF's bilateral program role is being extended (from $4.0 million to $4.7 million); cooperative research utilizing excess foreign currencies (PL-480) is being increased (from $65 million to $90 million); and the Department of State's funds for educational exchanges are being raised 29 per cent from $40.5 to $52.4 million.

FUNDAMENTAL RESEARCH

A highlight of the fundamental research effort for FY 73 is the decision to go ahead with the development of a Very Large Array (VLA) antenna system. Some $3 million is being provided to start the project, an effort which will put this country in the forefront of radio astronomy for many years to come. Its capabilities will permit us to look into the hearts of distant quasars and radio galaxies to examine their structures.

In other research facility developments, the 200-Bev accelerator at Weston, Illinois, is expected to be completed this year. Reflecting an Administration commitment to assure the continued health and progress of American science, the fundamental research supported by the National Science Foundation alone will go up by 10 per cent this coming year. Even as increasing attention is paid to problem-oriented efforts, funding for high energy physics will go up by $10 million in FY 73, and R&D in universities will, in the overall, go up 12 per cent or $237 million to $2.257 billion.

Increased emphasis on cancer, the augmented activities of the Heart Institute and other NIH programs will result in increased support of the life sciences. New investigations involving the biological effects of pollutants by FDA, EPA, NSF, and NIEHS will add to that support. "Problem-oriented R&D" will provide healthy spillover into basic research.

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EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF SCIENCE AND TECHNOLOGY

WASHINGTON, D.C. 20506

September 10, 1971

MEMORANDUM FOR

MEMBERS OF PSAC

From: Gabor Strasser

Subject; Haggerty Panel Report on Science & Technology Policy

Attached is a copy of the final report which Pat Haggerty expects to deliver to Ed David on Monday, September 14. Pat will not be able to attend the September PSAC Meeting on the 19th and 20th.

Since you have reviewed a previous version of this report, let me briefly summarize the notable changes that have been made since your review.

1. What we called "objective-seeking" R&D, we now call "objective-related" R&D.

2. The Academic Science Section IV became Appendix A, pushing all of the other appendices down one notch.

It was felt that the tone and nature of this piece is such that it would be better placed in the appendix, where we already have the criteria section for federal support of R&D. (Appendix B).

3. It was felt that the following should be emphasized:

While most of academic science consists of exploratory research a goodly portion of exploratory research is done outside academia. Our recommendations pertain to the exploratory research component of academic science, exclusive of the objective-related R&D efforts within universities.

4. The overall level of support for the exploratory research component of academic science is meant to be neither a stringent "floor" nor a "ceiling." Rather, it is to be viewed as a relatively firm guide.

5. Specific percentage growth rate recommendations for academic science support have been deleted.

6. It has been stressed that when a mission agency undertakes a massive exploratory research effort, and targets it on one of its mission objectives, then such effort automatically becomes objective-related R&D, and moves out from under the overall level of support consideration mentioned in 4 above.

7. The conditions under which the Federal government would support R&D in the civilian sector were handled in the July 8 draft as exceptions to a general rule. (This is in the criteria section, which is now Appendix B). These conditions are now stated in a positive manner, rather than as exceptions.

Gabor Strasser

Gabor Strasser

Report

by the

SCIENCE AND TECHNOLOGY POLICY PANEL

of the

PRESIDENT'S SCIENCE ADVISORY COMMITTEE
(PSAC)

September, 1971

Patrick Haggerty
Member of PSAC
Panel Chairman

THE PRESIDENT'S SCIENCE ADVISORY COMMITTEE
EXECUTIVE OFFICE BUILDING
WASHINGTON, D.C. 20506

September 1, 1971

Dear Ed:

Transmitted along with this letter is the final report of the PSAC Panel on Science and Technology Policy. Because the report itself is relatively brief and consists primarily of a tabulation of recommendations with the accompanying descriptive discussions held to the bare minimum, we have not listed these recommendations separately, and I will not comment on them in detail in this letter. Nevertheless, there are a few observations which seem appropriate.

Clearly, President Nixon understands the significance of science and technology not just to the economic strength and growth of the United States but as a cultural bulwark of our contemporary society. Numerous pre- and post-election statements are sufficient proof, as in a more specific sense have been his statements and the actions during our several PSAC meetings with him.

During the February 23 meeting with PSAC, for example, he particularly expressed concern about unemployment among scientists and engineers, not only in a humanitarian sense, but because a major national resource, the professional abilities of these unemployed scientists and engineers, was going to waste.

Yet, unemployment among scientists and engineers results primarily from several coincident actions, by agencies of the U. S. Government (aggravated by the levelling off of requirements for faculty in the educational system), including the decrease in the NASA budget, the decrease in the DOD budget, and the response of the general economy to the fiscal and monetary policies of the federal government in 1969 and early 1970.

It would appear that although the general increase in unemployment was anticipated (perhaps not quite to the extent of the 6% level reached), there was no agency of the federal government which assessed the impact of all of these actions occurring more or less simultaneously on the employment of scientists and engineers and, hence, on anticipatory programs which, to the maximum extent possible, would have capitalized on utilizing the resource so made available by applying it to other program areas where indeed there are great needs for technically educated, experienced personnel.

That this is so should be no surprise to the Science Adviser, OST or PSAC, since they certainly have not been organized to perform this kind of function, and the NSF and Department of Labor data are not prepared for this use.

The failure to anticipate this unemployment problem among scientists and engineers is one example which illustrates in the starkest kind of way the limitations of the present mechanism for discussing, influencing, and making science and technology policy at the federal level. Other examples which illustrate the need are the erratic federal support for Academic Science over the past few years and the growing anti-science, anti-technology feelings within our society.

This PSAC Panel report consists almost entirely of recommendations which if followed would insure the Science & Technology Advisory Mechanism of the President (STAMP)*assuming a much strengthened policy role.

The Panel is, of course, very much aware that, as a matter of fact, you already have begun this kind of expanded role and it views with enthusiasm such examples as the spring pre-budget reviews and the drafting of the initial Annual Report on Science and Technology.

With this report the Panel feels that it has completed its responsibilities and recommends that it be discharged. It also recommends that another panel, under a new chairman, be constituted to deal with specific items of science and technology policy of your choosing. Presumably, this new panel would function under the guidance of the expanded, full-time, professional competence in OST also recommended in this report.

Sincerely,

Patrick E. Haggerty, Chairman
PSAC Science and Technology
Policy Panel

Enclosure
*(STAMP) is comprised of the Science Adviser, OST, PSAC, FCST.

Dr. Edward E. David, Jr.
Science Adviser to the President
The White House
Washington, D.C. 20506

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* STAMP is comprised of the Science Adviser, OST, PSAC and FCST.

PREFACE

This report summarizes the deliberations of the Science and Technology Policy Panel.[1] The Panel was established with the approval of the President in early 1970 by Dr. Lee A. DuBridge, then Science Adviser, under the auspices of the President's Science Advisory Committee (PSAC).

In brief, the Panel was charged with finding improved ways of focusing, supporting and utilizing science and technology in the interest of the nation. The Panel has met monthly -- usually for one day, occasionally for two -- since its inception. During that time an extraordinary breadth of subject matter has been covered, ranging from discussions relating to the structure of the Science and Technology Advisory Mechanism of the President (STAMP),[2] to the development of a rationale for the support of academic science, and the relationship of science and technology to our national productivity and economic welfare.

The scope of the subject matter is indicated by Appendix E -- a guide to the more than 2000 pages in nine volumes generated by the Panel itself or reviewed or abstracted in connection with its work. These nine volumes

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[1] See Panel Membership List, Appendix C.

[2] Consisting of the Science Adviser, the President's Science Advisory Committee (PSAC), The Office of Science and Technology (OST), and the Federal Council for Science and Technology (FCST).

are available to the Office of Science and Technology and PSAC to serve as background information for further efforts in the science and technology policy area.

In addition, a collection of statements by individual Panel members enlarging on or criticizing the report itself, or discussing science and technology policy areas which the report itself does not treat, is included as Appendix D.

The Panel realized relatively early in its discussions that just because of the wide variety of subject matter implicit in science and technology policy, it would be able to discuss in detail and arrive at recommendations on only a very few of the items which could justifiably claim attention under that heading. Thus, The Panel concluded that it could be most productive by making recommendations dealing with how to make the STAMP more effective and that is the principal subject matter of this report.

There are four other documents which report preliminary findings either of the Panel or of sub-panels dealing with specific items. All are included in Volume IX described in Appendix E. These four documents are:

1. Report of the PSAC Sub-panel on Academic Science to the PSAC Panel on Science and Technology - Murray Gell-Mann, Sub-Panel Chairman - June 16, 1970.

2. "Progress Report and Observations of Science and Technology Policy Panel," Memorandum from Patrick E. Haggerty, Chairman, to Lee DuBridge, dated June 5, 1970.

3. "Federal Policy for Science and Technology," Interim and Partial Report of August 31, 1970, and the accompanying letter of transmittal dated September 9, 1970, from Patrick E. Haggerty to Dr. Edward David.

4. "On Increasing National Productivity Through Education and Technological Change," Report by Sub-panel on Research and Education - Arthur M. Bueche, Sub-panel chairman, June 18, 1971.

I. THE NEED TO REORIENT AND REFORM THE SCIENCE AND TECHNOLOGY POLICY PROCESS

It is only a very moderate oversimplification to state that Research and Development (R&D) generate the knowledge encompassed by the term "science and technology." Thus, any discussion about improved ways of focusing, supporting and utilizing science and technology in the interest of the nation soon turns to questions such as the following: For what purposes are given R&D efforts being undertaken? What kinds of Research and Development and how much of it are to be performed? Who should do it? Who is to pay for it?

The Panel found it helpful to its deliberations to divide all research and development into two categories:

1. Exploratory Research; i.e., Research looking to generate or expand knowledge and not aimed at attaining a specific objective. This includes most academic science and basic research.

2. Objective-Related Research and Development; i.e., R&D conducted as principal steps toward attaining definite objectives. More than 90% of all our national R&D expenditures fall in this category.

Thus, Category 1, Exploratory Research, is a principal element sustaining our entire culture. It generates the knowledge in scientific and technological fields which undergirds much of our way of life and based on which we select and conduct the research and development aimed at attainment of objectives. The knowledge so gained may be fundamental to creating and advancing new national goals.

Category 2, Objective-Related Research and Development often seeks knowledge just as fundamental as that sought in exploratory research, but the motivation is different. For some of the performers exploratory research is an end in itself; for those who support it, exploratory research serves as one of the means to open up new options. However, to the sponsor, objective-related research and development are always means toward an end. Similarly, exploratory research may suggest a completely different approach toward reaching an objective or generate whole new objectives, even though that was not it's motivation.

Thus, the division into these two categories is inevitably arbitrary, but it is a useful division and is particularly helpful in establishing the rationale for and mechanisms of federal evaluation and support which are discussed later in this report.

Even this simple classification of all research and development is sufficient to raise significant but difficult questions:

1. How should the United States set major national goals (e.g., in health, environment, defense, space, communications, transportation, etc.)?

2. How can the nation balance these goals so that:

   a. In total they are feasible and do not require resources in excess of our ability or willingness to commit them; and

   b. They are not mutually incompatible; i.e., goals in such areas as transportation or energy with goals involving the environment?

3. How can the Federal Government exercise appropriate leadership to translate these major goals into definitive, specific objectives so that government departments and agencies and the private sector as appropriate can respond acceptably by generating the knowledge, goods, and services which collectively would achieve these major national goals?

4. How can research and development be focused efficiently on these definitive objectives?

5. Are existing institutional arrangements adequate to accomplish 1, 2, and 3? If not, how should they be modified or should new institutions be created?

Clearly, there is a need for a more coherent mechanism for converting national goals into definitive scientific/technical objectives for responsible agencies, setting technical priorities, and evaluating and assigning R&D resources for accomplishment. There are also principles and procedures which can be adopted by STAMP and OMB that can contribute to answering significant parts of these five questions. The Panel's recommendations are restricted to those aspects of questions 2, 3, 4, and 5 which can be grappled with directly either by STAMP alone or by STAMP in concert with OMB.

The Panel does not pretend that this report treats all possibilities for improved STAMP performance. It does believe, however, that adopting its recommendations would initiate an evolutionary process which would eventually provide solutions to many of the problems posed by these questions.

II. INCREASING THE POLICY EFFECTIVENESS OF THE SCIENCE & TECHNOLOGY ADVISORY MECHANISM OF THE PRESIDENT (STAMP)

It took only a very few meetings for the Panel to conclude that the subject matter implicit in science and technology policy was not only extraordinarily broad but fundamental to the responsibilities of the entire STAMP. It also learned that the professional staff of OST was organized substantially around programmatic areas and indeed, that the STAMP as a whole involved itself primarily in and was organized to handle programmatic matters. As a consequence, aside from PSAC only the Science Adviser himself had a continuing responsibility for activities or policies which cut across or were fundamental to all of science and technology. The Panel by summer, 1970, had concluded that the subject matter with which it was dealing was so broad and so fundamental to the entire operations of STAMP that it was inappropriate that it be dealt with primarily by an ad hoc group such as itself. The Panel, in its preliminary and partial report of August 31, 1970,[1] recommended structural and procedural changes in OST to assure that science and technology policy at the federal level would be dealt with on a continuing basis by a full-time, professional staff.

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[1] See Item 3 in the Preface, and Volume IX, as identified and discussed in Appendix E.

The Panel has been meeting monthly for nearly a year since it issued those recommendations, and additional discussion has only strengthened its conviction that the primary focus for science and technology policy should not be in ad hoc groups alone. It makes the following recommendations which agree in principle with its recommendations of last August but differ in detail and emphasis:

1. The STAMP* would assume as a primary responsibility the evaluation & assessment of the overall vitality of science and technology in the United States and for making recommendations thereto. Such an assessment would include evaluating both the appropriateness and adequacy of federally supported research and development for attaining the national objectives at which they are aimed and recommending changes as well as entirely new programs.

2. In addition, on the basis of the opportunities and competencies revealed in this annual assessment, the STAMP would recommend to the President possible new initiatives which might in themselves be expressed as national objectives or which could lead to new national goals. The Panel views the recently announced proposals by the President

*Recommendations appearing in this report, are marked by vertical bars on the margin for easy reference.

for a major and concentrated attack on cancer and for assuring the adequacy of the nation's long-range energy resources as examples of the kind of national objectives which could result from such recommendations.

3. Within the STAMP,the competence for assuming this responsibility should be based on an appropriately organized, full-time, professional staff in the OST. In its August 31, 1970 report, the Panel recommended that this enlarged policy role for the STAMP be begun by establishing a three-man Council of Science and Technology Advisers supplemented by approximately six qualified, full-time professionals. The Panel recommends again that serious consideration be given to the establishment of such a council as a desirable if not essential element to adopting a more policy-oriented role for the STAMP.In the absence of the council, the essential element is the commitment of at least one deputy director supplemented by adequately qualified, professional staff to full-time responsibility in these policy areas. (On a year-in and year-out basis, the Panel still feels that the likelihood of getting three top-quality men of the breadth required for this enlarged role would be higher for a chairman plus two council members than for a director plus deputies.)

4. With basic, professional, full-time competence in the policy area established in OST, PSAC and other panels then can be used effectively to supplement the full-time, professional staff. Panels could be convened to study and recommend specific aspects of science and technology Policy. Qualified individuals, including PSAC members, willing and able to devote from a few weeks to a few months at a time in Washington, could bring strong support in their personal areas of competence. Studies involved in making the assessment recommended under No. 1 could be carried out by a variety of means, including contracts with NAS, NAE, and other profit and not-for-profit organizations, as well as by delegation of appropriate parts of the responsibility to other federal agencies, such as NSF.

III. UPGRADING THE MANAGEMENT PROCESSES OF THE SCIENCE & TECHNOLOGY ADVISORY MECHANISM OF THE PRESIDENT (STAMP)

The Panel recommends that the Science Adviser, as head of STAMP and in fulfilling his responsibilities to the President for assessing the state of federally supported research and development previously recommended,[1] initiate procedures to function as follows:

1. The Science Adviser, in collaboration with OMB, will do the following:

   a. Establish criteria[2] which would be used as a guide, both for their own actions and the other federal agencies whose requests for R&D they would review, in evaluating the appropriateness of and the kind of support provided for exploratory research and objective-related research and development.

   b. Establish early in the budget cycle for the succeeding fiscal year the overall level of exploratory research effort which will be supported for that fiscal year by the federal government and project probable levels of effort which will be supported for an additional two years.

   c. Request that each mission agency submit for review its budget for research and development directed to the attainment of its objectives:

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[1] See Recommendation 1, Section II-2.

[2] See Appendix B for proposed criteria.

(1) Stating the objectives of the agency at which research and development are being directed, as well as the schedules for accomplishment; and

(2) Describing the specific research and development programs being conducted to attain these objectives and the budget support levels requested.

d. Assess for the President the adequacy and the appropriateness of objective-related R&D programs (Category 2) for achieving the objectives stated and the coupling of these programs to the other activities of mission-oriented agencies.

e. Assess for the President for both exploratory research and objective-related research and development the general adequacy of the organizational structures of the respective agencies for initiating and supervising (and conducting where appropriate) such research and development.

2. The Science Adviser will do the following:

a. Using the overall budgetary level for all exploratory research,* as agreed upon with OMB as a guide and target,

- review with each federal agency its exploratory research program,

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*Two important clarifications are in order at this point. (1) The "overall budgetary level for all exploratory research" is to be viewed as a relatively firm guide, not as an absolute "floor" or "ceiling." (2) If any one department or agency wishes to mount a major research effort, however "exploratory," as (continued on page 14).

- coordinate the efforts of the several federal departments and agencies so that the total expenditures projected for exploratory research would be consistent with the contemplated level for this type of efforts.

- make recommendations, to the agencies to assure a well-balanced program including adequate effort in important but not necessarily popular fields.

(Such a process consisting of review, coordination and recommendation by the Science Adviser could make exploratory research, including that aspect of it described as "academic science" reasonably responsive to shifts in national goals and priorities without diluting its creative character.)

b. Assess the need for R&D facilities and personnel for the ensuing year as they develop during the reviews; advise the President of major imbalances which appear to be developing, whether these involve shortages or excesses; and make recommendations as to changes in the overall program which might utilize the total scientific and technical resources of the nation most effectively.

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long as the effort is targetted on one of its mission objectives, such effort by definition would move into Category 2, objective-related R&D, and would not be counted under the level for Category 1, exploratory research.

c. Forecast to the best of his ability to do so, the probable future total of research and development efforts of the nation over a sufficient span of time to allow him to assess and make recommendations with respect to support programs appropriate to meet these needs for scientists and engineers or for related facilities.

d. Annually, to the best of his ability, assess the level and the adequacy of the privately supported research and development in the nation and make recommendations relating to sustaining and improving the general health of such privately supported research and development.

e. Prepare an annual report on science and technology for the President, the Congress, and the nation in which he details the information and actions resulting from the enlarged policy and action role outlined.[1]

f. Review annually with the President a range of feasible initiatives in science and technology designed to support national objectives or to shape new national goals.

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[1] The Panel in its report of August 31, 1970, recommended that the Science Adviser and OST prepare such an annual report on science and technology, and the first issue is now in preparation. However, to the extent that the Science Adviser implements the recommendations made by the Panel, his annual report will change considerably to reflect the consequences of the science adviser's assessment and recommendations with respect to the overall vitality of science and technology with particular reference to that supported by federal funds.

APPENDIX A

Recommended Guidelines for Support of Academic Science

Exploratory Research (Category 1) and Objective Related Research and Development (Category 2) have been defined in Section I, page 4, and are further discussed on page 5.[1]

While research conducted at universities cover both categories under the label of Academic Science, by far most of this activity is exploratory in nature.

It is this dominant Category 1, Exploratory Research component of Academic Science -- Academic Science (Category 1) -- that this Appendix A addresses.

1. The Panel recommends that, as a first principle, federal support for Academic Science (Category 1) dealing with exploratory research, be set on the basis of sustaining some specified level of effort.(By definition, exploratory research is seeking to generate new knowledge and not to attain specified objectives. Inevitably, then, support cannot be rationalized on a predictable cuase-and-effect-basis.)

2. It is the Panel's strong conclusion that Academic Science (Category 1) like all R&D efforts, must know where it stands in its relations with the Federal government. It cannot maintain either quality or vitality under stop-and-go funding. Selection of the proper level of support inevitably always will be subjective; but hopefully, one of the principal initial efforts of the restructured OST recommended will be aimed at analysis, comprehension, and

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[1] Should the two Categories recommended in this report be adopted, the appropriate special analyses of OMB would also have to reflect this categorization.

recommendation relating to this level of effort. While OST is being restructured to address this issue more fully to develop a long-term financing formula, the Panel believes that the present level of effort is reasonable, and recommends that it be adopted as the initial base for budgeting purposes.

3. By its very nature, Academic Science (Category 1) has a very long time constant, and it should not be subjected to unnecessary transients either toward expansion or contraction. Furthermore, the extraordinary diffuseness of the total effort, and the initially hard to perceive difference between creative and mediocre programs, coupled with the mechanisms of university organization and governance make the entire structure of Academic Science (Category 1) especially vulnerable to unanticipated shifts in level or direction.

Accordingly, the Panel also recommends that OST and OMB, in addition to establishing the level of effort for Academic Science (Category 1) for the ensuing year, project probable levels of effort to be supported for an additional two years.

4. Because it is highly desirable to couple even Academic Science (Category 1) to eventual users of the knowledge generated, it is recommended that a majority of the federal support for Academic Science (Category 1) come from mission agencies. This will achieve a loose coupling between the mis sion agency and the exploratory research conducted at the universities and thereby improve the utilization of the new knowledge as a base for the objective-related research and development of the mission agencies.

5. Because it is desirable for a considerable proportion of Academic Science (Category 1) to be free of pressures from present, applied activities, the Panel also recommends that a considerable proportion of the federal support (about 1/3) for Academic Science (Category 1) come from the NSF-non-mission oriented programs.

6. The Panel is struck by the relatively limited support extended by industry to exploratory research at universities. Undoubtedly, this is because the knowledge generated as a consequence of exploratory research is rarely sufficiently proprietary to give a significant return to the sponsoring private company. Nevertheless, the Panel does believe that loose coupling between users of the knowledge generated and the researcher doing exploratory research significantly increases the utility of the knowledge and shortens the time between discovery and use as a base for objective-related research and development. Thus, the Panel recommends that serious consideration be given to Federal support for research and development at colleges and universities aimed at increasing this coupling. *

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*See Item 1, Appendix D.

APPENDIX B

Proposed Criteria for Federal Support of Science and Technology to be Established Mutually by OMB and OST

DEFINITION

Criteria for federal support of science and technology (which translates primarily into federal support for research and development) represent but a first screen to help us decide whether federal support is warranted. Actual decisions should depend on the specifics of each situation, which include quantitative aspects, value judgements and political balance. No set of criteria can cater, a priori, to such considerations. Analysis, specific value judgements, elements of the specific design, and the implementation of discrete programs, or program evaluations, do not belong in criteria.

A set of criteria by itself cannot yield clear-cut "yes" or "no" answers to the majority of specific situations. However, criteria can provide the framework within which the specifics of any given issue can be rationally discussed. Criteria cannot be expected to replace decision making.

Hence, criteria should:

(a) assist in providing for a more consistent approach to the support of Science, Technology, and hence, Research and Development, among agencies and programs,

(b) make the decision-making process more rational, orderly, and traceable,

(c) assist in identifying alternative courses of action, and

(d) uncover those factors which decision makers consider relevant and important.

RATIONALE FOR CATEGORIZATION

Conventionally in the U. S. A. scientific/technical activities are categorized as (1) Basic Research, (2) Applied Research and (3) Engineering, based on the nature of the activity. Basic research is not ordinarily related to any specific goal. However, it generates much of the knowledge upon which our entire system depends for ultimate replenishment. Applied Research is still research in the true sense of the word in that it develops essentially new approaches and procedures. But it differs from basic research in that it is goal-oriented. In this phase of the work detailed prediction as to cost is not yet practicable. Finally, engineering leads to the finished product and the emphasis has to be placed on feasibility, reliability, and also cost-effectiveness. This phase starts when a procedure or product has been proved out in principle, but when

many questions are still open. It is almost needless to say that there are no sharp lines of division between basic research, applied research and engineering. However, the above statements may serve as reasonably reliable distinguishing marks.

Orthogonal to the categorization of scientific activities by their nature, is the categorization by the motivation for the activity. Examples of such motivation are (1) The attainment of National goals, (2) The attainment of industrial or private goals, (3) Development of Scientific/Technical Manpower resources (training & education), and (4) Knowledge for the purpose of satisfying man's curiosity or other spiritual demands.

The financing or supporting of scientific/technical activities is strongly dependent on the motivation of the user. Hence, the establishment of criteria for the support of science and technology can be based better on the motivation for, than on the nature of scientific/technical activities. Therefore, the Major Categories and the Guidelines that follow are based on the motivation for the activities.

MAJOR CATEGORIES

1. Exploratory Research; i.e., Research looking to generate or expand knowledge and not aimed at attaining a specific objective. This includes most academic science and basic research conducted within or without the Government.

2. Objective-Related Research and Development; i.e., R&D conducted as principal steps toward attaining definite objectives. More than 90% of all our national R&D expenditures fall in this category.

GUIDELINES

I. Exploratory research generates the scientific knowledge which is basic to the entire technological and industrial culture. The knowledge generated is so basic to the welfare of our entire society that the federal government quite properly must assume the principal responsibility for its support. Exploratory research conducted at universities has, as a principal purpose in addition to the generation of new knowledge, the training of scientists and engineers, and this total activity has been customarily labeled "academic science."[1] Academic science is one of the primary components of our national exploratory research effort. The magnitude, nature, and mix of this support

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[1] For a discussion of the components of Academic Science see Appendix A, page 16.

must be determined (1) within the guidelines and review mechanisms as provided by the STAMP, in cooperation with OMB, as appropriate;[1] and with due consideration for the (2) needs of the operating agencies, as well as for (3) the opportunities afforded by progress in scientific disciplines themselves.

II. When there is a requirement to meet certain aspects of the welfare of the U. S., such as its defense needs; or, the overall prestige of the U. S. is involved (e. g., space), and the government is the principal or only user; the responsibility for the R&D seeking to meet those needs, (including advancing the necessary technology and establishing possible ranges of performance and their relationship to cost) rests with the federal government, and it should bear substantially all costs involved.

III. While in the past the Federal government has in general refrained from extensive and systematic support of R&D and technology that fall primarily in the private sector, there appear to be good reasons why the Federal government should now get more deliberately and deeply involved under certain conditions. For example:

1. When the results of the R&D are likely to have major beneficial effects on the welfare of a large segment of the population (e. g., agriculture in the past, and perhaps housing in the future) and when one of the following additional conditions holds true:

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[1] See Appendix A for the Panel recommendations on these guidelines and review mechanisms.

(a) The private sector is too fragmented for any single entity to be able to finance a meaningful feasibility demonstration.

(b) The risks of failure, the length of the effort and the total size of the investment, combined with the relatively small fraction of the resulting economic value that might accrue to the developer, contribute to the discouragement of private investment (e.g., nuclear reactors, high speed transportation).

(c) Antitrust laws or the regulated character of an industry prevent the necessary early R&D investment.

(d) Social returns appear to be so high that acceleration is required.

2. When there is a set of phenomena newly discovered or not yet sufficiently explored (e.g., high energy lasers) where basic research investigation appears likely to lead to new insights

of significant importance to the government or to the possibility of creating a wholly new industry.

3. When a great variety of payoffs are expected but R&D are not profitable to individual firms because of the narrowness of their product interest relative to the range of R&D application (e.g., social research on cities).

4. When the generation of the requirements themselves require substantial investment in R&D. This is particularly true of completely new technologies whose applications are not easily foreseen (e.g., nuclear energy, space, high power lasers).

5. When threats to our international trade balance justify cost sharing by the government (but to be limited both in size and in time) to accelerate the coupling of new technologies to profitable products, thereby gaining international competitiveness in world trade.

IV. Adequate mechanisms should be developed for the full and extensive exploitation of the fruits of R&D. For example, built into the mechanisms for federal support of R&D should be the means for expeditious and timely transfer of the effort as well as the funding responsibilities, when it becomes appropriate, to

mission-oriented agencies, state governments, and private entities.

Therefore, the federal agencies should:

1. Establish policies and mechanisms to facilitate these transfers and formulate expressly specified plans to this end.

2. Assign the R&D work to be conducted to private or governmental organizations, chosen so as to reduce the difficulty of the transfer from R&D to exploitation.

3. Cost share if it is deemed appropriate, based on some of the above criteria, the R&D work with those elements of the public and private sectors that are most likely to benefit from the results.

V. The Federal government should encourage vigorous R&D efforts and increased productivity in the private sector by:

1. Buying to the extent feasible, on the basis of performance rather than design specifications (e.g., such items as computers, aircraft, housing etc.).

2. Setting necessary <u>and</u> attainable standards (e.g. in the areas of pollution, food, drugs) which industry, through imaginative application of R&D and their other talents, could profitably attain.

APPENDIX C.

Members of the Science and Technology Policy Panel of the President's Science Advisory Committee (PSAC) (From February 1970 to August 1971)

Name	Function
Patrick E. Haggerty Chairman, Texas Instruments 13500 N. Central Expressway P. O. Box 5474 Dallas, Texas 75222	Chairman, Science and Technology Policy Panel
Gabor Strasser Office of Science and Technology Executive Office of the President Washington, D. C. 20506	Executive Secretary Science and Technology Policy Panel
Michael Boretsky Senior Policy Analyst, Office of the Secretary U. S. Department of Commerce Washington, D. C. 20230	Member
Arthur M. Bueche, Vice President Research and Development The General Electric Company P. O. Box 8 Schenectady, New York 12345	Chairman, Educational Productivity Subpanel, and Member
Carl Savit Office of Science and Technology Executive Office of the President Washington, D. C. 20506	Secretary, Educational Productivity Subpanel
Theodore Cairns Central Research Department DuPont Experimental Station Wilmington, Delaware 19898	Member (from February, 1970 to October 1970)

William Carey Arthur D. Little, Inc., Suite 510 1735 Eye Street, N. W., Washington, D. C. 20009	Member
Edward Denison The Brookings Institute 1775 Massachusetts Avenue, N. W., Washington, D. C.	Member
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Michael Ference, Vice President Scientific Research Station Ford Motor Company P. O. Box 2053 Dearborn, Michigan 48121	Member
Eugene Fubini Suite 816 1499 Jefferson Davis Highway Arlington, Virginia 22202	Member
Murray Gell-Mann Professor of Theoretical Physics California Institute of Technology Pasadena, California 91109	Chairman, Academic Science Subpanel, and Member (from February 1970 to August 1970)
Carl York Office of Science and Technology Executive Office of the President Washington, D. C. 20506	Secretary, Academic Science Subpanel
Philip Handler, President National Academy of Sciences 2101 Constitution Avenue, N. W., Washington, D. C.	Member

Donald F. Hornig (Former Science Adviser) President Brown University Providence, Rhode Island 02912	Member
John W. Kendrick Department of Economics Building C - Room 617 The George Washington University Washington, D. C. 20006	Member (From September 1970 to Present)
Richard R. Nelson, Professor Yale University New Haven, Connecticut	Member
Robert W. Olson Vice President Texas Instruments, Inc., 13500 N. Central Expressway Dallas, Texas 75222	Special Assistant to Mr. Haggerty
Derek de Solla Price, Professor 2036 Yale Station New Haven, Connecticut 06520	Member
Frederick Seitz, President The Rockefeller University Sixty-sixth Street and York Avenue New York, New York 10021	Member
Lloyd H. Smith, Jr. Professor and Chairman Department of Medicine University of California San Francisco, California 94122	Member (From February 1970 to July 1970)
Robert Solow, Professor Massachusetts Institute of Technology Cambridge, Massachusetts	Member (From February 1970 to August 1970)

Chauncey Starr, Dean School of Engineering University of California at Los Angeles Los Angeles, California	Member (October 1970 to Present)
H. Guyford Stever, President Carnegie-Mellon University 5000 Forbes Avenue Pittsburgh, Pennsylvania 15213	Member
Edward Teller University Professor Lawrence Radiation Laboratory University of California Livermore, California	Member (from October 1970 to present)

APPENDIX D

Personal Positions of Individual Panel Members

1.	Enhancement of Coupling Between Academic Science and Industry	July 7, 1971
2.	Comments by Edward Teller	July 7, 1971
3.	Comments by Chauncey Starr	July 7, 1971
4.	Comments by Frederick Seitz	July 7, 1971
5.	Comments by Arthur Bueche	July 10, 1971
6.	Comments by John Kendrick	August 10, 1971
7.	Comments by Michael Boretsky	August 28, 197

July 7, 1971

1. Enhancement of Coupling Between Academic Science and Industry*

While a significant number of the Panel members supported two alternatives to enhance the coupling between Academic Science and Industry, there was insufficient consensus to include these alternatives in the body of this Panel Report. These alternatives are listed therefore in this Appendix.

(1) Consideration should be given to federal support for R&D at colleges and universities aimed at increasing the coupling mentioned above. It is believed that a tax credit of approximately 25% would provide a large stimulus for industry to conduct sizable research and development at our colleges and universities and still have the sponsoring company influence the direction of the research and development effectively since it still would be paying between 25% and 30% of the R&D (after offsetting the expense of the R&D itself by federal income taxes). Probably the impact of the tax credit would be both to increase the total research and development at

*Also see Item 6, Appendix A, page 18.

universities and colleges and also to substitute some privately supported effort for the $1.7 billion of support for academic science presently coming from the federal government. Companies and universities should be allowed to arrive at whatever type of mutual agreement seems best to each.

(2) Consideration should be given to some formula for Matching Funds, where industry support of R&D at colleges and universities would be matched in some manner by federal funds.

July 7, 1971

2. Comments by Edward Teller

It appears necessary to emphasize that anti-technological trends, particularly among our young people, are becoming prevalent. The result is a crisis in Science and Technology. The report of the Panel pays limited attention to the causes, the existence and the cure of this crisis.

The problem is both important and difficult. I can offer no satisfactory answers.

The first step, however, is to recognize the existence of the crisis. More of our young people believe that we have too much technology and relatively few assert that we still have too little. Ecologists argue for controls rather than for research to find the right procedures. Opposition to defense oriented research is rampant. This endangers the safety of the Nation.

As to the causes: I suspect that overemphasis on "pure" research has led to a sense of futility. It is also true that world-wide emotional trends play an important role. I doubt that systematic research will unearth the underlying causes. But careful , wide-spread and continuing discussion may offer some enlightenment.

As to the cure: This portion of the problem is the most important and most difficult. It is particularly difficult to organize the future-oriented, infinitely varied and imaginative work in Research and Technology by a staff of professionals in OST as the report recommends. Good men on short tenure (3 to 6 months) may be more helpful. Professionals with long tenure and of high quality will still be needed to orient the newcomers, to preserve their contributions and to present the resulting ideas and conflicts. Resolutions of problems and recommendations must - in the end - come from the President's Science Adviser.

To build bridges between industry, government labs and academia is most desirable. In view of troubles at our universities such bridge building may be quite difficult. Support should be given to universities where orderly work continues and where cooperation with industry and government is truly welcome.

One step in the right direction would be abolition of secrecy in Research and Development efforts. Even a short time ago this proposal may have been considered visionary. Evidence and public sentiment make it more probable that such a measure may be introduced at the present.

The utilization of categories described in Appendix B could be illustrated by the following table which crudely estimates the distribution of present expenditures, given by the first figures.

TABLE

Relative Federal Funding estimated at present and proposed (in brackets)

Motivation of Activity \ Nature of Activity	Exploratory Basic Science Research	Applied Research and Technology	Engineering Actual Implementation	Total
Support of Goals (National & Industrial)	1% (3%)	15% (22%)	54% (40%)	70% (65%)
Education of Scientific & technical manpower	7% (4%)	4% (8%)	9% (8%)	20% (20%)
Knowledge Building A cultural Activity	2% (3%)	1% (5%)	7% (7%)	10% (15%)
Total	10% (10%)	20% (35%)	70% (55%)	100%

It may be of advantage, looking at the table to shift emphasis in the support of goals from Engineering to Applied R&D, thus reducing the probability of failures such as the F-111.

It would also appear that to spend 7% in education on the exploratory phase (i. e. about 2/3 of all the effort on the exploratory phase) is too much. Applied Research and Development should in general be expanded.

Knowledge building, on the other hand, is underemphasized. The 10% mentioned in the "Total" column could be stated only because of the 7% under "Engineering" due mainly to the space effort.

A proposed change in distribution is indicated in brackets in the Table. The main shift is from Engineering to Applied R&D which is proper in a phase of rapid development in technology.

July 7, 1971

3. Comments by Chauncey Starr

Subject: Proposed study of the dynamics of our national technology systems

The complexity of the interaction of science and engineering with the social and economic welfare of the country has been recognized by our panel in its past discussions of specific issues. However, I do not believe that anyone has adequately expressed (either quantitatively or qualitatively) the nature of the interaction network, the time constants involved, the leverage effect on the economic system, and the impact on our worldwide posture. In the absence of such system presentation, we constantly face a hurdle in communicating to the key decision centers of our federal government the significance of our recommendations. I believe therefore that the most fundamental contribution our panel can make would be the development of the principal features of the role of technology in shaping our national future.

I believe that such a system model can be assembled with a reasonable amount of study if one is willing to accept approximate and judgmental relationships in some of the important areas. As a starting point for discussion of this subject, I have attached a rough sketch of the principal elements that might enter into such a network. I would expect that a group that combined experience in research, development, manufacturing, marketing, and national economics might be able to supply enough insight to the principal relationships that a working and useful model would result.

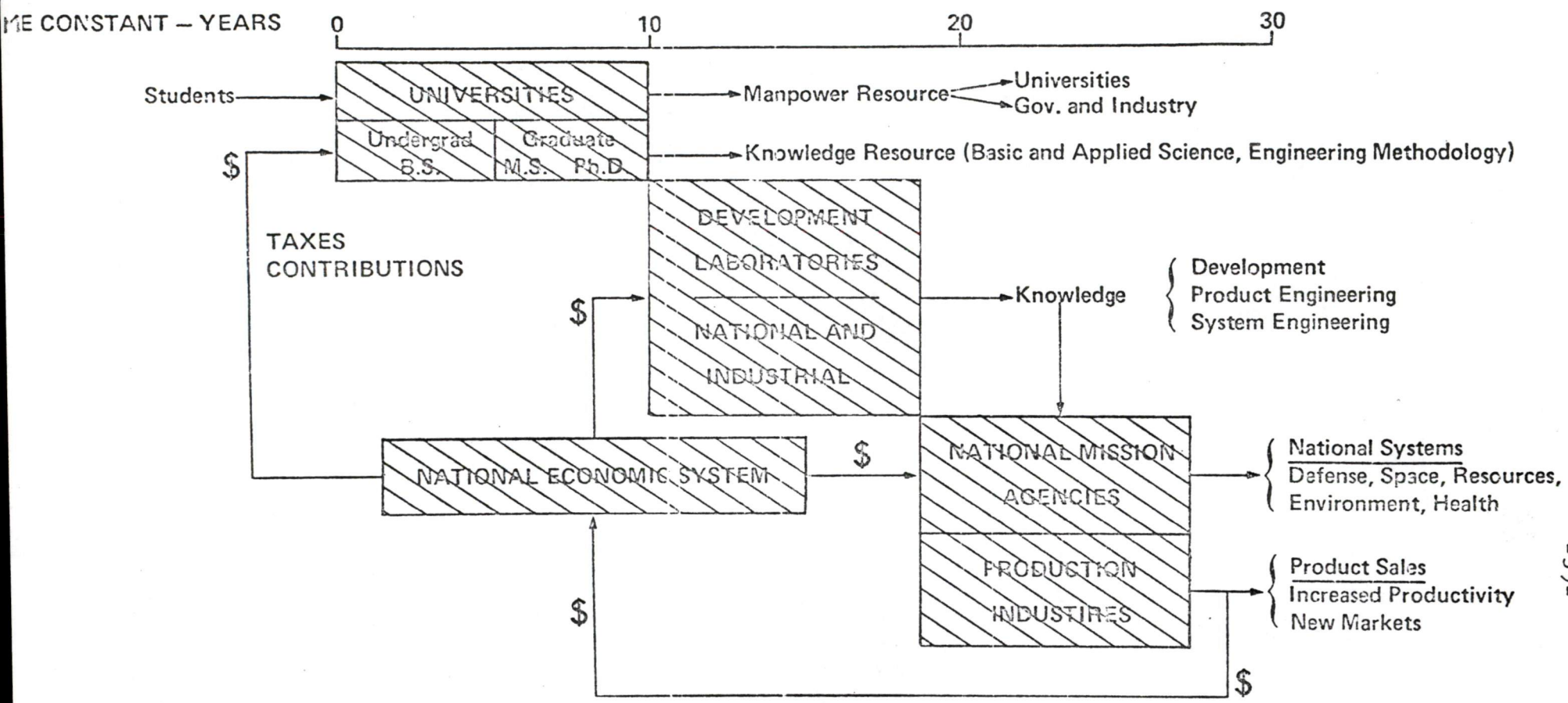
The value of such a model is potentially so great that I believe that the attempt to achieve it should be undertaken expeditiously. The model could be used to determine our long-range plans for technical manpower, to establish a rational level of basic science support, to determine national incentives for stimulating industrial R&D, and also to create a much better public comprehension of the importance of technology development to our total national well-being. *

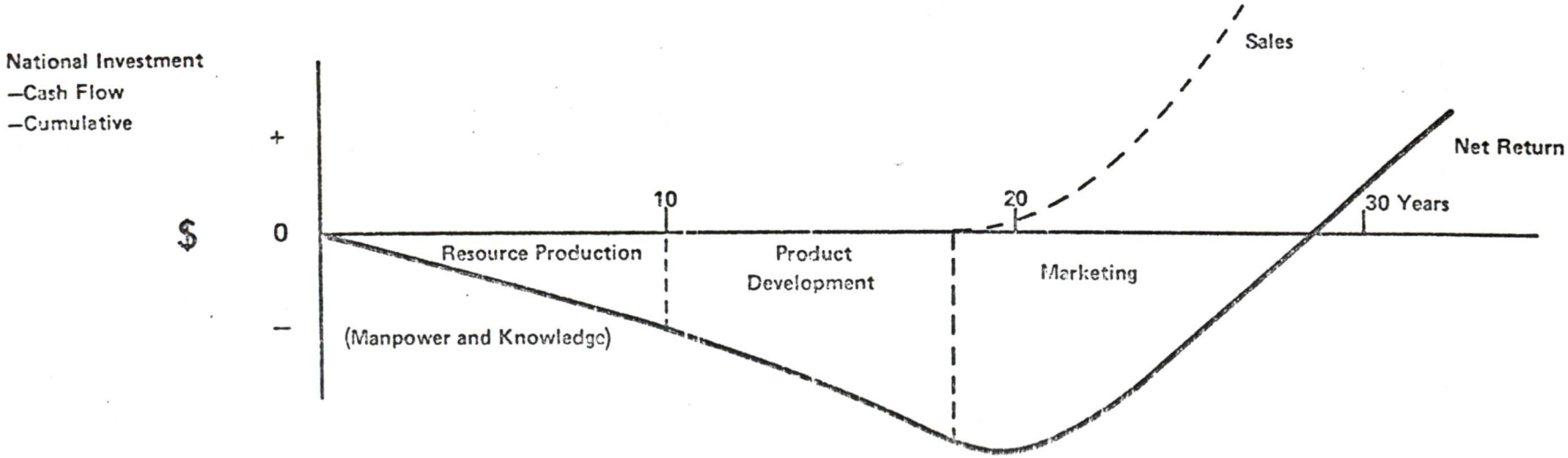
I have some general notion as to how such a task should be approached. It can be done directly as an OST panel effort, drawing upon the information resources and intuition of the panel members. Alternatively, it might be organized by a panel but conducted by separate sub-project groups, perhaps

*It could also be used to guide the future goals of higher education (universities) and the optional university reorganization to achieve these.

funded by OST or the NSF. Another possibility would be the organization of a summer task force at a university. The subsequent year could then be utilized for planning the study and arranging for the commitment of individual services. An OST panel could then function as the principal review and policy group for such a study.

NATIONAL TECHNOLOGY SYSTEM DYNAMICS





July 7, 1971

4. Comments by Frederick Seitz

Traditionally, our most successful endeavors involving science and technology that have an impact on the gross economy have become coupled with the development of large industrial organizations. In this category are, for example, enterprises such as the development, production and distribution of farm machinery, automobiles, petroleum, electrical equipment, aircraft and pharmaceutical products. Even matters related to food processing and distribution apparently can be handled more efficiently through a few large organizations than through many small ones, because it is possible to use highly specialized talents more effectively.

One wonders if this trend is inevitable, and if the use of individual initiative, that is not coupled to large organizations, will continue to diminish indefinitely. The issue becomes particularly important in the present transition period in which the largest source of our gross national product is shifting from the manufacturing of goods to supporting services. Unless much of the variety of life is to be more narrowly circumscribed, a substantial part of the service industry presumably should retain components having those individual characteristics which are needed to satisfy a diversity of individual tastes and needs. The following question is raised by this issue: Is it possible through the work of organizations, such as trade associations, to create research and development centers which can provide a large number of similar small enterprises some of the benefits which large organizations derive from their coordinated research, development and marketing activities? If so, one might be able to maintain the diversity associated with smaller enterprises and at the same time achieve some of the efficiency and effectiveness of larger organizations.

Viewed from one perspective, farming seems to provide an example of a field in which a cottage industry has survived as a result of advice provided to the farmer by the Department of Agriculture, the State agricultural schools and the manufacturers of agricultural supplies and equipment. Thus, the farmer who farms a specialized parcel of terrain has access to knowledge and products which he could never generate himself, but which can be adjusted to special and often variable needs. This example may be highly deceptive at the present time, if not in earlier decades, since farming is subsidized in so many ways which are designed to maintain the independent farmer. If such subsidies did not exist, or were altered

substantially, the smaller farmers might well be driven out of business rapidly.

It would be very valuable to know at this transitional stage in the growth of our GNP to determine if it is indeed practical and feasible to develop sources of technical advice for related small industries which would guarantee the survival of a more diversified national economy than would otherwise be the case.

July 10, 1971

5. Comments by Arthur M. Bueche

The recommended restructuring of OST will be beneficial to our Nation only if a number of other conditions are satisfied. Since technical knowledge is only one of the elements necessary to achieve many of our goals, the improved planning expected to result from the restructuring will have little impact unless the other factors are understood and the proper actions taken. A vigorous, well planned technical effort may be necessary to allow us to do many of the things we desire, but it is far from sufficient.

The path from new knowledge to beneficial public impact is a perilous one. It is influenced by almost every other type of human activity. The path to ultimate benefit can end abruptly if the managerial and public attitudes aren't correct, if the government regulations make continuing impossible, if the existing business or public institutions to achieve the goal are inadequate, if the financial resources can't be assembled at the right time, or if labor of the right kind and quantity is not available. So, while doing research and development can provide many opportunities, success in that endeavor does not assure a beneficial result.

Our Science and Technology Policy Panel has addressed itself only to one part of the total system. This part is an important one because it determines the number and kind of options for the rest of the system, it determines to a major extent the costs of achieving the goal being pursued and has a substantial impact on the availability and kind of people necessary. On the other hand, it must be recognized that even with an excellent science and technology policy and ample resources for research and development it may be that the other factors will prevent us from reaching the goal.

August 10, 1971

6. Comments by John W. Kendrick

In its report the Panel recommends a guideline for federal support of academic science. I believe this should be broadened to provide a guideline for support of research and development generally, to read: After appraisal of probable private expenditures for R&D in the ensuing fiscal year and following two years ahead, the Science Adviser and OST, in collaboration with OMB, should plan federal support for R&D sufficient to ensure an increase in total R&D expenditures in constant prices equal at least to the trend-rate of increase in real GNP. The trend-rate of increase in real GNP is projected for the 1970's by most economists at around 4 percent annually. Allowing for the probable range of price inflation in the 1970's, this would translate into a minimum rate of growth in total R&Dof 5 to 10 percent in current prices.

I feel strongly that a floor should be set under the rate of expansion in R&D outlays for a number of reasons. First, over the past half century the significant trend increases in total factor productivity averaging 2.3 percent a year, and in output per man-hour averaging around 3 percent annually, have been due in part to the rapid growth of the stock of technological knowledge resulting from significant increases in R&D outlays relative to GNP. In the mid-1960's, however, the ratio of R&D to GNP levelled out at around 3 percent, and has since declined to 2.6 percent in 1971. In my opinion, the relative drop in R&D was a major element in the retardation in productivity advance evident since 1966. An important measure required to reattain the past rate of advance in productivity (and thus in potential economic welfare) is the resumption of the growth of real R&D outlays, at least in line with the growth of real GNP.

Second, the consensus of students of the subject is that the rate of return on investments in R&D is high, on average -- probably higher than on investments in plant and equipment, as documented in the Report by the Sub-Panel on Research and Education. Further, R&D outlays help to maintain a rate of return on tangible investment sufficient to induce a high

enough volume to absorb private saving and contribute to maintenance of full employment. It is likely that privately financed R&D will continue to grow, so the chief aim of federal science and technology policy must be to avoid destabilizing fluctuations, as in recent years;or, in years in which private R&D deviates significantly from trend, to "lean against the wind" in order to stabilize the trend. All of the arguments cited in the Report against "stop and go" funding of academic science apply to the total R&D effort of the nation as well.

Finally, looking beyond the purely economic benefits of the results of R&D expenditures, one is impressed by the high order of creative, constructive work associated with R&D. As economies progress the relative trends are away from extractive and commodity-producing activities to service activities. Eventually, learning, exploratory, inventive and other creative activities may well comprise a major portion of total productive activity, as advances in technology progressively reduce the more repetitive and less interesting jobs, and as real income advances increasingly permit individuals to choose more satisfying types of activity. To maximize utility, governments, in determining their expenditures and thus influencing the allocation of resources, should take account of the nature of the work involved as well as the benefits of the product. This point of view reinforces the desirability of continuing relative increases in support for R&D, as well as for education and cultural activities generally.

August 28, 1971

7. Comments by Michael Boretsky

Subject: Manpower Ingredient of S & T Policy at the National Level

In a nutshell, the Panel deliberations concerned themselves with the current activities of Federal Government which affect the long-term promotion of new technological alternatives for futhering national objectives within the constraints of available and/or accessible resources. This, of course, is the essence of Science and Technology policy at the national level. Striving for brevity, however, the main body of the report explicitly focuses only on the organizational adequacy of the Science and Technology Advisory Mechanism of the President (STAMP) and the criteria for Federal support of R & D. Historically, R & D has been the key tool of the United States S & T policy. For an efficient national S & T policy, however, equally important would seem to be the mechanism working toward an optimum flow of appropriately trained S & T manpower, both as to various levels of educational attainment and within each level, and at a cost consistent with the resources that society can allocate for the purpose.

The importance of such a flow might best be seen in the methods we used to go to the moon. The goal, including the deadline, was decided upon in terms of an R & D budget without much regard to the availability of required S & T manpower. To get manpower, NASA and its contractors were forced to compete with alternative employment of S & T manpower opportunities, notably civilian-market-oriented technological endeavors of the industry as well as the pure "defense" segment of the industry. In the process of this competition, salaries of scientists and engineers skyrocketed and this not only increased the cost of going to the moon, but it also significantly hurt the operations of the other segments of industry as well as the overall rate of the "bread-and-butter" advance of the civilian economy. Though other forces probably have also been at work, this "disequilibrating" feature of "going-to-the-moon" is the principal cause that society started on the path of disillusionment with the program just about the time when the NASA activities began yielding its promised results.

An optimum flow of appropriately trained S & T manpower, and especially at a cost consistent with the resources that society can allocate for the purpose, is difficult to achieve with any educational system, and enormously difficult with our multi-system. Inasmuch as no agency in U.S. Government works toward this objective, STAMP must fill the gap. Moving in this direction would seem to require, at the minimum, the institution of a mechanism for at least some planning and coordination of the educational mix at each educational level at both the national and state levels. Its responsibilities might also include activities directed at:

a) Expansion and better utilization of facilities for continuous education and updating of educational attainment and job skills, including retraining for new skills required by new technology;

b) Elimination or at least substantial reduction of barriers to job mobility and pay in accordance with educational attainment and performance rather than some other rigid criteria (such as seniority);

c) Elimination or at least a drastic reduction of social prejudices against certain skills both with respect to levels as well as within the levels, especially the prejudices against "para-professional" occupations; and

d) Intensification of the search for the introduction of better methods (technology) for education and training, including better organization and administration of our educational system.

APPENDIX E

Guide to Nine Additional Volumes Generated by the Panel, or Related to its Work

GENERAL

Since its inception in February 1970, the PSAC Panel on Science & Technology Policy has amassed a substantial quantity of information in the form of letters from its members, testimony of witnesses to Congressional Committees, presentations, papers, and other documents, as well as books on subjects pertaining to its mission.

In the initial phases of collecting this information to assist the Panel's work, the most pertinent documents were "abstracted". These abstracts attempted to present clear, concise, factual summaries of the documents, which were both elaborations of the titles and condensations of their content.

It was found that often, in the course of abstracting, many of the salient points were overlooked or so abridged that they lost their meaning. So a technique, known as "extracting" was employed to overcome these shortcomings inherent in abstracting. The extracts thus attempted not only to provide the salient points of the documents, but also to present them in the author's own words, from which direct quotations could be made. The extracts also eliminated the less relevant material to compress the size of the documents for quicker comprehension. Furthermore, each extracted item was written to "stand alone", so that, if removed from its surrounding text, it would make sense by itself.

The greater portion of the most pertinent extracts were placed in machine-readable form to permit the various items contained in each extract to be rearranged under appropriate subject headings in alphabetical order. Thus, if a Panel member wished to see what had been written on a certain subject by various authors, he would be able to do so by merely looking up that subject. This information has been presented in machine-printed form for reference by the Panel.

In summary, then, there are "abstracts" and "extracts" of much of the material, and a collection of items taken from the extracts arranged by their subject categories, in alphabetical order.

In addition, the Panel letters were collected and bound, for convenience, into five volumes with appropriate indexes.

A more complete description of all this information compiled for reference of the Panel members and others involved in formulating Science & Technology Policy, is presented below:

DETAILED

The information is contained in nine bound volumes, as follows:

Vol. I - Contains Extracts from the Literature on Science and Technology Policy, including among others:

The statements of:

Dr. Lee A. DuBridge, Office of Science and Technology
Myron Tribus, Asst. Secretary of Commerce, and
Robert C. Seamans, Jr., Secretary of the Air Force, before the Daddario Subcommittee on Science, Research and Development, Committee on Science and Astronautics, U. S. House of Representatives.

Toward a Science Policy for the United States, the final report of the Daddario Subcommittee on Science, Research and Development.

The OECD Reports, entitled:

Reviews of National Science Policy - Canada
Reviews of National Science Policy - Italy
Reviews of National Science Policy - Japan
Reviews of National Science Policy - (West) Germany
Science Policy in the USSR.

Federal Funds for Research, Development and Other Scientific Activities, National Science Foundation, NSF 70-38, 1970.

Federal Support of Applied Research,
Committee on Public Engineering Policy,
National Academy of Engineering, 1970

Trends in U. S. Trade and the International Competitiveness of U. S. Industry
Boretsky, M. and McKibben, R.

Probable Levels of R&D Expenditures in 1970 - Forecast and Analysis.
Fisher, W. H. and Lederman, L. L.

The Behavioral and Social Sciences: Outlook and Needs.
National Academy of Sciences
Prentice-Hall, Inc., Englewood Cliffs, N. J., 1969

Federal Policy for Science and Technology - An Interim Report to Dr. Lee A. DuBridge
PSAC Panel on Science and Technology Policy, 8-31-70

The Higher Learning, The Universities and the Public
Carl Kaysen
Princeton University Press, 1969

Vol. II-Contains:

A Machine Index of the Items from the Extracts on Science & Technology Policy - by Subject Category

These are the most pertinent items taken from the extracts contained in Vol. I and arranged by their subject categories in alphabetical order.

The items are so numbered that they can be traced to their parent documents by reference to the Document Index provided.

This volume was generated by placing the extracts in machine-readable form, cataloging them by subject content, and machine-ordering them by their subjects.

Where an item applies to several subjects, its listing will be repeated under these other subjects.

At the end of this volume is a listing of the Subject Categories used in the cataloging process.

Vol. III - Contains:

Abstracts* from the Literature on Science and Technology Policy, including such material as:

U. S. Dept. of Labor, Bureau of Labor Statistics:
Employment and Earnings, Vol. 16, 1970
Population Survey, Rept. 313, Ser. p-23, 1967
Area Trends in Employment and Unemployment, 1970

Articles on Science and Technology Policy taken from the periodical literature, such as:

Science	Business Week
Physics Today	Harvard Educational Review
Scientific American	Fortune
Nature	Bulletin of the Atomic Scientists

NAE and NSF Reports:

A Study of Technology Assessment - Report of the Committee on Public Engineering Policy, NAE, 1969.
Knowledge into Action: Improving the Nation's Use of the Social Sciences, NSF, 1969

Science and Technology: Tools for Progress
Ruben F. Mettler
President's Task Force on Science Policy, 1970

Papers by international authorities on the various phases of science.

Presentations on the Funding of Science, Technology Assessment and Crime Control.

Presentations to the Daddario Subcommittee on Science, Research and Development, Committee on Science and Astronautics, U. S. Congress:

A Recommendation for Centralization of Federal Science Responsibilities, 1970
Technology: Processes of Assessment and Choice, 1969
Technology Assessment - DuBridge, December, 1969

*Note that "abstracts" are different from "extracts," as previously indicated.

Vol. IV - Contains Abstracts & Extracts from the Literature on Science & Technology Policy.

This is a collection of all the extracts and abstracts contained in Vols. I and III, plus other abstracts considered less pertinent than those in Vol. III. This does not imply that the articles and documents were less significant, but merely that the added abstracts were not quite as well written as those contained in Vol. III.

Vol. V - Contains the most recent Panel letters from March 1, 1971 to the last letters generated by the Panel in July 1971.

Vol. VI- Contains the Panel letters from January 1,1971 to February 28, 1971.

Vol. VII- Contains the Panel letters from June 1, 1970 to December 31, 1970.

Vol. VIII-Contains the Panel letters from the commencement of the work of the Panel in February, 1970 to May 31, 1970 plus some earlier references.

Vol. IX - Contains the following documents which were separated from the other Panel letters for ease of reference:

(1) Report of the PSAC Subpanel on Academic Science to the PSAC Panel on Science and Technology Policy, 6-7-70
Murray Gell-Mann, Chairman.

(2) Progress Report and Observations of Science and Technology Policy Panel.
Submitted to Dr. Lee A. DuBridge, Chairman PSAC, June 5, 1970, by Patrick E. Haggerty, Chairman.

(3) Federal Policy for Science and Technology - An Interim Report of the PSAC Panel on Science and Technology Policy
Submitted in a letter, dated Sept. 9, 1970 to Dr. Edward E. David, plus a covering letter to Dr. Lee A. DuBridge, dated August 31, 1970, by Patrick E. Haggerty, Chairman.

(4) On Increasing National Productivity Through Education and Technological Change.
A Report by the Subpanel on Research and Education to the PSAC Panel on Science and Technology Policy
Arthur M. Bueche, Chairman. Drafted May 24, 1971

INDEXING: All documents contained in these nine volumes are indexed by title and author, alphabetically.

The Abstracts and Extracts are also indexed by an accession number given them in the cataloging process.

The letters are arranged in chronological sequence, with the most recent ones appearing first.

1730 M Street, N.W., Washington, D.C. 20036, Telephone (202) 833-8000

National Journal

Oct. 24, 1973

Mr. Kenneth H. Olsen:
President
Digital Equipment Corp.
146 Main Street
Maynard, Mass. 01754

Dear Mr. Olsen:

Enclosed you fill find two National Journal Reports which contain the science policy articles I mentioned in our chat the other day.

I enjoyed meeting you and if I can be of further assistance please let me know.

Sincerely,

John Iglehart

John K. Iglehart

PSA
File

March 24, 1973
Washington, D.C.
Vol. 5, NUMBER 12

National Journal

Reports

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nce reports on federal policy-making

National Journal, March 24, 1973, Volume 5, Number 12. Published weekly by The Government Research Corporation, 1730 M Street NW, Washington, D.C. 20036. Telephone (202) 833-8000. Available by subscription only. Subscription rates, $200 per year, $375 for two years. Subscribers provided with quarterly and semiannual indexes. Binders available. Second-class postage paid at Washington, D.C., and additional mailing offices.

Editor's Report

Scientific advice *by Claude E. Barfield* **405**

At a time when scientific and technological judgments are increasingly important to public policy decisions, President Nixon has abolished the institutions established over the past 15 years to provide the White House with expert advice from top scientists and engineers.

In the process of streamlining his staff and reorganizing the executive branch, he has abolished the post of science adviser to the President, the White House Office of Science and Technology, the nongovernment President's Science Advisory Committee and the interagency Federal Council on Science and Technology. Although only 15 per cent of government-financed research and development is in basic research, science advisory functions have been transferred to the National Science Foundation, a basic research agency.

These actions raise major questions about the role of scientific judgments in Presidential decision making, some of which are explored in this, the first of two reports on the changing federal science system.

'Detailed' payroll *by Dom Bonafede* **416**

A series of letters between Members of Congress, the General Accounting Office and the White House sheds a little light on the number of "detailed" personnel working for the White House, but carried on the payrolls of other parts of the executive branch.

School aid *by Karen DeWitt* **417**

The Nixon Administration sent its legislation for special educational revenue sharing to a hostile Congress this week, the third year in a row it has sought to revamp the system of federal aid to schools. President Nixon's proposal is expected to fail its examination again this year, but the Administration is prepared to take a tougher stance and threaten to use the President's veto to block all school aid unless its legislation is approved. The major existing law expires June 30, but is automatically extended one year, thus possibly putting over the big battle until then. Opposition to the Nixon plan comes from education interest groups and their congressional supporters who criticize both the amount of money allocated under the plan and the way in which the money would be distributed.

Highways and transit *by Bruce E. Thorp* **427**

Both the Nixon Administration and Congress are trying to use this year's federal aid highway legislation as a vehicle to demonstrate their support for mass transit. But in one major respect, their ways of doing this are incompatible. The Senate bill would provide $400 million a year in operating subsidies for ailing transit systems and the House Public Works Committee is leaning in the same direction. So strong is Administration opposition to operating subsidies that Transportation Secretary Claude S. Brinegar says he will urge the President to veto the highway bill if it provides subsidies. Meanwhile, the House is heading for a split with the Senate, which has approved Mr. Nixon's request to let cities use their Highway Trust Fund money for mass transit purposes. If the House, as it has in the past, refuses to go along, it will be inviting a veto of the bill on still another ground.

Science Report/Nixon reorganization raises questions about role of science in federal policy making

by Claude E. Barfield

A federal science advisory system that developed over the last 15 years has been swept away in a Presidential reorganization that raises questions about the future ability of the White House to obtain disinterested advice on scientific aspects of major public-policy issues.

Over the years, the system had provided an organized framework for channeling to the President the views of the nation's top scientists on issues ranging from expensive defense hardware projects to the supersonic transport aircraft, the nuclear fast breeder reactor and the chances of conquering cancer.

But in the past four years, it has not proved to be of great use to the White House, despite the increasing number of scientific issues of major economic consequence which have required a Presidential judgment.

Hearings now being held in Washington by the Environmental Protection Agency provide a current example of a major technological question requiring a government decision. At issue is the request of domestic automobile manufacturers for a delay in the requirement to install high-performance air pollution control devices on new cars, and the EPA-White House decision will have immense economic consequences for the companies and for the consumer.

Presidential action: President Nixon announced his plan to dismantle the science advisory structure on Jan. 26.

Two actions, outlined in Reorganization Plan No. 1 of 1973, would:

- abolish the White House Office of Science and Technology, and transfer its functions to the National Science Foundation;
- abolish the position of special assistant to the President for science, and transfer its functions to the director of the NSF.

In addition, the White House let it be known that it would abolish the prestigious President's Science Advisory Committee (PSAC), a group created in 1957 and composed of 18 top non-government scientists. Finally, the Administration plans to abolish, and then reconstitute in a different form, the Federal Council for Science and Technology, a federal interagency body established in 1959 to coordinate the government's scientific and technological activities.

The reorganization removes from the White House organization an office that was supposed to provide the

Two-Part Series

This is the first of two reports on the Nixon Administration's plans to reorganize the federal science advisory system.

President with an overview of federal R and D activities, scattered through dozens of federal agencies, advice on the allocation of federal R and D resources, and advice, where needed, on specific public-policy questions, such as the automotive pollution issue.

The advisory system's demise comes at a time of unprecedented demand for development and use of new technologies to meet domestic needs, especially in the fields of environment and energy, often at a high cost to society.

The President's decision raises a number of important questions about the federal science system:

- Should there be more coordination and control of the decentralized and diffuse federal research operations?
- Is there a need for some more structured priority-setting mechanisms at a time when federal R and D funding has leveled off, thus heightening interagency competition for research dollars?
- How can the government more successfully integrate scientific and technological considerations into top-level decision making?
- How can the President get independent advice on technology-related questions, advice free from federal agency bias or interest-group pressure?

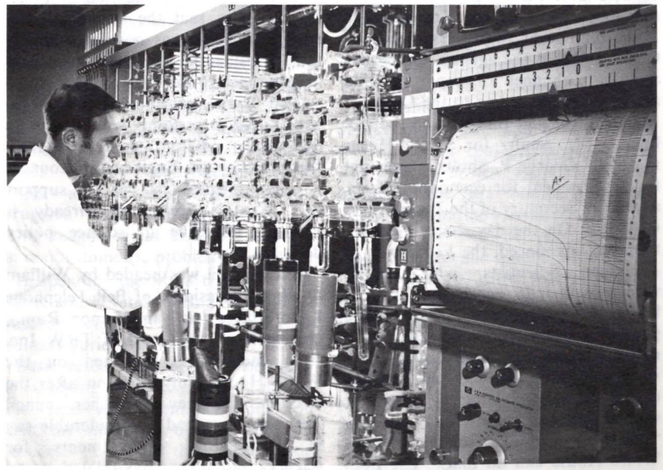
Administration rationale: Members of Congress and of the scientific community have expressed deep misgivings about what appears on the surface to be an estrangement of science from White House decision making.

To its critics, the Administration responds chiefly by arguing that the dismantling of the science structure makes sense in terms of efficient management of the executive branch.

Administration leaders place the move in the context of an over-all effort to streamline the President's executive office and to remove from that office functions and agencies that are not crucial to Presidential decision making.

They say that the R and D capabilities of line departments and agencies has been upgraded in recent years and no longer needs close White House supervision, and argue that NSF is well suited to performing the functions previously lodged in the White House structure. Any requirement of independent advice of the kind provided by PSAC can be met through ad hoc, NSF-recruited panels of scientists, they say.

Edward E. David Jr., who was the last man to hold the science adviser's post, is a defender of the reorganization. David, who left the government on Dec. 29 to return to private industry, said: "I know some scientists, par-



A scientist from an AEC radiation laboratory checks radiation levels resulting from an underground nuclear explosion to free natural gas

ticularly those who have worked under the old system, are disturbed. Institutions are like children. People who bring them into being become fond of them and want to see them prosper; it's difficult for them to let go. But I think the new arrangements can be effective. And it's what the President wanted; that's the important thing."

NSF: Although the NSF is taking on new responsibilities that fall outside its area of traditional expertise, the fiscal 1974 budget gives it no new money and no new personnel to carry out these duties.

The agency traditionally has been the government's leading promoter of basic research in civilian fields; in fiscal 1974, some 83 per cent of its $554-million research budget financed basic research in universities and other institutions. Only 17 per cent of the budget was targeted for applied research.

In contrast, only 15 per cent of the government's $17.4 billion fiscal 1974 R and D budget is in basic research. Twenty-six per cent is spent on applied research, and the remaining 59 per cent on development of technologies that already have benefited from basic and applied research.

Although these figures show that the NSF will be stepping into unfamiliar terrain in any attempts to perform a policy-making function for all federal science activities, the agency's director, H. Guyford Stever, said on Jan. 26 that "NSF has the will and is capable of fulfilling the job." Stever said that "there are more resources in NSF than ever were assembled in OST" and that the agency would have a "clear channel of reporting and acting . . . a direct line to the Office of Management and Budget, and a direct line to Mr. Shultz for White House matters." George P. Shultz is assistant to the President for economic affairs, as well as Secretary of the Treasury.

Criticism: On the day the reorganization was announced, the Federation of American Scientists, whose 4,500 members include nearly half of the living U.S. winners of Nobel science prizes, issued a statement calling the move a "downgrading of science." The statement questioned the NSF's ability to serve "as a watchdog for the major science-related agencies," saying "only a collection of scientists in the White House can do that." The FAS also was highly critical of the abolishment of PSAC, which, it said, had been an "indispensable" Presidential

H. Guyford Stever

tool in "getting the facts and keeping the bureaucracy in line."

Philip B. Handler, president of the National Academy of Sciences, also expressed concern. "It's not the loss of 'our man in the White House' that I mourn," he said in an interview. "It's rather the seeming lack now of any independent mediating voice, above competing agencies and bureaucracies, to set forth scientifically sound options for policy."

Leading science specialists in Congress, including Rep. John W. Davis, D-Ga., and Sen. Edward M. Kennedy, D-Mass., likewise have criticized the President's decision.

Republican scientists: One reason for the demise of the White House science structure was the perception of Presidential aides that the scientific community at large was hostile to important Presidential policies, especially his approach to the Vietnam war.

And if the advisory system is reconstituted, it certainly will be with an eye to the advisers' politics. Indeed, the Science and Engineering Council, a group formed last year to support Mr. Nixon's reelection, already is exerting influence in science policy decisions.

The council was headed by William O. Baker, president of Bell Telephone Laboratories Inc., and Simon Ramo, chairman of the board of TRW Inc. Both men were consulted on the White House reorganization after the election, and they and other council members have had a considerable say in Presidential appointments for science- and technology-related posts. They also are exploring ad hoc means of giving advice to the White House on R and D questions.

Federal science system

The large and complex science establishment supported by the federal government today grew from the emergency needs of the Second World War and the continuing exigencies of the Cold War that followed.

Responding to the call from Washington in 1941, scientists flocked to government service in unprecedented numbers, and the military victory the United States won over Germany and Japan was in no small part a triumph of American scientific technology. The extraordinary scientific effort was best symbolized by the Manhattan Project that produced the world's first atomic bomb in 1945.

To coordinate the use of scientific personnel and resources, President Roosevelt in 1941 established the Office of Science Research and Development. It was the first centralized federal organization for science and technology. Its director, Vannevar Bush, had direct and continuous access to the President, and many of the scientists who worked for Bush went on to become members of a postwar, elite scientific federal policy-making establishment.

Bush's 1944 report to Roosevelt entitled "Science, the Endless Frontier," became the classic exposition of the rationale for the federal subsidies for scientific research and technological development.

OSRD was disbanded after the war, but in 1950, pursuant to a recommendation of the Bush report, Congress established the National Science Foundation, and gave it responsibility for support of basic research and for coordination and evaluation of federal R and D policies. NSF's first-year budget was $225,000; its budget today is about $640 million.

R and D growth: The federal science activities NSF was supposed to oversee grew rapidly in the 1950s and 1960s, especially after the Soviet Union placed its Sputnik satellite in earth orbit in 1957.

In 1953, federal R and D outlays totaled $2.7 billion; in 1957, $6.1 billion; in 1961, $9.3 billion. In 1968 they reached a four-year plateau of about $15 billion.

The percentage of the R and D budget devoted to civilian research also has grown steadily, although defense continues to dominate.

In 1953, 88 per cent of the R and D budget was devoted to defense work,

R and D Trends

The table below reflects trends in research and development expenditures by the federal government, industry and academic and other nonprofit institutions for the period 1953-72. Totals, in millions of dollars, are for calendar, not fiscal, years.

Year	Federal government	Industry	Universities and colleges	Other nonprofit institutions	Total
1953	$ 2,759	$ 2,239	$ 151	$ 58	$ 5,207
1954	3,138	2,367	167	66	5,738
1955	3,509	2,513	185	72	6,279
1956	4,859	3,336	204	84	8,483
1957	6,119	3,460	230	103	9,912
1958	6,791	3,700	257	122	10,870
1959	3,059	4,057	290	134	12,540
1960	8,752	4,508	328	142	13,730
1961	9,264	4,749	371	168	14,552
1962	9,926	5,114	424	201	15,665
1963	11,219	5,449	485	218	17,371
1964	12,553	5,880	555	226	19,214
1965	13,033	6,539	615	252	20,439
1966	13,990	7,317	673	284	22,264
1967	14,420	8,134	753	306	23,613
1968	14,952	8,997	741	329	25,119
1969	14,917	10,008	900	354	26,179
1970	14,775	10,435	970	386	26,566
1971 (est.)	14,996	10,813	1,099	407	27,315
1972 (est.)	$15,923	$11,570	$1,226	$424	$29,150

SOURCE: National Science Foundation

while 10 per cent went to civilian work and 2 per cent to space research.

In 1963, defense received 63 per cent of federal R and D funds; space 21 per cent (almost entirely for the Apollo program) and civilian programs 16 per cent. In 1969, defense was down to 59 per cent and space to 19 per cent, while civilian R and D was up to 22 per cent. In 1972, NSF estimates that the government spent 54 per cent of its R and D money on defense; 19 per cent on space and 27 per cent on civilian programs.

Organizational diffusion: As the dollar volume in federal R and D mushroomed during the past two decades, so too did the number of federal agencies spending the money.

The Defense Department remained the largest single recipient of federal R and D funds. In addition to NSF, the other two postwar high-technology agencies, the Atomic Energy Commission and the National Aeronautics and Space Administration, have drawn heavily on federal resources. At the same time, the multipurpose missions of the National Institutes of Health have received ever-increasing amounts of federal outlays.

Older federal departments such as Agriculture, Interior and Commerce have continued R and D programs in their specified areas and added new responsibilities. Grouped within them are a number of smaller technology-related agencies including the National Bureau of Standards, the Geological Survey, the Bureau of Mines, the National Oceanic and Atmospheric Administration, the Office of Coal Research and the Agricultural Research Service.

Regulatory agencies, particularly the 60-year-old Food and Drug Administration and the recently created Environmental Protection Agency, are greatly dependent on scientific and technical information for their standard-setting and regulatory functions.

And finally, during the 1960s the newer civilian departments—HEW, HUD and Transportation—have struggled with uneven success to bring technological expertise to bear on major domestic problems.

In spending the $17.8 billion in federal R and D funds during fiscal 1974, these agencies will support an extraordinary variety of projects.

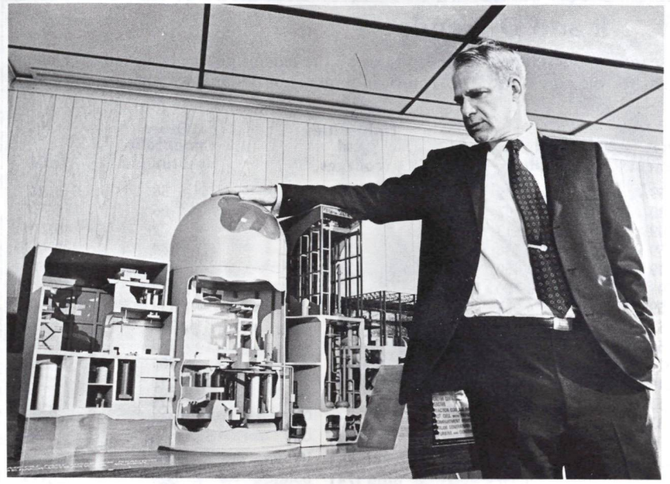
Basic research money will be spent on studying solar magnetic storms that interrupt communications on earth, the movement of deep water on the ocean floors and the characteristic difference between normal human and cancer cells, among many other projects.

The federal budget will finance targeted, applied research on such diverse matters as the use of nuclear fusion to produce electricity, solar energy, superconducting technologies for electric-power transmission, the use of enzymes for industrial processes, laser technology for medical surgery and instrumentation to monitor environmental pollutants.

Finally, the funds will support the government's extensive development activities, which often are conducted in alliance with private industry. Development projects include a demonstration nuclear-breeder reactor, construction of the space shuttle, a demonstration coal-gassification plant and a series of new weapons systems, including the B-1 bomber and the Trident submarine missile.

The work will be performed by many private and public institutions. In calendar 1972, the federal government distributed about $8 billion to private industry, mostly for applied research and development; $1.7 billion to academic institutions, mostly for basic research; and $1.4 billion to federally funded R and D centers and nonprofit research institutions. In addition, it spent about $4 billion for resident R and D.

Executive office organization: The growth of federal R and D spending and organizational diffusion produced



Former AEC Chairman James Schlesinger displays model of a fast-breeder nuclear power plant

periodic calls for centralization and coordination of federal science and technology activities in one department.

In the wake of Sputnik, Sen. Hubert H. Humphrey, D-Minn., in 1958 introduced a bill to create a Cabinet-level Department of Science and Technology. For the next four or five years, Humphrey and other members of the Senate Government Operations Committee pushed the concept of such a department, or at least the establishment of a commission to determine the need for major executive reorganization for science and technology.

Presidents Eisenhower and Kennedy opposed the Cabinet-level department, but both took steps to centralize and coordinate science policy making in the White House.

In late 1957, President Eisenhower announced the appointment of a permanent special assistant to the President for science and technology and the creation of a continuing President's Science Advisory Committee, to be composed of 18 non-government scientists and engineers.

In 1959, the interagency Federal Council for Science and Technology was established to provide coordination among the most important government agencies involved in science and technology. It was chaired by the President's science adviser, and included representatives from eight (later 11) departments and agencies.

In 1962, President Kennedy completed the White House structure for science that Mr. Nixon now has dismantled. Under his Reorganization Plan No. 2 of 1962, Kennedy created the Office of Science and Technology, the director of which was subject to Senate confirmation.

In sending the plan to Congress, the President told Congress that OST would assume responsibility for policy planning, coordination and evaluation of all federal science and technology programs. The OST director was to be available to congressional committees, and thus would be able to furnish Congress with information on the Administration's scientific policies from an over-all, rather than a departmental, point of view.

In explaining why these functions were being taken away from NSF, Kennedy said: ". . . the Foundation, being at the same organizational level as other agencies, cannot satisfactorily coordinate federal science policies or evaluate programs of other agencies. Science policies, transcending agency, need to be coordinated at the level of the President, drawing upon many resources both within and outside of government. Similarly, staff efforts at that higher level are required for the evaluation of government programs in science and technology."

After 1962, the President's science adviser wore four hats. He served as assistant to the President for science and technology, director of the Office of Science and Technology, chairman of PSAC and chairman of the FCST.

Independent variables: The centralization of science policy making in the White House theoretically meant that scientists had access to the highest levels of decision making. In practice, this access and the use made of the science policy making and advisory apparatus were dependent on a group of highly variable factors, including:

- the personal relationship between the President and his science adviser;
- the perception by the President and the White House staff of what the science adviser, OST and PSAC should or could be doing;
- the capacity of OST and PSAC to change over time and, to provide meaningful aid in solving non-defense problems of emerging government concern—in the fields of environment and energy, for example;
- and finally, outside political factors affecting the relationship between the White House and the scientific community. In recent years, many scientists have opposed the President on the Vietnam war, and the scientific community in general has been upset about the impact of inflation on research and development, which has been an area particularly vulnerable to price increases.

Early years—Both non-government scientists and government administrators agree that the science adviser-OST-PSAC system was most productive from 1957 until 1966 or 1967. During those years, the variable factors were almost all favorable to the framework created as a result of Sputnik and Cold War competition, and the first three science advisers—James R. Killian Jr., George B. Kistiakowsky and Jerome B. Wiesner—all enjoyed an extraordinarily close relationship with their Presidents, Eisenhower and Kennedy.

Kistiakowsky said that both Presidents "were acutely aware of the need of independent advice, particularly on defense questions. Ike was a military man himself, and he just didn't trust the Pentagon without an outside check."

Many of the Presidential decisions in which the science adviser-OST-PSAC apparatus played an important role were made in these years. The science adviser and his allies successfully fought against Pentagon proposals for a nuclear-powered aircraft, the B-70 bomber and the Skybolt project (a nuclear-rocket program). OST and PSAC early on began focusing on the issues of population control, pesticides and the problems of the environment.

Later years—None of the last three science advisers, Donald F. Hornig, Lee A. DuBridge and Edward David, developed a close personal relationship to Presidents Johnson and Nixon.

Hornig was a Kennedy appointee who came to the White House just after the assassination in 1963. After 1965, with most of the nation's scientific community in opposition to the Vietnam war, Hornig's position within the White House weakened substantially. And both DuBridge and David suffered to some degree from the same fate.

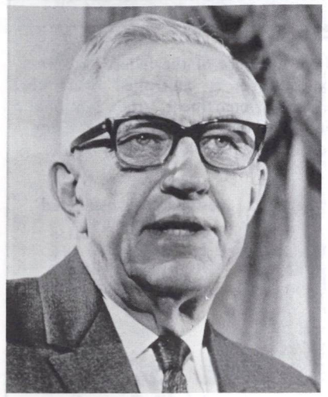
Said Philip B. Handler, president of the National Academy of Sciences: "It was unfortunate but President Johnson came to view the science adviser and PSAC as the closest face of the academic community that he felt had turned on him. The system had declined greatly by 1969, and President Nixon for reasons of his own didn't see fit to revive it."

Handler maintains that "despite the genuine misgivings and even disagreements with both Administrations by some PSAC members on the war, I never heard direct criticism of either President as a culprit or any attempt to betray him. . . . To the very end, the attitude was: 'How can we be helpful to the President?'"

Inflation—After 1967, the science adviser also was caught in a crossfire between the budget bureau and the scientific community as federal support for R and D leveled off and even began to decline in terms of real purchasing power.

Between 1960 and 1967, federal funds for R and D rose at an average of about 10 per cent annually; between 1967 and 1972, a reverse occurred and federal R and D support, adjusted to account for inflation, declined at an average of about 6 per cent annually.

During the tenure of President Nixon's first science adviser, Lee DuBridge, criticism from scientists coalesced and centered on the White House science-policy apparatus. Said DuBridge, who to a great degree was a casualty of the attack: "It was, I guess, natural that we should be blamed. But there were a number of complex factors at work, and I felt when I left Washington that the entire federal science-support system and organization needed reexamining." In an interview with *National Journal* on the day his resignation was announced



Lee A. DuBridge

Philip B. Handler

in 1970, DuBridge said that he personally thought that a Council of Science Advisers should be established in the White House, equal in status and power with the President's Council of Economic Advisers.

Centralization restudied: The tightening budget stringency and what James Killian called an "accumulation of uncoordinated actions" by the federal government which brought "disorder and dismay to the house of science" raised anew fundamental questions about the structure of the federal science and technology system.

Daddario—During 1969, the House Committee on Science and Astronautics Subcommittee on Science, Research and Development, chaired by Rep. Emilio Q. Daddario, D-Conn., held extensive hearings on the question of the need for centralization of federal science activities.

Daddario, who left Congress in 1970 in a losing bid for the Governorship of Connecticut, was the leading congressional authority on science policy during the 1960s. Looking back on the hearings, he says now: "Even though the danger signals had been flying since 1967, we found the scientific community divided and uncertain about the necessity for wholesale restructuring and moving drastically from the existing decentralized, pluralistic system."

Despite the uncertainties within the scientific community, the Daddario subcommittee proposed the creation of a new agency—the National Institutes of Research and Advanced Studies (NIRAS)—built around an enlarged NSF. Added to the NSF core would have been a National Foundation on the Arts and Humanities, two new institutes of social sciences and ecology, a group of basic research projects no longer relevant to mission agencies and a number of graduate education programs from HEW. The agency would have had an initial budget of about $2.3 billion.

Kennedy bill—Although Daddario's bill failed to move, Congress has shown itself increasingly restive and unhappy about the federal R and D establishment, particularly about the seeming inability of major civilian agencies—HUD, HEW and Transportation—to bring science and technology to bear on major domestic problems.

The reception given the National Science Policy and Priorities Act of 1972 (S 32) by the Senate last year clearly demonstrated that Congress is receptive to proposals for reorganizing the far-flung federal science and technology establishment. The bill, sponsored by Sen. Kennedy, passed the Senate 70-8, and quite likely would have passed the House by an equally impressive margin had the second session of the 92nd Congress not ended soon thereafter.

Like the Administration's reorganization, the bill would make NSF the government's central planner for science and technology. But the foundation would be given a much stronger mandate—as well as a new statutory base—to perform that function. In addition, the bill would create within NSF a new Civil Science Systems Administration with authority to spend $800 million over a three-year period to fund design, develop and demonstrate technological ad-

1972-74 R and D Expenditures by Agency

As the table below shows, about three quarters of the federal government's research and development expenditures is controlled by three hardware-oriented agencies—the Defense Department, the National Aeronautics and Space Administration and the Atomic Energy Commission. Figures are for fiscal years and in millions of dollars.

Agency	1972 actual	1973 estimated	1974 estimated
Defense (miltary functions)	$ 8,117	$ 7,873	$ 8,333
NASA	3,373	3,008	3,066
HEW	1,513	1,670	1,873
Atomic Energy Commission	1,298	1,359	1,411
National Science Foundation	418	423	446
Transportation	274	290	359
Agriculture	349	360	343
Interior	210	262	255
Commerce	165	179	187
Environmental Protection Agency	133	146	164
Veterans Administration	66	71	75
HUD	47	43	61
Justice	13	30	46
All other	127	173	171
Totals	**$16,103**	**$15,886**	**$16,790**

SOURCE: Office of Management and Budget

vances in such areas as pollution control, health care, transportation, communications and education. An aide to Kennedy predicts the legislation will pass the Senate again by mid-summer.

Congress also moved last year to increase its own ability to weigh scientific issues by establishing a new Office of Technology Assessment. Staff now is being recruited for the office, and Daddario is a leading candidate for the director's office.

Brooks—Harvey Brooks, one of the nation's most knowledgeable and influential spokesmen on science policy and organization, believes the case for some kind of centralization of federal science policy making has become much stronger in the last few years. Brooks is dean of Engineering and Applied Physics at Harvard and is a member of both the National Academy of Sciences and the National Academy of Engineering. A former PSAC member, he is currently on the National Science Board—the governing board of NSF—and the board has turned to him to prepare a memorandum regarding the consequences for NSF, the board and federal science of the recent reorganization.

Brooks, who is worried that the President's reorganization did not give NSF the power to carry out the mission he assigned it, said in an interview: "The American system, with its emphasis on pluralism, decentralization and competition among sectors for R and D funds, performed pretty well until the mid-1960s. However, we've moved into an era where resources for R and D are limited, thus necessitating more careful planning and coordination at or near the highest government decision-making level. . . . In addition, a new and more difficult task of interweaving science policy with national social, economic and political policies would seem to call for a unified, coherent strategy."

Nixon and reorganization

A deep concern with government organization and structure has been a hallmark of the Nixon Administration in nearly every major area of government policy making. And given the problem that already had surfaced regarding the White House science policy-making and advisory apparatus it was natural that White House attention should turn to it early on.

Ironically, in light of the Administration's recent decisions, a Presidential task force in 1970 and a PSAC panel in 1971 both recommended augmenting the role of the science adviser and the OST in the White House by giving them broadened and much stronger budgetary, planning and management responsibilities. The first group—the Presidential Task Force on Science Policy—was one of 17 advisory panels named by Mr. Nixon in 1969 and was chaired by Reuben F. Mettler, president of TRW Inc. The PSAC panel, chaired by Patrick E. Haggerty, chairman of the board of Texas Instruments Inc., studied questions of science-policy structure in detail for over a year, and turned over its report to the President's Advisory Council on Executive Organization headed by Roy L. Ash, president of Litton Industries Inc. and now the director of OMB.

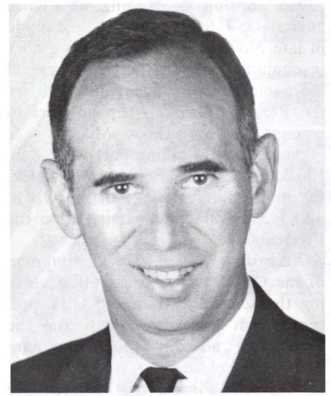
The Ash council, whose advice has been followed closely by the President in his sweeping government reorganization proposals, came to an entirely different set of conclusions. Its recommendations regarding the White House science-policy structure were never made public, but according to Ash and to Andrew M. Rouse, former staff director of the council, they called for abolition of the entire science-policy system in the Executive Office of the President. "In reality," said Rouse, "the Administration has just carried out the earlier council recommendations, and it used the same rationale in explaining its action."

The Ash council's conclusions, stemming from theoretical premises regarding efficient government management, were reinforced by the day-to-day practical experience of the White House and Domestic Council staff.

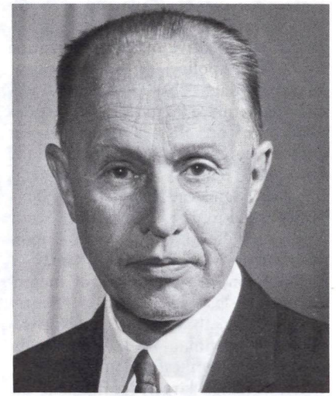
Inability to use: Looking back over the first four years of the Nixon Administration, several White House and Domestic Council staff members argued that they had not found OST advice of unique utility or packaged in a way they found helpful.

Said William E. Kriegsman, a former Domestic Council staff member (1969-1971) who had major responsibilities for science policy: "I think that if it had been expedient the White House would have dropped the science adviser and abolished OST two years ago when DuBridge resigned. DuBridge was a sweet guy with impeccable credentials and a desire to help; but when we asked OST for advice, they kept coming with answers that weren't usable or which didn't fit the political realities. The White House staff had to handle most of this work itself. . . . David tried hard to retrieve the situation and work within the system, but basically it was too late, I think."

Kriegsman's view was corroborated



S. David Freeman



George B. Kistiakowsky

Edward E. David Jr.

by Richard M. Fairbanks, a Domestic Council staff member who since 1969 has dealt with natural resources and environment issues. Fairbanks, who recently was named an assistant director of the council staff, said: "We did find OST useful, but they were by no means the only independent source we depended upon in energy and environmental matters; and they were no more right on a number of issues than other agencies. Sometimes EPA was better, or Interior or the AEC. Maybe they could or should have, but the fact is they didn't constitute the most important option-analyzing source for us."

Unstated reasons—In addition to the publicly stated reasons given by the Nixon Administration regarding the reorganization, there are several unstated difficulties that undercut the science adviser-OST-PSAC system after 1969.

To some degree the OST staff, and to a much greater degree PSAC and its panel members, never could overcome the feeling of the top political operators in the White House that they were an alien, hostile force.

S. David Freeman, who headed the OST Energy Policy Staff from 1968 to 1971, is a Democrat who stayed on at both DuBridge's and David's request. Says Freeman: "The OST staff was an oasis of holdovers, and I think we did feel the need to bend over backwards to show that our advice was disinterested. But in retrospect, I don't think we ever overcame the sense of distrust by the political types around the White House. . . . Actually, I'm a great believer in the spoils system myself, and I wonder now if it wouldn't have been better for OST if DuBridge had cleared the decks in 1969 in order to allay the resentment and fear. The institution might have had a better chance of surviving."

Even more damaging were clashes between PSAC panels and the Administration on several of the most important political issues that came up after 1969.

The most celebrated and corrosive disagreement erupted over the doubts raised by a PSAC panel, chaired by Richard L. Garwin of IBM, about the environmental effects of the supersonic transport. The panel's negative findings were supposed to remain confidential, but they emerged publicly at the height of the struggle over the SST in Congress and became a crucial factor in the debate.

The scientific community was overwhelmingly opposed to the Administration's decision to deploy the antiballistic missile system, and PSAC itself, after analyzing the issue at one of its meetings, verbally passed on to the White House its deep reservations both about the technical problems and the Cold War implications involved in the decision.

And a PSAC panel, in a report to Edward David during the fall of 1971, directly attacked the major arguments advanced by the Administration and NASA in favor of the space shuttle, giving Sen. Walter F. Mondale, D-Minn., the leading Senate antagonist of the project, bountiful ammunition for continued opposition. The shuttle study was supposed to be confidential (like the Garwin report), but was leaked to *National Journal*. *(See Vol. 4, No. 33, p. 1295.)*

Said Paul M. Doty, professor of chemistry at Harvard and a member of the NAS Committee on Science and Public Policy: "It seems pretty clear that the White House staff viewed PSAC as an institutionalized center for internal dissent—and after the incidents which occurred over the past few years, they just said 'Who needs them?' "

Privately and not for attribution, several White House staff members agreed that the substance of Doty's remarks was correct. Said one: "There was something of the feeling that some of the members were more politically than scientifically motivated."

David—President Nixon's last science adviser, Edward David, bore the burden of defending a system already badly compromised and weakened.

One former OST staff member who worked under David said: "Ed, from the time he came in, did everything he could to avoid antagonizing the top political men. The signals in our staff meetings were: 'Be careful and don't rock the boat.' "

Freeman said: "It's easy to sit in judgment with hindsight, but I think he'd have been better off with a kind of 'damn the torpedoes and full speed ahead' attitude that would always have called all the shots on the merits. Considering the recent decisions of the Administration, what Ed David really proved was that appeasement was not a more viable policy than trying to lead from strength when you've got the facts."

The White House attitude toward the role of the science adviser stood out clearly when it decided, in the summer of 1971, to mount a crash

drive to identify new technologies whose development the federal government could fund over the next decade.

To lead the effort, the Administration turned to William M. Magruder who had spearheaded the SST drive in Congress for President Nixon, and he was brought in to work for John D. Ehrlichman, who was executive director of the Domestic Council staff. At the time, Ehrlichman explained the decision to *National Journal* by saying that the President used the OST "to provide specific and precise advice on matters of science and technology," and that the office was not equipped to make policy decisions on questions involving fiscal, social, political and other considerations. *(See Vol. 3, No. 43, p. 2144.)*

The failure of the Magruder operation to produce a technology program the White House could adopt further hastened the demise of the executive office science structure, in the view of Lawrence A. Goldmuntz, who served as liaison between Magruder and David in 1971.

Goldmuntz, who was executive director of the FCST at the time, said that "the personal, and bureaucratic rivalries and bad feeling were even worse than the press reported." But more important, in Goldmuntz's view, was the "surprise and disappointment" of the President and Ehrlichman at the study's results. "I think they believed somehow that we would be able to find a number of specific technologies to solve difficult problems—that somehow they could get a shot to the moon in the areas of transportation or energy or medical research," Goldmuntz said. "When it didn't turn out that way, there was an inevitable reaction against science and technology or at least a disenchantment with what it could do for this Administration over the short term."

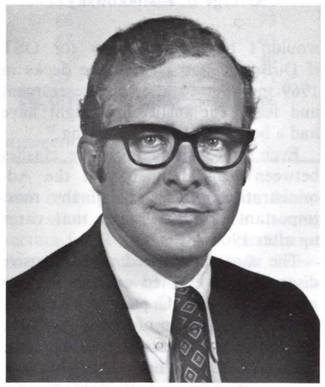
1972 discussions: In December 1971, when the Administration suddenly backed away from any large-scale technological initiatives, Ehrlichman quietly turned to Edwin L. Harper, then the assistant director of the Domestic Council, to pick up the pieces and devise explanations of the program's results.

Harper also became the key Domestic Council figure in the construction—with OST—of the President's March 16, 1972, "message to Congress on science and technology."

Waldman—Beginning last spring, Harper's assistant, Raymond J. Waldman, prepared several staff memoranda on executive office organization for science policy. In an interview, Waldman said: "The Magruder exercise had raised important questions about the role of the science adviser and his staff in the White House, and how they related to other elements like OMB and the Domestic Council. I was asked to do an operational study to try and figure what OST's important functions—if any—really were."

Waldman wrote a series of memoranda—the last in October—for Harper and Kenneth R. Cole Jr., who replaced Ehrlichman in January as director of the Domestic Council staff.

His findings largely reaffirmed the



Raymond J. Waldman

negative judgments of the Ash council in 1971.

During the spring, David briefed members of the Domestic Council staff on his own views concerning alternate organizational possibilities for federal science policy making.

Among the proposals that were debated over the past year and a half were the creation of a White House Council of Science Advisers, as recommended by both Hornig and DuBridge, expanding NASA into a civilian technology agency and the establishment of a new civilian advanced research agency, patterned on the Defense Department's highly successful Advanced Research Projects Agency (ARPA).

Final decisions: In the end, all of the alternatives debated were discarded and the original thinking of the Ash council, reinforced by the experience of the White House staff and the Waldman memoranda, won.

The decisions concerning the science adviser-OST-PSAC system were made in late November and early December in conjunction with the more general reorganization changes initiated by the President and his top advisers in meetings at Camp David, Md.

Among those taking part were Ash; Ehrlichman; Cole; Frederic V. Malek, the new deputy director of the OMB; and H.R. Haldeman, assistant to the President.

According to Charles F. Bingman of the OMB, "the discussion concerning the science adviser and OST presented no unique problems for the Presidential advisers." Said Bingman: "It was merely part of a larger debate on the streamlining of the Executive Office of the President—that is, what could they get along without." Bingman heads the government organization branch of OMB's Office of Management Systems. In that position, he has chief responsibility for the staff work to support the testimony regarding the reorganization plans and has accompanied Malek in his appearances before the Government Operations Committees in both houses.

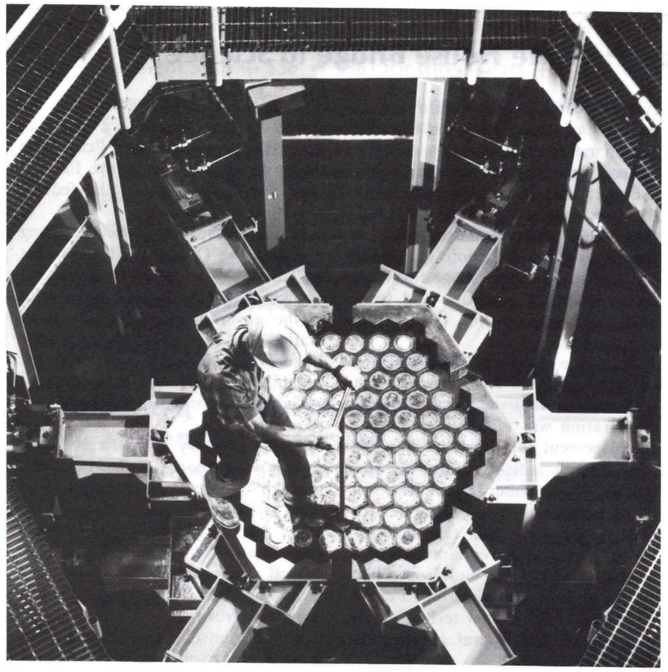
By early December, an initial decision had been reached to abolish the OST, PSAC and the position of special assistant to the President for science and technology.

Significantly, neither David nor H. Guyford Stever, director of NSF, was consulted or asked his opinion. (Since the abolition of his post, David has loyally defended the Administration, but as late as October, in discussing his opposition to Sen. Kennedy's NSF bill, he told *National Journal* that it was "important and necessary to have the coordinating and planning function for science policy in the executive office itself.")

Baker-Ramo committee—Though the top White House political officers failed to consult their own internal science-policy leaders, key members of a 27-member Science and Engineering Council, established during the Presidential campaign to work for Mr. Nixon's reelection, intervened and were listened to on the science-policy questions.

The council was headed by William O. Baker, president of Bell Telephone Laboratories Inc., and Simon Ramo, vice-chairman of the board of TRW Inc.

A Republican, Baker is a member of the governing council of the National Academy of Sciences and since



An engineer prepares a laser measurement test

1969 has been the key link between the Administration and the scientific academic community. In an interview, he said that "the council did not act as a unit; the input to the White House was on an individual and informal basis."

"We tried to explain to them," said Baker, "what were the implications of what they were planning and open up other options."

Baker conceded that it "was fair to say" that top White House officials knew very well what they wanted to get rid of but had not thought through very clearly what functions the OST and PSAC were performing that would have to be taken over somewhere in the federal government.

Members of the council were most disturbed at the fact that under the initial White House reorganization plan "there would have been no one place, man or institution who would represent the voice of science in the high councils of government," said Baker.

"We also pointed out," he said, "the political necessity and attractiveness of having someone to explain and communicate both to the scientific community and to the nation at large just what was in the President's mind regarding science and technology."

In December, top White House officials offered David chairmanship of the AEC and the title of science adviser to the federal government. After considering the offer for several weeks, David turned it down.

Baker and others continued pressing for some kind of central focus; but as late as mid-January, when George P. Shultz, Secretary of the Treasury and special assistant to the President, appeared before the National Science Board to explain the Administration's resolve to transfer the duties of OST to the NSF director, the issue had not been resolved. Several NSB members quizzed Shultz closely about the lack of a central focus under the new arrangement.

After the NSB discussions the White House finally decided to bestow on the NSF director the title of science adviser.

Though he supports the reorganization plan fully, Baker is critical of the methods used to bring it about. "We warned the White House staff," he said, "that by operating behind closed doors and then suddenly springing this without any discussion they would create a poisonous atmosphere. Dr. David had worked hard and had achieved a real rapport with scientists and engineers around the country; and this crude dumping was bound to produce misunderstanding and resentment. In some ways, it was just like the Magruder episode all over again."

Hope for future—Ironically, given the last-minute nature of the decision, it is Stever's new title and its implications that have occasioned the chief debate over the past month.

Members of the scientific community have seized upon it as a symbolic sign that science has not dropped entirely off the Administration's organizational charts. Administration officials, reacting to the criticism by Members of Congress and scientific organizations that "science has been downgraded," have stressed the importance of the title and the new role for the NSF director.

On Jan. 26, in an initial explanation of his new role to the press, Stever was tentative about its dimensions, by stressing that he was not the science adviser to the President. "I guess I am everybody's science adviser," he said.

But a month later, before the House Government Operations Committee, Frederic Malek posited a much more expansive role, stating: "Dr. Stever is really the science adviser to the entire Executive Office of the President, not just to the President himself. His role will be to advise the OMB . . . and the Council on International Economic Policy . . . who are formulating recommendations to the President that have something to do with science and technology."

Malek added later: "I can say from a personal point of view—having to cope myself with the complexities of a new job—that I am convinced even more of the need for sound scientific advice from Dr. Stever and his staff if we are going to make the kind of responsible decisions and give the President the advice he needs."

Administration rationale—The White House has advanced a number of arguments for the abolition of the science adviser-OST-PSAC system.

Basic to its thinking is a theory about the history and role of the system.

White House officials contend that the Presidential office science structure was conceived as an emergency measure to upgrade U.S. science in

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William O. Baker: White House Bridge to Science

As relations between the Nixon Administration and the scientific community became tinged with hostility and distrust over the past four years, no man has been more important in maintaining communications between the two than William O. Baker, a long-time executive of Bell Telephone Laboratories Inc.

Baker, who was named president of the Bell Labs on Jan. 17, possesses impeccable credentials within the American scientific establishment and at the same time a Republican with close connections to the White House staff. He served as co-chairman in 1972 of the Science and Engineering Council for the Re-Election of President Nixon.

Biography: Baker, 57, has spent his entire professional career—34 years—at the Bell Labs. Before assuming the top position in January, he had been for 18 years vice-president for research and was also responsible for the labs' patent division.

He received a BS from Washington College in 1935 and a PhD in physical chemistry from Princeton University in 1938. In 1939, he went to work at the Bell Labs, concentrating his research on the macromolecules that form the basic elements of plastics. During the Second World War, Baker was responsible for the discovery of a synthetic polymer molecule called microgel that was fundamental to the production of synthetic rubber. After the war, he continued his work in the area of polymers and was elected to the National Academy of Sciences in 1961.

Baker began a long career of service to government during the Second World War, working with the Office of Scientific Research and Development. Since then, he has served on many advisory committees and boards, particularly in the defense area. He is a past member of the President's Science Advisory Committee, the National Science Board of the National Science Foundation and the Science Advisory Committee of the Defense Intelligence Agency.

He is presently a member of the governing council of the NAS; a member of the President's Foreign Intelligence Advisory Board and a member of the Air Force Systems Command Board of Visitors.

Nixon Administration adviser: Baker had met and become friendly with the President some years ago, and, since 1969, the Administration has turned to him on various occasions for advice and for suggestions on appointments to scientific and technological posts within the federal government.

Thus it was Baker who suggested Edward E. David Jr., at the time a Bell Labs executive, when the Administration was looking around for a replacement for President Nixon's first science adviser, Lee A. DuBridge. It was Baker who came down to Washington in the summer of 1971 to smooth over relations between David and William M. Magruder, whom the White House had chosen to lead a crash drive to come up with a series of new technological projects for the federal government to develop and fund.

And during the past three months, it has been Baker—and other members of the Science and Engineering Council—to whom the Administration has turned for help, in the wake of the demolition of the White House science policy-making apparatus.

Baker views—Although he plays down his own role in the decisions on the current restructuring ("It has been wholly unofficial and only one of a number of inputs," he says), Baker does admit that "there is often a need for someone to serve as an interface between Washington and the scientific community.

"During the current reorganization," he said, "the White House operatives have tended to think purely in textbook management terms, without perceiving the scientific and technological imperatives that are a part of almost all political decisions today. On the other hand, scientists outside of Washington sometimes have a very dim view of how the system here really operates. . . . They think, for instance, that everyone in the White House has access to the President and that removing the science adviser means the end of the use of science in policy making."

Baker says he thinks the National Science Foundation, which has assumed a broad advisory function under the reorganization, "can form the core of a new structure for science and technology in the federal government."

NSF will have to develop strong ties with the Office of Management and Budget, he says, because that agency "is now the most powerful in the government; it is even autocratic." At the same time, argues Baker, "OMB does not have the capability of judging the technological content of programs and will have to turn to NSF."

In his advisory role, the NSF director will report to the President through George P. Shultz, Mr. Nixon's assistant for economic affairs, and Baker expressed confidence that Shultz "is fully aware of the central underpinning science and technology constitute for American economic growth."

Baker himself undoubtedly will have easy personal access to Shultz through Kenneth W. Dam, who is the White House counselor's assistant. Dam and Baker established close connections while Baker was working on the President's Foreign Intelligence Advisory Board during the time Dam was OMB assistant director for national security programs. Each today has high praise for the other.

The Science and Engineering Council is forming a series of ad hoc advisory panels to undertake some of the duties the recently abolished President's Science Advisory Committee. The panels, Baker said "will nominally report through NSF but actually will consider themselves White House advisers." He said that "quite soon" there should be an announcement about an energy panel "putting together some of the best minds in the country;" and later other groups would be formed in such areas as environment, transportation, health, etc.

In conclusion, he predicted: "It's going to be an exciting and interesting time. I think the restructuring of the science policy apparatus can be done in a way that will serve the President, the scientific community and national goals and purposes."

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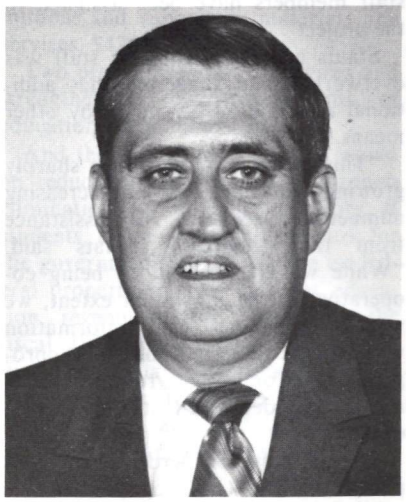
the wake of Sputnik and because of the exigencies of the Cold War. That mission, they say, has been accomplished and there is no longer a need for a special science office in the White House.

In an interview Roy Ash put it this way: "The (science adviser-OST-PSAC) structure represents one of a whole list of problems that got put into the White House because it was perceived that there was an emergency or special situation. A couple of years ago, the Johnson Administration felt it had to have a protective agency for poverty programs—hence, the Office of Economic Opportunity. Today, the drug problem is to the fore, so we've set up a special group in the White House. All are necessary in their time, but when the emergency is over they tend to linger on without real function."

"The fact is," said Raymond Waldman, "that the position of science adviser was an anomaly in the White House. Why should science have a special representative there, when there is no one for welfare or education or public works?"

Waldman said that in his own management studies of OST last year, he found that in the areas of coordination, policy planning and management of the federal R and D program, OST had not contributed a great deal. "The need for an OST perspective just didn't seem that big," he said. Only on the matter of the close relationship that had grown between OMB and OST on funding decisions said Waldman, did he "end up with very mixed feelings" as to whether OST was vital.



Charles F. Bingman

General reorganization—White House aides also tie the demise of OST and PSAC to the Administration's broader management goals, as reflected in its total reorganization of White House staff and Cabinet functions.

"It is the intention of the President," said OMB's Bingman, "to have policy made by the assistants and counselors in the White House. Certainly, on many decisions they will have to have a scientific and technical input. But they can and will draw on a variety of sources to get this—including the NSF director, the NSF bureaucracy, line departments and agencies, and where needed, outside advice."

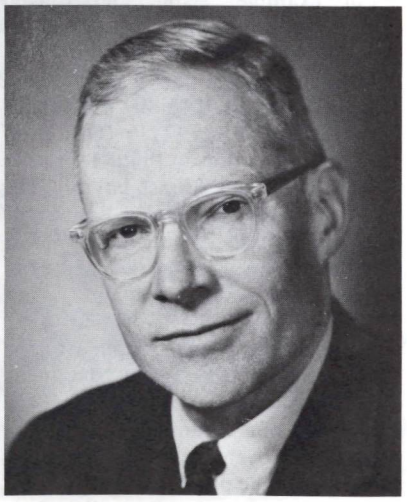
"You can't have advice singly on the subject of science," Malek told the House Government Operations Committee. "It has to be science as it relates to whatever the scientific application is."

Stever is to report through Shultz, the President's chief economic counselor, said Malek, "because it is our feeling that the key impact of science and technology has to do with the economy and the development of the economy as a whole."

For scientific or technological matters that fall under the aegis of natural-resources or community-development counselors, he said, Shultz and his staff will arrange for Stever's aid and advice.

Line agencies—Basically, the Administration sees science and technology as part of the operational functions of individual agencies and not an area of general policy making.

Malek said on Feb. 22 that one aim of the reorganization was to move "operational functions back into line departments and agencies, thus leaving the executive office better able to carry out its original mission as a staff for top-level policy formation and monitoring of policy execution in broad functional areas."



William O. Baker

The White House also argues that since 1962, when OST was established, the departments and agencies of the government have substantially upgraded their capacity for the management of R and D. Said Ash: "Today science and technology so permeates the whole of government that each agency has developed its own R and D capacity. There isn't needed a continuing definition of their roles in the Presidential office."

PSAC—Administration officials say they will adopt an ad hoc approach to securing the kind of outside scientific and technical advice previously provided by PSAC, and that this will give them better information sources. Bingman said: "The potential spectrum for scientific advice for policy-making is so broad that no one cast of characters—as PSAC represented—could possibly provide all the answers. You don't need a standing committee; indeed, a standing committee locks you in to the same advice from the same old stands and biases."

The Administration, said Bingman, does plan to tap into the scientific community through NSF and the National Academy of Sciences, on a case-by-case basis, as individual problems arise.

According to William Baker, plans are already afoot to reestablish some kind of informal advisory relationship between the Administration and the scientific and technological community. Members of the group of scientists and engineers that worked for President Nixon's reelection are moving to form a series of panels to advise the government in key domestic-policy areas. Baker said: "We hope to bring to bear on these issues some of the best brains in the country. Our first concern has been getting together a group on energy R and D alternatives, and there should be some announcement about that very soon in conjunction with the Administration's plans." He said other panels in such areas as transportation, health care and housing also are in the works.

"Probably, they will remain unofficial," he said, "with some loose connection with NSF." □

White House Report/Dean lists 'detailees' to Presidential staff from other agencies

by Dom Bonafede

At a Jan. 26 press briefing, Presidential Press Secretary Ronald L. Ziegler told reporters "there will be no detailing" of federal personnel to the White House from other departments and agencies.

Ziegler recalled that beginning in 1971, the Nixon Administration instituted the "full disclosure" budget, under which all personnel assigned to the White House from the agencies would be publicly listed. He reported, "If someone is detailed to a project in the White House for longer than six months, then he would automatically become on the White House payroll, or the department he is detailed from would be reimbursed."

There were, Ziegler estimated, "maybe a total of 10" detailees on the White House roster.

Dean letter: Yet, 11 days earlier on Jan. 15, John W. Dean III, counsel to the President, informed Elmer B. Staats, comptroller general of the United States, that during fiscal 1972 a total of 33 persons were detailed to the White House. Dean further observed that there currently were 22 persons assigned to the White House under that category.

In a letter to Staats, who is head of the General Accounting Office (GAO), Dean wrote:

"The total number of different individuals detailed to the White House office on either a reimbursable or non-reimbursable basis over the course of fiscal year 1972 was 33, and the amount of funds transferred for such details during fiscal year 1972 totaled $131,945.33."

Listing: Identified by Dean were these 22 persons detailed to the White House as of May 1, 1972, and the agencies from which they were "borrowed:"

• personnel serving on reimbursable detail—Bonnie Bradbeer, HEW; Helen M. Browder, Agriculture; Carol Condon, HEW; Llewellyn J. Evans Jr., Transportation; Barbara H. Franklin, Labor; Paul L. Gomory Jr., Commerce; Rayburn D. Hanzlik, HEW; Warren Hendricks, HEW; Bobbi Lungren, HEW; Valerie Neveraskas, CIA; Pamela Rabbit, HEW;

• personnel serving on non-reimbursable detail—Michael P. Balzano Jr., OEO; Anita M. Beatty, Agriculture; Judith A. Cole, Commerce; Carlos D. Conde, Cabinet Committee on Spanish Speaking; Bonnie L. Gage, ACTION; Brad E. Hainsworth, OEO; Judith M. Kaufman, ACTION; Olga F. Labourdette, Cabinet Committee on Opportunities for Spanish-Speaking People.

• Foreign Service officers serving on non-reimbursable detail—Karen D. Jenkins, Noble Melencamp, Michael B. Smith.

Inquiry: Dean's acknowledgment was in response to an effort by Reps. Les Aspin, D-Wis., and Phillip Burton, D-Calif., beginning last summer, to obtain data from the GAO regarding White House personnel practices and related expenditures involving the Executive Office of the President.

Staats on Sept. 1 wrote H. R. Haldeman, White House chief of staff, that Members of Congress had requested an examination of the fiscal and personnel records of the executive office for Jan. 1, 1972, through June 30, 1972.

Staats suggested that the study be conducted by specified members of his staff. Subsequently, information concerning their inquiry was relayed to Aspin and Burton.

Dissatisfied: However, in a 10-page letter to Staats dated Oct. 19, the two legislators wrote that information given them by GAO was inadequate and advised that the review of White House personnel be expanded.

They said, " . . . There are several major deficiencies in the information provided to your office by the White House in response to our request. More seriously, the data provided to you by the White House is full of inconsistencies with their testimony to the House and Senate Appropriations Committees, and this data also indicates the existence of numerous unauthorized expenditures by the White House over the last two years."

For example, Aspin and Burton said, a study of White House records showed that "many Presidential appointees have been placed on the payrolls of OEP (Office of Emergency Preparedness) and OTP (Office of Telecommunications Policy) rather than on the White House payroll. The result of such perversions is a 'de facto' detail to the White House."

New letter: Staats again wrote to Haldeman on Nov. 1, saying:

"Our examination work to date, and the data we have supplied to the Members of Congress who have made the request, now requires that the scope of our examination be expanded to cover the period of fiscal year 1969 to the present.

"Since our examination will include a determination of the propriety of payments to individuals and consultants employed by, at, or for the White House Offices we will also be examining records for the period under review at other Federal agencies. These include but are not limited to the Domestic Council, the Office of Emergency Preparedness, the Office of Telecommunications Policy, the Department of Commerce, and the Department of the Treasury."

Two days later, on Nov. 3, Staats wrote to Aspin and told him that his (Staats') latest letter to Haldeman "was delivered personally to Mr. Noble Melencamp, chief executive clerk, The White House, by a member of our staff.

"He was informed that the records required would be made available only after Mr. Haldeman had officially replied to my letter of Nov. 1. We are still awaiting Mr. Haldeman's response."

Unofficially, Aspin and Burton learned from GAO officials that the White House was unlikely to comply with their request until after the Nov. 7 Presidential election.

Change made: On Nov. 19, Aspin claimed in a public statement that the White House had at least 60 more staff members on its roster than the 540 approved by congressional appropriation.

Next, on Dec. 1, Staats maintained in a letter to Burton that the GAO had done all it could in attempting to obtain the information requested by him and Aspin.

"Most of the information requested had been obtained," Staats wrote. "To expedite furnishing you the information requested, as many as eight staff members have been assigned to the project."

Staats contended that his staff was overworked and suggested that additional information be sought by other means.

"This office is faced with a sharply growing workload and an increasing number of requests for assistance from the Congress," Staats said. "While we are desirous of being cooperative to the maximum extent, we would appreciate it if information which bears directly upon the Appropriations Committee responsibilities might be developed through that channel."

Burton, however, perceived this as a put-off by the GAO against further inquiries into White House staffing procedures. □

Education Report/Administration revenue-sharing plan unlikely to get passing grade from Congress

by Karen DeWitt

President Nixon's new plan for special educational revenue sharing is taking its first examinations on Capitol Hill. The test will be rigorous, and it is likely Mr. Nixon's program will flunk —at least this year.

Education interest groups and their allies in Congress, who oppose the President's plan to convert 30 separate and specific education-aid programs into a system of five block grants, say it would shortchange school districts by reducing the total amount of funds available and by revising the formula for distribution of the over-all amount.

At stake is nearly $3 billion in federal aid to elementary and secondary schools. If Congress rejects the switch to the revenue-sharing method of distributing the money and instead appropriates funds for the existing programs, President Nixon could veto the program. If the dispute reached a stalemate, the nation's 19,000 school districts would face the prospect of opening this fall without federal aid.

Proposal: The Administration proposal would convert the 30 categorical grant-in-aid programs into block grants that would aid the education of: disadvantaged children; the handicapped; vocational education; areas impacted by federal employees and educational-support services.

Budget—The fiscal 1974 budget for education revenue sharing is $2.77 billion, some $200 million lower than the original fiscal 1973 budget request for similar legislation.

Under the new bill, education of the disadvantaged would receive $1.5 billion; education of the handicapped, $147.7 million; impact aid, $232.0 million; vocational education, $437.0 million; and supporting materials and services, $420.4 million.

Two programs—library services and strengthening state departments of education—would be eliminated.

And the impact-aid program would be reduced by $146 million through elimination of so-called category B students, those whose parents work for the government but do not live on federal property. Unlike previous education revenue-sharing proposals, the fiscal 1974 budget does not request funds that guarantee school districts would receive the same amount of money they are getting currently under the categorical programs.

Bill—Here is an outline of the legislation drafted by the Administration and introduced "on request" by Rep. Alphonzo Bell, R-Calif., on March 20 as HR 5823, entitled "Better Schools Act of 1973:"

• States would be allotted 100 per cent of the funds they currently receive for the disadvantaged under Title I of the Elementary and Secondary Education Act of 1965 (79 Stat 27). The allocation would be equal to 35 per cent of the average amount a state spends on a pupil, or 35 per cent of two-thirds of the national average spent per pupil (whichever is higher), multiplied by the number of poverty level children, ages 5 to 15, in the 1970 census. Poverty would be computed on a new formula.

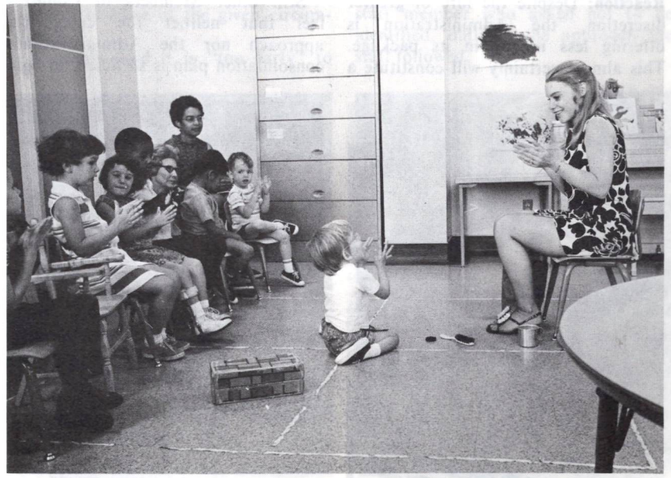
• School districts would receive at least 50 per cent of the funds they got in fiscal 1973 for the disadvantaged. Funds would be concentrated in districts with high proportions of poor children. Districts entitled to receive $10,000 or less under this formula would be eliminated from the program and would receive no funds. Within districts, funds would be concentrated in schools with high proportions of educationally disadvantaged children according to a formula to be provided by the HEW Secretary. A minimum of 75 per cent of this money must be spent for basic reading and mathematics instruction.

• Funds for education of the handicapped, vocational education, and supportive services would be combined into one allocation for each state based on the state's school-age population, ages 5 to 17. Forty-three per cent of this allocation would be for vocational education, 16 per cent for education of the handicapped, and the remainder for supporting services and materials. States could reallocate 30 per cent of the funds for vocational education and education of the handicapped to any category except impact aid. Up to 100 per cent of services funds also is flexible.

• Impact aid—funds for areas with concentrations of federal employees who live on federal property—would pass through the state directly to the local school district. Each school district would receive 60 per cent of the national average per-pupil expenditure, multiplied by the number of students from those families in average daily attendance.

Tough stance: Last year's passage of general revenue sharing, a landslide reelection victory for President Nixon and public support for the Administration's commitment to holding the line on federal spending have apparently contributed to the Administration's tougher stance on all its special revenue-sharing proposals.

Providing further impetus to the White House's drive for education revenue sharing is the expiration on June 30 of ESEA, the basic law for federal aid to elementary and secondary education. The ESEA statute provides that the act automatically will be extended one more year, but the Administration's budget for fiscal 1974 requests no money to continue the ESEA programs in their current form.



School classrooms across the country will be affected by the federal debate over education revenue sharing

The White House unsuccessfully has sought adoption of Mr. Nixon's plan in each of the past two years.

But there is a major difference in the Administration's posture this year: officials are being much more aggressive about their commitment.

"None (of the four special revenue-sharing proposals) is more vital than education special revenue sharing," said HEW Secretary Caspar W. Weinberger in a speech before the American Association of School Administrators in Atlantic City, N.J., on Feb. 28.

"It is here that we can succeed in reforming and renewing our process of education. President Nixon is committing the full resources of the Presidency this year to achieving passage of education special revenue sharing. I urge you to join us in that fight."

At an education budget briefing on Jan. 27, Assistant Secretary of Education Sidney P. Marland Jr. said it was "irrelevant" to talk of alternatives to education revenue sharing.

"ERS (education revenue sharing) is the aim of the Administration and the posture of HEW," Marland said. "We stand on ERS, live or die."

Administration officials contend that the categorical-grant approach of ESEA and other elementary and secondary education aid programs has been restrictive and administratively complex. They imply that opponents of the proposal are wedded to the categorical-aid approach to protect their own interests.

Reaction: Despite the lure of greater discretion, the Administration is offering less money in its package. This almost certainly will constitute a barrier in garnering support for the plan from education interest groups, mayors, Governors and state administrators.

Charles B. Saunders Jr., deputy assistant secretary of HEW (education), said in an interview that educators and interest groups should "focus on the concept of education revenue sharing. The money levels are an appropriations problem separate from the ERS delivery mechanism."

Though there is support for simplification and consolidation of some of the current federal education programs, many state and local school administrators are wary that what they see in the budget may be what they get if they back the proposal.

In Congress, the reduced funding, and particularly the exclusion of category B of impact aid, has raised such deep concern among Republican Members of Congress that the White House was hard-pressed to find sponsors for the bill.

While many Members of Congress feel that there is some need for simplification, a key opponent of the Administration's plan and strong supporter of the categorical-aid approach is Rep. Carl D. Perkins, D-Ky. As chairman of the House Education and Labor Committee, Perkins is in a strategic position to delay action on the bill once it is introduced. He already has held hearings on a bill (HR 69) designed to renew ESEA for five years.

Still other Members of Congress feel that neither the categorical approach nor the Administration's consolidation plan is sufficient in light of recent federal court decisions on school finance. They feel the federal role in education should attempt to aid states and local governments in equalizing per-pupil expenditures.

Administration

HEW Secretary Weinberger March 19 told the Perkins committee that the Administration bill "would redefine the federal role in elementary and secondary education, a redefinition which has become more necessary with the passage of each new categorical program."

Although Weinberger was particularly anxious to have the bill introduced prior to his appearance before Perkins' committee on March 19, the bill (HR 5823) was introduced March 20 by Rep. Bell "on request." White House aides had assumed that the proposal would not be introduced for another week or 10 days because of complications that the distribution formula for the disadvantaged had presented to some mayors and Governors. Weinberger, however, persuaded Administration officials of the urgency of introduction.

"He didn't want to testify on the concept of special revenue sharing," said one HEW legislative official, who asked not to be identified. "He wanted to testify on the administrative details of the bill, the wrinkles so to speak. The feeling was that the nitty gritty problems could be worked out once the bill was before Congress."

Formula: Indeed, Weinberger testified that the bill's allocation formula was "complex and it is perfectly possible that the committee will identify desirable changes that should be made in them."

He added, however, that the "specific formula is not the most important feature of our bill. . . . The most important feature is the comprehensive new program it would authorize for the education of the disadvantaged."

Regulations: When queried over the numerous regulations for the distribution of funds for the disadvantaged, Weinberger said:

"We have never portrayed special revenue sharing as having no strings like general revenue sharing. We just want the states and local governments to pay some attention to the regulations. We want to free the system of a lot of unnecessary paperwork. I can confidently tell you now and stand on it that we will have one-tenth the regulations under special revenue sharing than we do presently. Our system is infinitely better."

Saunders: Though ESEA automatically is extended for one year, Administration officials maintain that the time is ripe for a redirected and streamlined delivery system for federal aid for education.

"Education revenue sharing—like any better idea—is seen as a threat by those who have a vested interest in maintaining the status quo," said Saunders, the deputy assistant secretary of HEW for education (policy), at the school administrators' convention.

"It has been attacked as a withdrawal of federal support for elementary and secondary education . . . it is no such thing. It is a proposal for improving the process by which the federal government meets these commitments.

"For anyone who understands the rich variety that exists among our schools, the very idea that detailed federal regulations can be drafted and applied uniformly to 19,000 different districts is inherently ridiculous. . . . Education revenue sharing would relieve much of the federal red tape, and enable more effective use of federal funds than under the complex restrictions of so many categorical programs."

Saunders said in an interview that because ESEA comes up for renewal this year, the Administration expects to have its proposal given a fair consideration by Congress.

"In the past, people have thought of education revenue sharing and all the special-revenue-sharing proposals as gimmicks. But we had little reason to think Congress would act on our proposal last year since they were all involved in developing the higher education legislation," he said. *(For background on the Education Amendments of 1972, see Vol. 4, No. 12, p. 472 and No. 38, p. 1466.)*

"Now we have an entirely different set of circumstances. We have the success of general revenue sharing and this Congress will have to give us a respectful hearing. They'll have to listen to us just because they will have to consider how effective ESEA has been, how it could be improved and whether there is room for consolidation," he said.

"Education revenue sharing is our judgment of how education programs at the federal level could be improved. We're taking a stronger position on our bill because of the given circumstances."

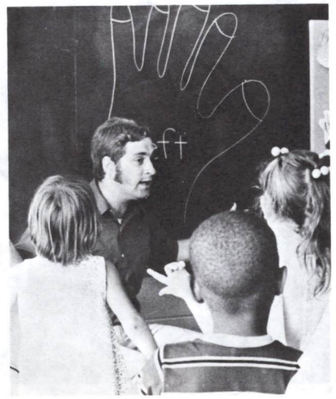
Saunders said it is "too early" to talk about the kinds of compromises that the Administration would be willing to make on its proposal. He said that several Members of Congress realize that some changes should be made in the current programs: "You'll probably see some Democratic version of our bill floating around pretty soon."

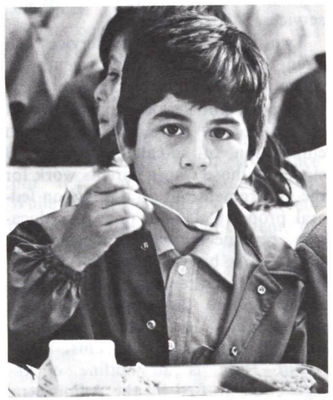
Policy formation

In creating the legislation, HEW sought to combine the White House philosophy that education revenue sharing would maintain national educational priorities with its promise to allow states and local governments discretion in deciding the degree of their own educational needs.

For the past year, 15 to 20 staff members from the Office of Education (OE) and other HEW departments have been working to develop a package that would meet that objective. Recently, the working core has consisted of John R. Ottina, newly appointed U.S. commissioner of education; Stephen Kurzman, assistant HEW secretary (legislation); Judith A. Pitney, acting deputy assistant HEW secretary for legislation (education); Alan L. Ginsburg, office of the assistant secretary for planning and evaluation; H. Reed Saunders, director, office of school finance (OE); Albert L. Alford, assistant commissioner (legislation); and economist Frank S. Levy, a Brookings Institution fellow on leave from the University of California at Berkeley.

Philosophy: In an interview, an HEW staff member who asked not to be identified, outlined the approach the staff followed.





The fiscal 1974 budget for education revenue sharing totals $2.77 billion, incorporating funds for education

of the disadvantaged and handicapped, impact aid, vocational education, and supporting materials and services

"We started from the premise that what we've got now is too complex," he said. "Unless the federal government is willing to put 50,000 auditors out into the states, narrow categorical programs are never going to operate the way Congress wants. The states and local governments are going to get around those rules and regulations and use the money for what they want.

"We worked with the realities in developing the bill. Maybe it's a fetish for neatness, but at least with the grants consolidation, and that's what special education revenue sharing is all about, we're not kidding ourselves that the federal government can ensure that the formula grant money is being spent properly, which is the assumption under ESEA. Special revenue sharing looks kind of neat and tidy and we only put strings where we absolutely had to."

Pitfall: Ironically, some staff members said that it was difficult not to fall into the categorical approach while trying to ensure safeguarding of the Administration's priorities.

"Take vocational education, for example," said one staff member who did not want to be identified. "Under the current legislation, 10 per cent of vocational funds go for vocational education of the handicapped. We had groups in here from the handicapped saying that under special education revenue sharing they would lose that. We felt that in order not to further categorize the funds, it would be best to just take the 10 per cent out of vocational education and put in into the handicapped earmark."

Unwanted freedom: While the groups worked at maintaining flexibility in the proposal, some surprising information on the amount of discretion that states wanted began arriving.

"We had originally decided to stick with flexibility of 30 per cent of the funds in the categories of vocational education, education of the handicapped and special services," said an HEW staff member. "Then we started to get opposition to that formula from some of the state people. They argued that such a percentage of discretion opened them up to battles from educational interests that they would rather not fight."

Formula: The Administration's proposed changes in the fund-distribution formula within states could mean considerably less money for urban northeastern states. (See table, p. 425.)

ERS Funds: 1974 Bill vs. 1973 Budget

(Figures are in millions of dollars.)

	Actual 1973	ERS 1974
Disadvantaged earmark (total)	$1,524.1	$1,524.1
local educational agencies	1,390.1	1,443.6
neglected & delinquent children	22.1	22.1
migratory children	58.4	58.4
state administration	17.2	0
incentive grants	8.2	0
grants for high concentration poor	28.1	0
set aside from Vocational Education Act	under vocational education earmark	under vocational education earmark
Handicapped earmark (total)	158.0	158.0
grants to states (EHA, part B)	37.5	37.5
handicapped set-aside from Title 1, ESEA	60.9	60.9
handicapped set-aside of 15 per cent from Title III, ESEA	21.9	21.9
handicapped set-aside of 10 per cent from Vocational Education Act of 1963 State grants	37.7	37.7
School assistance in federally affected areas (total)	373.5	232.0
874 local educational agencies (section 3a)	227.2	232.0
local educational agencies (section 3b)	146.3	— —
Vocational education earmark (total)	437.0	437.0
annual appropriation (VEA part B)	282.0	282.0
—disadvantaged set-aside (15%)	57.0	57.0
permanent appropriation (Smith-Hughes Act)	7.2	7.2
programs for students with special needs (VEA, Part B)	20.0	20.0
consumer and homemaking education (VEA, Part F)	25.6	25.6
work-study (VEA, Part H)	6.0	6.0
cooperative education (VEA, Part G)	19.5	19.5
State advisory councils (VEA, Part A)	2.7	2.7
innovation (VEA, Part D)	8.0	8.0
research grants to states (VEA, Part C)	9.0	9.0
residential vocational education (VEA, Part E)	0	0
Supporting services earmark (total)	544.8	420.4
Title II, ESEA, school libraries	90.0	0
Title III, ESEA, supplementary (less set-aside)	124.3	124.3
Title V, ESEA, strengthening state departments of education	38.0	0
Title III, NDEA	1.5	0
National School Lunch and Child Nutrition Act	239.0	244.0
Education Professions Development Act (Part B-2)	0	0
Adult Education Act (not including Sec. 309)	51.1	51.1
advisory councils (combined)	0.9	1.0
Total	**$3,037.4***	**$2,771.5**

*—$2,761.6 for 1973 if items zeroed out in the budget are not included.

SOURCE: Office of Education

Perkins' View of Revenue Sharing: 'Throwing Money Down Ratholes'

The Nixon Administration will have to get up early in the morning to outflank House Education and Labor Committee Chairman Carl D. Perkins, D-Ky., beginning his 13th consecutive term in the House. Perkins, chief foe of the Administration's special education revenue-sharing proposal, regularly arrives at his third floor office in the Rayburn House Office Building at 6:30 a.m. and works until 6:30 or 7:00 p.m. *(For a profile of Perkins, see Vol. 4, No. 2, p. 73.)*

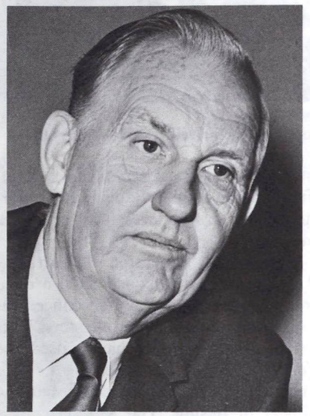
For several weeks, Perkins' 12-hour day has been more than usually crowded as he gathers support for continuation of the Elementary and Secondary Education Act of 1965 (79 Stat 27), which the Administration's grants-consolidation plan is designed to supplant. Perkins was a major architect of ESEA and is holding hearings on a bill (HR 69) that would extend the legislation five years beyond its June 30, 1974, expiration date.

During a recent early-morning interview, Perkins discussed the purpose behind the early hearings on ESEA and his philosophy on federal aid to education:

ESEA: "There has been a lot of propaganda about ESEA not doing its job," Perkins said. "But that was based on studies from the early days of the legislation when local education agencies scattered the money over too wide a front. Further, Title I, which targets money on the disadvantaged, has been hampered since its inception by inadequate funding. If it's a matter of priorities the Administration is talking about, then we can't go to any kind of general education package until we get the proper level of funding for Title I. Even at its current level of funding, Title I has been highly successful and the testimony we've been receiving on my bill bears that out.

"Of course, some areas have done better with ESEA funds than others. That's to be expected since some school people have not yet realized what the purpose of the categories are. And just because such situations exist, the Administration's education revenue-sharing proposal is foolish. It would be throwing money down ratholes. Until the local education agencies and the states thoroughly prove themselves, it would be unwise to upset current programs.

"Richardson (Elliot L. Richardson, former HEW Secretary and current Secretary of Defense) was up here several weeks ago and he admitted that states have a tendency to disregard federal regulations for categorical programs. But without the regulations, how much more would they disregard national priorities? It doesn't sound to me like



Carl D. Perkins

we need to just hand over the money to the states.

"Most of the ESEA programs are still in their infancy so there has got to be some accountability of how federal funds are spent. There may be some room for consolidation, but people have to understand that when you consolidate some concerns are going to suffer. When the states and localities grasp the significance of the categorical programs that are in existence, then perhaps we can move to some consolidation.

"As far as simplifying the regulations, revenue sharing cannot fulfill that promise. There is no assurance that the regulations at the state level will be any simpler, but there is certainly a greater fear at that level that the money will not go for the purposes it was designed for."

HR 16: On Jan. 18, Perkins introduced The School Finance Act of 1973. The bill (HR 16) would provide increased general support to schools through a $100-grant per child and grants to encourage states to equalize their school expenditures per child.

"I really believe that the federal government must contribute more to the education of our nation's children," Perkins said. "I really believe in supporting education. The federal government must become a better partner in the financing structure of education.

"A recent Harris poll indicates that the American people favor more federal spending on education. And several court cases have put pressure on the states to restructure their distribution system of school finance.

"I don't think its a tease to the public to introduce a bill like this. If we fail to advocate for a concept of general aid to education, we will never get general aid to education. Take a look at the record back in 1949 and 1950 before we got ESEA. There were all kinds of general aid-to-education bills being introduced and yet we didn't get any significant federal assistance until more than a decade later.

"We struggled a long time to get ESEA because of the religious controversy over whether to let non-public school children participate. And there was the whole question of integration. The only approach left to Congress was the categorical-aid approach. If we don't start advocating an increased role in education for the federal government now, we'll never build up support for the principle.

"HR 16 is not a carrot we're dangling in front of the public. It is not a promise that will never be fulfilled.

"It is a real necessity for us to be thinking and developing a position on this issue.

"I'm really concerned that the Administration is backing away from support for education. I understand their position, but I thoroughly disagree with Mr. Nixon on it. We cannot sacrifice the future of millions of Americans by cutting back on spending for education."

Under Title I of ESEA, education of the culturally deprived receives $1.5 billion

Disadvantaged—The Administration proposal for the disadvantaged category, which supplants Title I of ESEA, would provide $1.5 billion in fiscal 1974 for culturally deprived children, nearly 55 per cent of all federal aid for education. The disadvantaged category is the major concern of most Governors, mayors and education interest groups.

Under the plan, it would be the most structured category. For fiscal 1974, states would receive 100 per cent of the amount they received for fiscal 1973. In 1975, the full impact of the Administration's proposal would take effect and some states would be cutback.

The allocation to school districts would be set up so that funds go to areas with a high concentration of disadvantaged students first. Funds then would be distributed to other districts according to their poverty rank. No district receiving less than $10,000 in federal aid would receive an allocation. Funds would go directly to the local education agencies, which would receive at least 100 per cent of the funds they currently get under Title I in fiscal 1974. After that a number of districts would be cut off as the funds become concentrated in the most disadvantaged districts. The bill would eliminate approximately 100 million students from the 6.1 million disadvantaged served under Title I.

The legislation also incorporates a new element based on the Administration's concept of spending more money on the disadvantaged as outlined in the Equal Education Opportunity Act it unsuccessfully proposed in 1972.

The Equal Education Opportunity Act would have provided $300 a child for schools retaining a high concentration of disadvantaged youngsters. Theoretically, this would have raised the quality of education in schools in poor areas and would have decreased the appeal of busing. The $300-level was based on studies done on Title I programs in California, Colorado and Connecticut which concluded that compensatory education programs could work if $300 extra were spent on each child.

Poverty index—The state-distribution formula could become the most controversial feature of the whole proposal. Under Title I, a state's allocation is based on the number of families with incomes of $2,000 a year or less and the number of families over $2,000, but who are on welfare. Under the legislation a state's allocation would be based on the Orshansky social security poverty index. The Orshansky index varies from urban and rural areas and has a cost-of-living element built in. The Orshansky table defines an urban family of four with an annual income of $3,749 or less as poverty level.

Since states such as New York, New Jersey, California, Kentucky and West Virginia and the District of Columbia have large numbers of welfare families whose incomes exceed the Orshansky-index figures, their allocations would drop. The new formula would also reduce allocations to a number of southern states which had substantial population losses during the 1960s. This ensures some opposition to the proposal from Members of Congress from these states. *(For disadvantaged distribution fund levels under current legislation now pending in Congress, and the Nixon Administration's Education revenue-sharing proposal, see State Allocations box.)*

Three categories: Funds for vocational education, education of the handicapped and for special services would be distributed according to each state's plan, with 30 per cent of the funds in vocational education and education of the handicapped for discretionary use. The special services category could have 100 per cent of its funds for flexible use.

"At one time, we considered freezing the funds for the handicapped like those for the disadvantaged earmark," an HEW staff member said. "We assumed that the lobbies for the handicapped were a vulnerable group at the local level and without this protection they would lose their funds. However, we now have a Rand Corp. study which shows that the lobbies are pretty potent at the state and local level. Look at all those court cases arguing the right to an education for all handicapped youngsters. The handicapped are more likely to benefit from the discretionary funds than they are to lose from them."

Impact aid: One of the crucial discussions the staff members had was whether to keep the fiscal 1973 $146-million category B impact-aid program in the package. The program has two parts—A is for students who attend a community's schools while they and their parents live on federal property; B is for students with a parent working for the government, but not living on federal property.

Most of the staff members felt that impact aid should be dropped completely from the Nixon package, but HEW Secretary Weinberger decided to retain category A.

Every President since Dwight D. Eisenhower has tried to reduce the impact-aid program, but virtually all congressional districts derive some money from it, and Members of Congress generally oppose attempts to cut the outlays.

The law authorizing category B aid expires this year (category A is permanent legislation). An HEW staff member said that by removing all impact aid from the package, education revenue sharing would not be "clouded" by the legislative fight over category B.

Supporters of that strategy felt that Members of Congress favorable to the Administration proposal, but who had difficulty supporting the reduction of impact aid, could more easily support the bill if impact aid were kept separate.

According to the staff member, Kurzman was a major critic of this strategy. He argued that a reduction in the total amount of money in the bill would lessen the appeal of revenue sharing.

Administration: A major objection to last year's education revenue-sharing proposal was that funds would be distributed by the Governor of each state. State education officers and education interest groups contended that this would give the Governors too much authority. The draft bill delegates the Governor as the instrument for administering the program within the state unless administration is provided for by a specific state agency.

To qualify for the funds, a state would have to draft a plan, summarizing how it would use the funds. HEW would not have to approve the plan, but would use it to determine if a state were making proper use of the funds. If money were not used according to the state plan, the HEW Secretary could recall the funds.

Local school boards would be able to appeal to their state school boards if they felt they were not getting a proper share of the money. There would be no appeal to HEW, as in existing current legislation.

Congress

Congressional reaction to the general outlines of the education revenue-sharing plan ranges from conditional support to outright opposition.

In addition to philosophical and political differences, the issue is caught up in the broader conflict between the White House and the legislative branch over diverse issues: impoundment of funds; U.S. aid to North Vietnam; the question of executive privilege and budgetary cutbacks.

Senate: Chairman Harrison A. Williams Jr., D-N.J., of the Senate Labor and Public Welfare Committee, which has jurisdiction over education aid, opposes the administration plan. In an interview, he said:

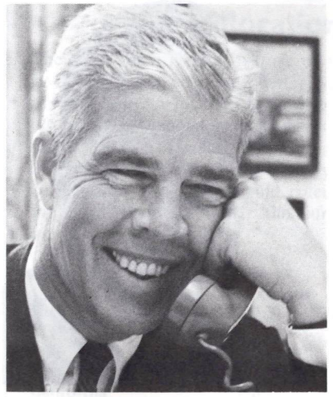
"I view the proposal as an abdication of federal responsibility. The budget request for education revenue sharing leaves no doubt that the President is asking for fewer dollars to be spent on education than ever before. And, like general revenue sharing, I think this will turn into a shell game in which the people of this country are the losers."

Pell—During the 92nd Congress, the education revenue sharing proposal was reviewed during three days of hearings held by Sen. Claiborne Pell, D-R.I., chairman of the Labor and Public Welfare Education Subcommittee.

In an interview, Pell said that he remains "unenthusiastic" about the White House proposal.

A staff member of the subcommittee, who asked not to be named, said that the Senate probably would wait for action from the House before determining which way it would go.

"The Senate is not as wedded to the specific programs in ESEA as some of the House Members," he said. "It is, however, wedded to having programs with some federal accountability."



Peter H. Dominick

Walter F. Mondale

Dominick—Sen. Peter H. Dominick, R-Colo., ranking minority member of the Labor and Public Welfare Subcommittee on Education, said that he expects to introduce the Administration bill. But the impact-aid cutback in the budget could be "disastrous," he said, where local school systems have made the funds an integral part of their budgets.

Dominick, who sponsored the 1972 education revenue sharing bill (S 1669), supports the Administration's proposal but said he feels allowance should be made in the bill for school systems unable to support themselves without impact-aid funds. He said he would like to see the funds eliminated over a three- to five-year period.

The Administration wanted Dominick to introduce the bill without any qualifying remarks, but because Colorado receives a significant amount of funds from category B impact aid, Dominick, up for reelection in 1974, said he was unable to do that.

Mondale—"There has never been enough money in ESEA to adequately say whether it is time to switch to another form of aid," said Sen. Walter F. Mondale, D-Minn., chairman of the Select Committee on Equal Education Opportunity.

"Some of these things, like simplifying the administration of programs, have to be tightened up, but we're not about to throw ESEA into the trashcan," he said.

Stevenson—Sen. Adlai E. Stevenson III, D-Ill., a member of the Labor and Public Welfare Committee, said that the issue of school finances, as raised in seven state court cases, indicates that the federal government should be increasing its support.

The Supreme Court, ruling March 21 in one of the seven cases, *Rodriquez v. San Antonio,* upheld the constitutionality of the property tax as a means of school finance. A Texas court had ruled that the system violated the Constitution's "equal protection" clause by penalizing poor school districts. *(For a report on school finance, see Vol. 4, No. 52, p. 1954.)*

"Schools do not need gimmicks like special revenue sharing," Stevenson said. "Instead they need new programs of general aid tied to reducing existing disparities among school districts in per-pupil expenditures."

Stevenson said he would reintroduce his bill, co-sponsored with Sen. Jacob K. Javits, R-N.Y., in the 92nd Congress, that would provide a $5-billion general grant to the states to reduce disparities in per-pupil expenditures.

Stevenson said that he thinks the current categorical programs need consolidating, but "we need not and ought not forego the responsibility to set and pursue national objectives such as aid to the disadvantaged."

Stafford—Sen. Robert T. Stafford, R-Vt., said that he found the block-grant proposal "interesting," but that he would like to see "as much money as the present programs call for, if not more money.

"I'm particularly concerned that the concept of aid to disadvantaged students be incorporated strongly enough to ensure that money gets to these students," he said.

Republicans—A minority staff member of the Labor and Public Welfare Committee, who asked not to be identified, said that HEW had approached several Republican committeemen about their support of the proposal.

"I talked to Steve Kurzman and he asked me what they could do to get a dialogue going up here," he said. "I told him they'd have to put more money in the bill and be a little more flexible about its contents. The Administration has a tendency to view their proposals as sacrosanct."

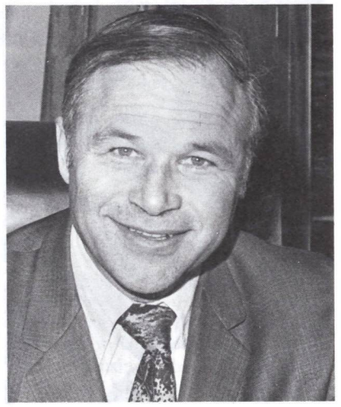
He said time was a vital factor in determining the fate of the bill. "It took us a day less than three years to get the ESEA and that was with a mild-mannered Congress. Given the mood of this Congress, and a proposal that is equally complex, they're not going to be prepared to just snap it up with approval."

House: Chief opponent of the Administration's proposal and prime champion of ESEA and the grant approach is Rep. Perkins, chairman of the Education and Labor Committee. His state, Kentucky, would lose about $13 million under the Nixon bill.

Perkins, a major architect of ESEA, recently chaired hearings on his own bill (HR 69) that would extend the existing legislation for five years.

The Administration's bill "alarmed" him, Perkins said, "by the clear indication contained in the Administration's budget that the federal, state and local partnership in elementary and secondary education is to be abandoned."

Robert T. Stafford



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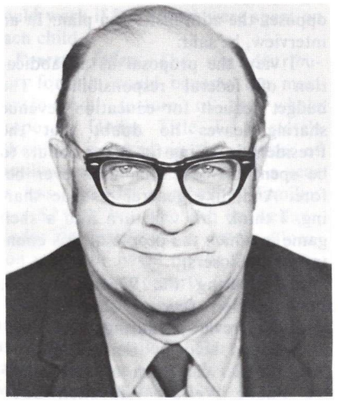


James R. Kirkpatrick

"The tactics of the opposition are many and varied," Perkins said on Jan. 25 during hearings on his bill. "But it is the first time I've seen them desperate enough to want to buy themselves out of any federal responsibility."

In an interview, Perkins said that he is committted to the renewal of ESEA, and does not think President Nixon would veto funds for the one-year extension of ESEA if Congress appropriated them. "It (the veto) just will never happen," he said.

Quie—Rep. Albert H. Quie, R-Minn., ranking minority member of the House Education and Labor Committee, said 11 of the states represented on the committee would lose money under the Nixon proposal, while five would gain.

Quie recently introduced a block-grant proposal (HR 5163) that would target money for the disadvantaged, the handicapped and occupational education based on a needs analysis instead of poverty-level census data.

"Since ESEA was first enacted into law I have been concerned with the use of census data in determining the allocation of funds," Quie said.

Brademas—Rep. John Brademas, D-Ind., a committee member, said that he is "receptive to suggestions for change" but cannot accept the Administration's proposal.

"I'd like to see if there are some places where we can consolidate," he said. "There have been some thoughtful considerations on the distribution formula which I would like to see pursued."

Steiger—Rep. William A. Steiger, R-Wis., another member of the education committee, said that while he supports the concept of block grants he is "concerned that revenue sharing may not target money as successfully or as explicitly as Congress would.

"I certainly think that paperwork involved in applying for the categorical programs should be simplified, but in some pattern that is not so open to distortion of the thrust of certain programs," Steiger said.

Interest groups

HEW officials met with a number of education interest groups to discuss tentative specifications of the proposal. While many of the groups still are assessing the impact of the budget cutbacks on their constituencies, their reaction to the proposal is virtual opposition.

State officials: "We're not about to let go of the bird we've got (the existing education programs) for education revenue sharing," said Byron W. Hansford, executive secretary of the Council of Chief State School Officers. CCSS represents 56 state school officials.

National school boards: August Steinhilber, director of congressional and federal relations for the National School Boards Association, which represents 17,000 of the nation's local education agencies, said the bill was "intellectually dishonest."

"They (HEW) had to meet with us because they promised they would," he said. "But they just ran us in and ran us out. They didn't take any of our objections into consideration. We see nothing in this new proposal to change our position of opposition. We were treated shabbily."

Steinhilber said his organization "may have to come up with our own consolidation proposal."

"The Administration is flying under the same false colors," he said. "They announced this with a great deal of fanfare and promise and it's just the old shell game."

Superintendents: James R. Kirkpatrick, executive secretary of the American Association of School Administrators, said that the AASA was a long-time supporter of the concept of consolidation, "but so far we've had no assurances that the red tape is going to be reduced."

"We're not going to buy something that is not necessarily better," he said. "We'd like to see the bill a little more categorical." AASA represents more than 20,000 school administrators and principals.

Arthur R. Lehne, assistant superintendent of the Chicago public schools, agreed. He said that the Administration's incorporation of its revenue-sharing proposal in the budget was a detriment to good administrative planning.

"The concept will tend to slow down planning for programs that are largely funded by federal money," Lehne said. "With the Administration saying, 'Education revenue sharing or nothing,' we don't know what to expect."

NEA: Stanley McFarland, assistant secretary for legislation of the Na-

State Allocations: Old and New

The most controversial feature of the Administration's education special revenue-sharing proposal, Better Schools Act of 1973 (HR 5823), is the new distribution formula for aid to the disadvantaged. The bill would use the Orshansky social security-poverty index of $3,749 for an urban family of four and 1970 census figures in making allocations to the states. Below are the allocations states currently receive under Title I based on 1960 census data, what they would receive under 1970 census figures and what they would receive under the current Administration proposal (figures are in millions of dollars):

	Title I - 1960 census	Title I - 1970 census	Better Schools Act (disadvantaged)
Alabama	$37.5	$20.0	$37.3
Alaska	2.7	4.3	4.2
Arizona	10.4	11.7	15.0
Arkansas	23.1	11.9	21.3
California	126.3	161.9	122.0
Colorado	12.1	14.8	13.8
Connecticut	13.0	18.1	13.3
Delaware	2.9	3.8	4.1
Florida	34.7	37.1	53.3
Georgia	43.8	28.2	45.4
Hawaii	4.0	4.9	4.5
Idaho	3.6	3.9	3.4
Illinois	74.3	88.1	71.9
Indiana	20.5	21.6	23.1
Iowa	16.1	11.1	14.9
Kansas	10.2	10.6	12.1
Kentucky	34.3	20.2	28.6
Louisiana	33.8	28.6	52.0
Maine	6.3	6.7	6.1
Maryland	21.6	26.2	27.6
Massachusetts	26.5	35.6	25.0
Michigan	59.3	69.6	51.3
Minnesota	23.8	19.6	23.8
Mississippi	39.2	20.1	35.9
Missouri	25.3	21.3	29.9
Montana	4.1	4.0	4.8
Nebraska	7.9	6.9	8.8
Nevada	1.2	1.7	1.8
New Hampshire	2.2	2.9	2.6
New Jersey	48.9	64.7	42.3
New Mexico	9.1	9.4	13.3
New York	213.4	272.9	187.5
North Carolina	56.7	31.3	45.7
North Dakota	5.1	3.7	4.4
Ohio	46.5	54.2	49.9
Oklahoma	18.6	15.1	18.3
Oregon	11.0	13.5	12.3
Pennsylvania	69.6	78.0	66.4
Rhode Island	5.2	6.4	5.5
South Carolina	32.8	16.8	28.4
South Dakota	6.0	4.1	5.8
Tennessee	34.2	17.7	33.6
Texas	87.2	74.3	101.9
Utah	4.6	5.6	4.8
Vermont	35.2	26.0	37.9
Virginia	35.2	26.0	37.9
Washington	16.0	20.8	17.1
West Virginia	19.3	10.7	16.4
Wisconsin	19.1	21.1	23.6
Wyoming	1.5	1.7	2.1
District of Columbia	11.1	14.3	10.3
Territories and trusts	47.1	46.9	46.0
Total (billions)	**$1.52**	**$1.53**	**$1.53**

SOURCE: HEW

tional Education Association's government relations and citizenship office, said that his organization wants state and local governments to have more discretion in spending federal funds. But he said NEA does not want the numerous titles and subsections of federal education legislation consolidated into five broad authorizations and three appropriations. NEA represents 1.1 million elementary and secondary school teachers.

He said the association feels that the consolidation would decrease the chances of funds for education growing since interest in specific programs would be diffused.

NEA President Catherine Barrett, in testimony before Perkins' committee, outlined some other objections that the association has to grants consolidation.

"We don't believe that the red tape is going to be any less at the state and local level," she said. "Much of the present complexity is due to the Administration's own making of excessive regulations. This could be cured without special education revenue sharing. Indeed, we might see the red tape intensified at lower levels of government.

"NEA has opposed and continues to oppose special education revenue sharing in the form and amounts proposed in the fiscal 1974 budget. The basic ills of the federal grant program do not lie so much with their multiplicity as with their low level of funding."

AFT: David Selden, president of the American Federation of Teachers, which represents some 200,000 teachers, said the proposal gave more power to the local education agencies.

"If the Office of Education would list the present programs and show which ones that overlap could be consolidated, we could probably support them," he said. "That's just good housekeeping. But to take the money and put it up for grabs is a rather dangerous thing."

Governors: Richard E. Merritt, special assistant to the National Governors' Conference, said that the organization has not altered its position of support for the special revenue-sharing concept, but that there is concern over the funding amounts and the administration of the program.

"The bill doesn't give the Governors any more control over funds for the disadvantaged than under Title I," he said. "The state acts as a conduit for this program and yet HEW holds the state responsible for any local mismanagement of funds even though the state doesn't have any administrative control."

Mayors: In a pamphlet on "The Federal Budget and the Cities," the National League of Cities-U.S. Conference of Mayors' said that "folding vocational education into special revenue sharing will probably mean the elimination of the earmark for the disadvantaged which has helped channel more vocational-education funds into cities since its enactment. . . . The fact that it (the money for the educationally disadvantaged) does not increase during a time of rising costs means an effective reduction in support for this essentially urban-education program."

Outlook

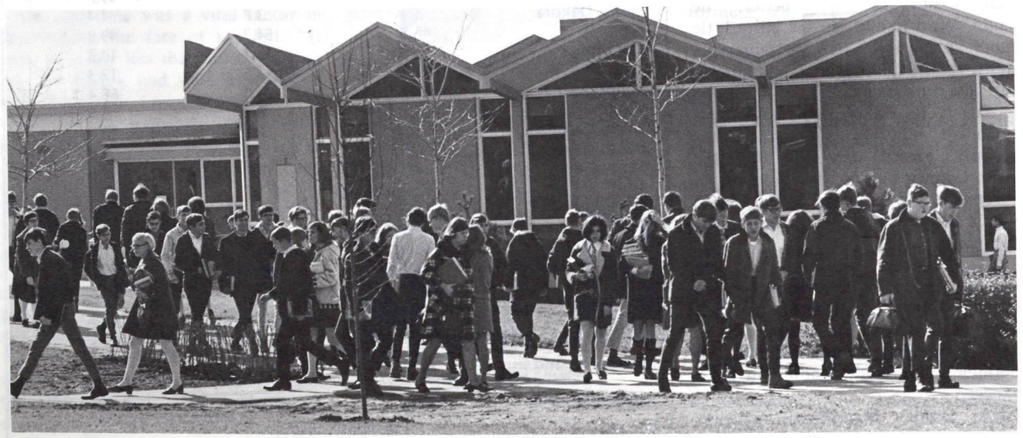
While the Administration has maintained an aggressive stance on education revenue sharing and is likely to continue that posture, there is no real pressure for any activity at all in education this year, according to one Senate aide.

"ESEA is automatically extended for another year," he said. "There is the whole school finance issue still up in the air and many Members would like to give the concept of federal aid to education some leisurely thought. Some of the educators get all excited because the budget doesn't have any money in it for ESEA. But I don't think that will be a problem. It's inconvenient for their planning, but there will be money for some of the current programs at least," the aide said.

A high-level HEW official, who asked not to be identified, also discounted a Presidential veto of funds for ESEA if revenue sharing is not passed.

"I don't think anyone over here really expects Congress to pass revenue sharing this year," the HEW official said. "What we'd like is maybe another year of ESEA after the extension runs out, instead of the five years that (Rep.) Perkins is suggesting."

The situation now, he said, is "a game of 'chicken' between the legislative branch and the executive. I think you'll see a lot of backing and filling on both sides if something isn't done by July and schools are faced with having to plan the next academic year with no federal money." □



Transportation Report/Congress may clash with President over transit operating subsidies in highway bill

by Bruce E. Thorp

After failing to pass new highway legislation last fall, Congress is moving on a bill that may run smack into a Presidential veto over the issue of operating subsidies for mass transit.

The Nixon Administration has taken two strong stands on proposed changes in the financing of highways and mass transit—it wants cities to be allowed to divert money from the Highway Trust Fund to pay for rail or bus transit equipment and facilities, but it does not want to earmark any federal money from any source to offset the operating deficits of transit systems.

On March 15 the Senate passed a highway bill, S 502, that includes both of these provisions, thus giving President Nixon one change in current law that he wants and one that he does not want.

The Senate bill would allow cities to divert at least $850 million a year from the trust fund to pay for capital expenditures for rail or bus transit. It also provides $400 million a year from general funds for transit operating subsidies.

Transit systems already receive about $1 billion a year in federal aid from the Urban Mass Transportation Administration, but the amount is small when compared with the more than $6 billion authorized each year for federal highway aid. Nearly all of the highway money comes from the Highway Trust Fund, which draws its income from gasoline taxes and other taxes paid by highway users.

The Senate bill already has aroused Administration opposition. Transportation Secretary Claude S. Brinegar told the House Public Works Subcommittee on Transportation March 19, "I would recommend that the President veto a bill if it has operating subsidies in it."

Brinegar was testifying during the first day of House hearings on highway legislation. The reaction of that body to the Senate proposal will be the key to what the final bill from Congress will contain.

The House traditionally has strongly opposed any diversion of highway money for non-highway purposes. One significant sign that the opposition has weakened somewhat came Feb. 21, when Rep. John C. Kluczynski, D-Ill, chairman of the roads subcommittee, responded to increasing constituent pressures by issuing a public statement in which he endorsed—for the first time—the use of highway money for mass transit. *(See Vol. 5, No. 8, p. 286.)*

Highway Funding

This is the most recent of several *National Journal* reports on attempts to have Congress modify highway-funding legislation to provide more federal aid for public transportation. *(For a report on last year's deliberations in the Senate Public Works Committee, see Vol. 4, No. 37, p. 1437; on the Administration's plan for combining urban highway and transit funding, see Vol. 4, No. 13, p. 525.)*

Kluczynski and other Members of Congress are feeling increased pressures from home and from other quarters for more transit aid. Concerns over the wasteful use of gasoline by automobiles and the choking air pollution that it brings are forcing Congress to give greater consideration to the idea of diverting money from highways to transit.

The nation's Governors for the first time have launched a concerted lobbying effort to win more flexibility in the use of trust fund monies.

Countering these efforts, however, are highway interests who are working hard to persuade the House to keep the trust fund intact by rejecting the Senate's diversion feature.

"'Klu' will support diversion for mass transit, but Blatnik won't," said a Public Works Committee staff member who did not want to be identified. "Neither will most of the other members of the committee." (Rep. John A. Blatnik, D-Minn., is chairman of the committee.)

However, some Members of the House who oppose diversion have expressed a willingness to help transit by approving operating subsidies.

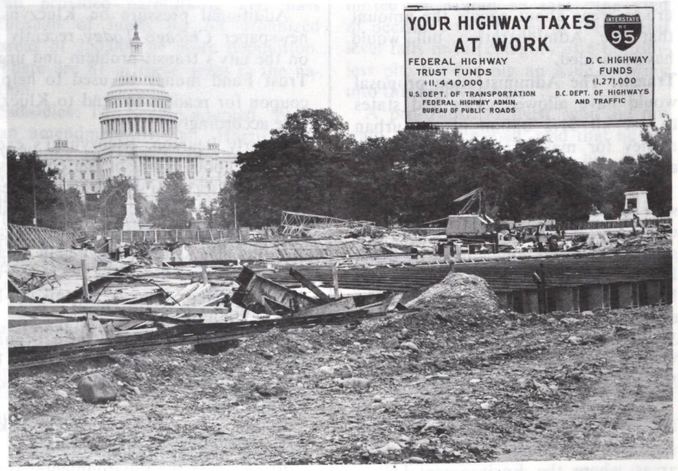
The staff member said that the committee bill most likely will include a provision for operating subsidies, as well as one that would allow controversial Interstate highway projects to be dropped and the authorization used instead for mass transit. But the substitute money would have to be appropriated from the general fund rather than from the Highway Trust Fund.

"We know it's not what the cities want, but it's as far as the committee will go," the staff member said.

If committee members then have their way on the House floor and prevail in a joint conference committee with the Senate, the final bill very well might disallow diversion from the trust fund but at the same time provide for operating subsidies, giving the President a double reason to consider a veto.

Senate

The Senate on March 15 approved a three-year, $18-billion highway bill (S 502) that would allow cities to divert most of their share of the Highway Trust Fund to rail or bus mass-transit projects. Available for diversion would be at least $850 million in



Construction of Interstate 95 in 1970 brought federal highway funds back to Congress' front door

urban highway funds each year, and possibly much more.

The Senate bill is an amended version of a bill introduced by Sen. Lloyd Bentsen, D-Tex., chairman of the Public Works Subcommittee on Roads, and Sen. Jennings Randolph, D-W.Va., chairman of the full committee.

Funding: In funding the highway program for three years, instead of the usual two, the Senate bill follows the lead of the Administration's proposal, S 967, which was introduced Feb. 21 by Sen. Howard H. Baker Jr., R-Tenn. Adoption of a three-year bill would make it unnecessary for Congress to consider highway legislation again until 1975.

The bill would authorize spending $3.25 billion a year for the Interstate Highway System, which would be scheduled for completion in 1980. The amount is the same as that in the original Bentsen-Randolph bill, but is slightly more than the Administration proposed.

The bill would provide $1 billion a year for rural roads (the same as in the Administration bill), $850 million a year for urban systems (major streets and roads that are wholly within urban areas) and $350 million a year for urban extensions (rural highways that enter city areas).

The $850 million for urban systems —which is the money that could be used for mass transit—is $200 million more than the amount in this category in the Bentsen-Randolph draft. The total of $1.2 billion a year for urban areas about equals the amount that the Administration bill would have provided.

Transit: The Administration proposal would have allowed cities and states to use all $1.2 billion of the urban money for mass transit—rail as well as bus.

The Senate bill would limit diversion of money to the $850 million in urban system funds. The Senate approved, 49-44, an amendment by Sens. Baker and Edmund S. Muskie, D-Maine, that would make rail transit eligible, as well as bus transit. *(See Senate vote 37, p. 435.)* The Public Works Committee had rejected the Muskie-Baker amendment, 6-8.

The highway funds available for bus systems would be augmented considerably in about 37 metropolitan areas where the Environmental Protection Agency has said that restrictions against automobiles will be necessary to combat air pollution.

The Public Works Committee had adopted an amendment by Muskie, which the Senate also accepted, that would allow those areas to use their urban extension funds for public transportation, in addition to their urban system funds. This would provide an average 41-per cent increase in the amount of money these areas could divert from highway programs to public transportation. *(For a report on EPA's program to curtail automobile use in urban centers, see Vol. 5, No. 10, p. 345.)*

Interstate transfer: The urban system money could be augmented further, for highways or mass transit, through a provision in the Senate bill that would allow the transfer of funds from contested Interstate segments. If construction of such a segment were being held up for environmental or other reasons and the segment were not necessary to complete routing of an Interstate highway through or around a city, the city or state involved could cancel the construction and use the money for other urban projects, including expenditures for mass transit.

This provision, a major departure from the current requirement that money from cancelled projects revert to the national fund for redistribution, would free hundreds of millions of dollars in some cities where freeways have been held up but have not been cancelled outright for fear that the money would be lost to other areas of the country.

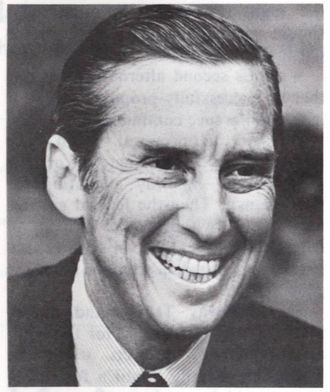
About $5 billion is tied up in controversial Interstate highway projects. *(See table, p. 431.)*

Pass through: In another major departure from present law, the Senate bill would earmark specific percentages of a state's urban funds to each urbanized area of 400,000 or more within the state, based on the area's share of the state's entire urbanized population. This would ensure that each of these areas, of which there are 56 in the nation, gets its fair share of the urban highway aid designated for its state.

Besides earmarking funds for these urbanized areas, the bill would provide cities of 400,000 or more population—of which there are 32—with their shares of federal highway aid directly from Washington. This is known as the "pass-through" provision of the bill.

Urban funds currently are given to each state on the basis of that state's share of the total U.S. urban area population. It is then up to the state to divide the funds among the various urban areas (defined as metropolitan areas containing cities of 50,000 or more) within the state. The Senate bill would make another major change by including all urbanized areas of 5,000 population or more as recipients of urban funds.

The bill's pass-through provision is similar to that in the Administration's proposal, except that the Administration would have sent federal funds directly to all 56 urbanized areas for which the funds were earmarked, rather than to just the 32 largest cities within those areas.



Lloyd Bentsen

Jennings Randolph

The original Bentsen-Randolph bill provided earmarking and pass through of funds for all urbanized areas of 250,000 or more population. There are 81 of these areas in the nation.

Subsidies: The Senate adopted, 59-36, an amendment by Sen. Harrison A. Williams Jr., D-N.J., that would provide $400 million in annual operating subsidies for mass-transit systems. The money would come from general revenues rather than from the Highway Trust Fund. *(See Senate vote 36, p. 435.)*

Sen. Williams won approval of a similar provision in 1972. It was included in last year's conference committee bill, which died when the House failed to act on the bill before adjournment.

The Williams amendment incorporates his transit bill, S 386, and would provide $3 billion in new contract authority for the Urban Mass Transportation Administration through fiscal 1977. An additional $400 million would be provided in each of fiscal 1974 and 1975 for operating subsidies for failing rail and bus lines in cities.

The matching requirement for the UMTA's capital-grant program would be changed from the present two-thirds federal, one-third local to 90-per cent federal, 10-per cent local, the same as the financing for the Interstate highway program.

The Administration has consistently opposed operating subsidies on grounds that they would snowball by removing the incentive for inefficient transit systems to put their costs and revenues in balance.

Transportation Secretary Brinegar told the House transportation subcommittee on March 19 that "the kind of decisions this forces at the federal level falls in the category of a bottomless pit. It's too big an issue to bring into this highway bill."

A pro-transit lobbyist, who did not want to be identified, said that he believes Williams included his entire UMTA bill in the highway bill to reduce the threat of a Presidential veto over the issue of operating subsidies.

House

The key to this year's highway legislation probably will lie in the reaction of the House to the Senate-passed bill. Because of its traditional opposition to the use of trust fund money for non-highway purposes, whatever liberalization the House is willing to accept is most likely what the new law will contain.

In turn, the key to House reaction probably lies in the reaction of the

Putting the Pressure on Kluczynski

Transportation problems in his own Chicago district played a major role in the decision of Rep. John C. Kluczynski, D-Ill., to abandon his opposition against using Highway Trust Fund money for public transportation.

The problems intensified this year, said John D. Kramer of the Washington-based Highway Action Coalition, due to wage demands by employees of the city-owned Chicago Transit Authority. Transit workers had threatened to strike if they did not get pay raises by March 18. They got the raises, but the CTA says that unless it gets financial help from state or federal sources, it will have to cease operations.

John C. Kluczynski

The situation, said Kramer, has embarrassed Chicago Mayor Richard J. Daley, D, who lives in Kluczynski's district. Both Daley and Milton Pikarsky, new CTA chairman, have put considerable pressure on Kluczynski to use his position as chairman of the Public Works Subcommittee on Transportation to help transit systems, such as Chicago's.

"I know that there's been great pressure on 'Klu' this year, and during the last session there was a great deal of pressure," said Rep. Glenn M. Anderson, D-Calif., a member of Kluczynski's subcommittee and a leader in the drive to open the trust fund for mass transit.

Anderson said that last year Kluczynski was instrumental in getting Rep. George W. Collins, D, who served a neighboring Chicago district, to co-sponsor Anderson's bill to open the fund. (Collins was killed Dec. 8 in an airplane crash.)

By soliciting Collins' support, Anderson said, Kluczynski was trying "to show that he was doing all he possibly could to help the city of Chicago and still not jeopardize his own position in protecting the fund itself."

Additional pressure on Kluczynski came from the press. The daily newspaper *Chicago Today* recently printed a series of front-page stories on the city's transit problem and urged in several editorials that Highway Trust Fund money be used to help. The newspaper provided a clip-out coupon for readers to send to Kluczynski in an effort to persuade him to vote accordingly.

Beverly Pearson, Kluczynski's executive secretary, said that the office received about 6,000 of the coupons and had replied to each one with a copy of Kluczynski's Feb. 21 statement supporting diversion.

Kramer gave much of the credit for Kluczynski's decision to local environmental groups and other organizations that belong to the national coalition. He said, "They began a campaign several months ago to get to "Klu,' and they did. Now we're starting to do the same thing in Blatnik's district." (Rep. John A. Blatnik, D-Minn., chairman of the House Public Works Committee.)

Environmental groups have begun campaigning for public support in Blatnik's district, which includes Duluth and a portion of suburban Minneapolis-St. Paul. The *Minneapolis Star* has lent its editorial support, Kramer said.

Blatnik has voted with Kluczynski in the past to keep the trust fund intact. Kramer said that Blatnik now is beginning to waiver.

Blatnik told the Environmental Writers Association of America recently that he is keeping an open mind on how mass transit should be assisted.

House Public Works Committee, which in recent years has held tight rein on highway legislation approved by the full body. Even with the change that Rep. Kluczynski has announced in his own views, his transportation subcommittee, as well as the full committee, may continue to oppose diversion of trust fund money.

When the subcommittee opened its hearings March 19 on the highway bill, several members sharply criticized the Nixon Administration for proposing the use of trust fund money for mass transit. They said that the Transportation Department's own figures show an urgent need for $300 billion in highway improvements in the next 20 years and that this is more than twice the amount that the Highway Trust Fund would take in during that period.

Some of the severest criticism came from Republican members of the committee. This prompted a Democratic member, Rep. Gerry E. Studds of Massachusetts, to remark to Brinegar: "The severity of the attack from the minority members leads me to think that you're doing something right."

Studds said that he favors use of trust fund money for mass transit and that the Administration "is going in the right direction on the issue of flexibility."

Committee philosophy: The philosophy of the Public Works Committee was expressed in an interview by Rep. Jim Wright, D-Tex., the fourth-ranking Democrat on the committee.

"There continues to be a strong resistance in the House and in the House committee to splitting up the trust fund," Wright said, "basically because there isn't really enough money in the trust fund to satisfy highway needs."

He said that allowing highway funds to go for mass transit might just create the illusion that the federal government was taking care of the nation's transit needs. "But we'd wind up with not enough money for either mass transit or highway needs."

Wright said that most committee members also feel that they cannot really alter the way federal highway aid is used because the money comes from taxes—primarily a four-cent-a-gallon gasoline tax—that originated in the House Ways and Means Committee. Under House rules, he said, only that committee can initiate a change in the use of the money, which now is earmarked only for highways. He said the Senate has no such restriction.

"You see, here's where we're hooked in the House," he said.

Alternatives—Yet, he said, he and other members of the Public Works Committee would like to see more federal aid for transit. He described two possible alternatives that would not take Highway Trust Fund money away from highways.

"There has been a suggestion floating around," Wright said, "that we might want to consider allowing a state at its option to take a portion of its own highway matching funds and use that for mass transit instead of for highways.

"The effect, of course, would be to prolong the time which completion of the highway projects in that state should require. It would simply stretch out the time period."

Wright's second alternative was one that he successfully proposed last year in the conference committee.

He said his proposal would have allowed a city to designate all or part of its urban highway allocation for mass transit. Then the federal government would withdraw the amount of federal highway aid involved and substitute an equivalent amount from the general fund.

The Highway Trust Fund money that had been designated for the withdrawn highway projects would be frozen temporarily "until a future decision could be made by Congress as to how to reallocate it," Wright said.

The frozen funds might end up in some other urban area, but would be reserved for highway construction, unless Congress decided to release them for other purposes.

A committee staff member, who did not want to be quoted by name, said that he expects the Wright proposal to be included in the highway bill that emerges from the Public Works Committee this year.

"The committee will go for some form of flexibility, but not out of the trust fund," the staff member said. "It will be an improved form of the Wright plan, which would have passed last year if the House had acted on the conference report. We know it's not what the cities want, but it's as far as the committee will go. The committee will go 99 per cent of the way, but it won't go the rest of the way to take the money out of the trust fund because there isn't enough money in there to take care of both highway and mass transit needs."

The staff member said that the Wright plan is unsatisfactory to mass transit advocates because the money to replace highway projects dropped by cities in favor of mass transit would have to be approved through the appropriations process, and thus there is no guarantee that it would be forthcoming.

Final solution—Wright said he thinks that the best way to finance both highways and mass transit adequately is to use a combination of programs for transit.

"It's my opinion," he said, "that the most effective thing you can do for mass transit is something along the lines of Sen. Williams' bill (funding the UMTA grant program and providing for operating subsidies), plus the things that we do in the highway bill for transit projects which are highway related, such as express bus lanes, plus the flexibility that I discussed earlier in the use of local matching funds for transit.

"I think that when you talk about all these things, you're talking about a truly massive bit of help for encouragement of mass transportation without, at the same time, violating the integrity of the highway program by raiding its source of revenue."

Kluczynski: Although Wright's comments reflect what has been the committee's traditional view of highway and mass transit financing, Rep. Kluczynski's Feb. 21 statement was an indication that the committee is under strong pressure to change its position.

The chairman of the transportation subcommittee said in his statement that he now favors giving local officials the option "to spend a portion of the monies heretofore earmarked solely for highways, for public transportation programs as well."

He spoke of a need for "broadening the potential uses of the Highway Trust Fund," a need "to increase federal aid and support to our mass transit programs," and a need "to give our urban areas greater flexibility in the use of the transportation aid they receive."

Skepticism—Despite these phrases, there continued to be doubt among persons close to Kluczynski as to whether he really favors opening the Highway Trust Fund for mass transit.

Lloyd A. Rivard, a subcommittee staff engineer-consultant who has been instrumental in drafting highway legislation, said of Kluczynski's

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statement: "He is taking a pro-transit stand, not an anti-Highway Trust Fund stand."

Rivard said that in last year's conference committee Kluczynski had been quick to accept provisions in the highway bill for increased mass transit aid, including money for operating subsidies. "That was the first thing we accepted," Rivard said. However, that money would have come from general funds rather than the Highway Trust Fund and Rivard said he thinks that Kluczynski still favors this approach.

No comment—Apparently Kluczynski is not eager to clarify his views. When an interview with him was requested, a member of his staff reported back that he was not going to grant any interviews or issue any more statements before the subcommittee completes its hearings.

Rail prospects: One committee member who is most anxious to learn how Kluczynski feels on transit financing is Rep. Glenn M. Anderson, D-Calif., who last year and again this year has led the fight in the House to open the trust fund to both bus and rail transit.

"If 'Klu' comes over, we may have the votes in committee," he said.

Anderson's legislative assistant, Cliff Madison, added: "I think if 'Klu' comes over, Blatnik will come over." And then, he said, enough of the "old guard" on the committee might vote with them to provide a majority for the first time in favor of transit money from the Highway Trust Fund.

But Anderson is not counting on that to happen. The vote on this issue in committee last year was 21-11 against transit, and he said he doubted he could pick up enough votes this year to win in either the subcommittee or the full committee.

"But I think we'll get a better showing," Anderson said. "Among the newer members of the committee there's a decided feeling that we ought to finance mass transit out of the trust fund."

Floor outlook: If Anderson loses in the Public Works Committee, he will take his case to other Members in an attempt to amend the committee bill on the floor. But before a floor vote on transit financing is possible, there must be either a favorable vote from the Rules Committee to allow a transit amendment to the bill or a favorable vote on the floor to overturn a negative Rules Committee decision.

A Plan for Resolving Freeway Disputes

Almost $5 billion now tied up in Interstate highway projects stalled by controversies in about 17 cities could be diverted to mass-transit projects in those cities if the Senate-passed federal aid highway bill (S 502) is enacted into law.

The Senate bill contains a transfer provision that would allow disputed urban segments to be dropped from the Interstate system and shifted to the urban system (streets and highways that are wholly within urban areas). Another provision of the bill provides that a city could use its share of urban-system funds (which would be supplemented by $850 million in new money for fiscal 1974) for mass transit.

The Senate adopted an amendment by Sens. Edmund S. Muskie, D-Maine, and Howard H. Baker Jr., R-Tenn., that would make rail-transit projects eligible for the urban-system funds, as well as bus projects.

But the transfer of Interstate money to mass transit would be subject to certain conditions. One is that the city must be tied in some way into the 42,500-mile Interstate highway system, which is 98 per cent complete. An Interstate system beltway around a city could serve as the connecting link, said a Senate Public Works Committee staff member.

A request by a Governor and mayor to drop an Interstate segment would have to be approved by the Secretary of Transportation. A Transportation Department spokesman said that the Secretary would resist any such request "if it detracted from the completion of a national Interstate highway system."

A House Public Works Committee staff member, who did not want to be identified, said that the committee and the House itself most likely will approve a transfer provision that will differ from the Senate's in one major respect; funds would come from general revenue sources rather than the Highway Trust Fund.

The following is a listing by the Federal Highway Administration of urban or partially urban Interstate freeways that are in jeopardy and therefore might be candidates for diversion to mass transit. Cost figures are in millions of dollars.

State	Segment	Route	Miles	Cost
California	Hawthorne-Century Freeway	I-105	3.3	$ 76.2
Connecticut	East Hartford	I-86	3.7	51.0
	West Hartford-Windsor	I-291	11.5	63.2
District of Columbia	Three Sisters Bridge	I-266	0.2	14.0
	Potomac River Freeway	I-266	1.2	81.5
	North Central-Northeast Freeway	I-95	4.2	161.0
	North Central Freeway	I-70S	2.3	68.4
	North Leg of Inner Loop (K Street)	I-66	2.9	243.6
	East Leg of Inner Loop	I-295	4.3	134.9
	South Leg of Inner Loop	I-695	1.9	77.9
Hawaii	Honolulu-Moanalua Valley	H-3	10.0	153.4
Illinois	Chicago Crosstown	I-494	19.9	965.3
Maryland	Baltimore-Leakin Park	I-70N	3.4	91.8
	Baltimore-Fells Point	I-83	3.4	127.6
	Baltimore-Harbor Crossing	I-95	4.7	383.5
	North Central-Northeast Freeway (Prince Georges County)	I-95	5.4	71.2
	Washington-North Central (Montgomery County)	I-70S	3.4	103.0
Massachusetts	Boston-Canton to Lynnfield	I-95	22.5	491.2
	Boston-Cambridge (Inner Belt)	I-695	4.4	307.1
	Rehoboth-Swansea	I-895	19.2	51.8
Michigan	Detroit-Huntington Woods	I-696	7.4	147.0
Ohio	Cleveland-Shaker Heights	I-290	8.7	114.7
Pennsylvania	Philadelphia-Cobbs Creek	I-695	6.8	153.7
	Allentown-Bethlehem	I-78	27.0	181.2
Rhode Island	Warwick-Barrington	I-895	12.1	134.4
Tennessee	Memphis-Overton Park	I-40	3.8	6.9
Washington	Seattle and Mercer Island	I-90	6.3	330.7
			203.9	$4,797.0

SOURCE: Federal Highway Administration

Rules Committee—Last year Anderson lost in the Rules Committee by the narrowest of margins, 8 - 7. He said he expects the vote to be just as close this year, but perhaps in his favor.

A significant factor is a change in the chairmanship of the committee. Last year's chairman, Rep. (1933-73) William M. Colmer, a Mississippi Democrat who did not run for reelection, has been succeeded by Rep. Ray J. Madden, D-Ind. Colmer opposed Anderson's bid for a special rule to amend the bill on the floor; Madden supported it.

Another good sign for Anderson is that seven members of the Rules Committee already have indicated their support. Five of them, including Madden, are co-sponsors of Anderson's proposal, contained in HR 101, to allow urban funds to be used for bus and rail transit. The other two voted with Anderson last year—unsuccessfully—to overturn the unfavorable vote by the Rules Committee.

Anderson said he knows that five other Rules Committee members are against him, but that he is unsure of three new members—Reps. Gillis W. Long, D-La., Clem Rogers McSpadden, D-Okla., and Del Clawson, R-Calif. If he got one of their votes, he would win.

But Anderson has not yet talked to any of these three to seek support. "I don't want to go to one of them and have him jell his position against me," Anderson said.

"I know with at least one of them that I would get an out-and-out 'no' answer. But if I don't ask him now, maybe somebody else will go and soften him up first."

Anderson suggested that mayors, Governors or other supporters of his bill might have better luck convincing Long, McSpadden and Clawson to vote in his favor than he would, and he said he prefers leaving the job to them for now. "We have some time," he said.

Floor vote—Even if the Rules Committee allows a transit amendment to the highway bill, Anderson faces the challenge of convincing a majority of the full House to support him in his efforts to open the trust fund.

Last year the floor vote to allow the amendment was defeated 168-200. So this year he is looking for a reversal of 17 votes to turn the vote around to his favor.

"I'm sure we've picked up some of these," he said, explaining that he had surveyed some of the new Members of the House on this issue. "The ones I have talked to are all for us," he said.

Anderson, whose district lies within Los Angeles County, said that he expected other new Members, as well as some older ones who voted against him last year, to be swayed by what he sees as increasing public demand for more federal transit aid. "People don't want to see any more freeways built unless there is some new kind of a transit bill in effect," he said.

John D. Kramer, co-director of the Highway Action Coalition, a prominent lobby group in favor of opening the trust fund, said he is optimistic about a House vote this year.

"Last November's election gave us a few extra votes in the House, maybe a net gain of 15 or 20," he said. "That gives us a tiny majority. It's still too close to call, but it's so far ahead of where we were a year or even six months ago that it's very encouraging."

Lobbying

With few exceptions, the lobbying struggle this year between groups that want to open the Highway Trust Fund for mass transit and those that do not is a replay of last year's fight.

Road builders and highway-user groups still generally oppose changes in the way the money is used because they fear that the road construction program will suffer.

Environmentalists and the transit lobby still want major changes in the law to reduce the current emphasis on automobiles and highways for transportation and to ensure greater funding for mass transit. *(For a summary of the conflicting positions, see Vol. 4, No. 37, p. 1442.)*

There are some new elements already noticeable this year, however. There is a new thrust from the nation's Governors toward opening the trust fund and giving states the option of using federal highway aid for transit.

There also is increased concern over air pollution and the use of energy.

These new elements in the struggle add impetus to the drive to, in the words of one lobby group, "bust the trust."

Governors: This is the first year that the National Governors' Conference has led an active lobbying effort toward changing the highway aid program. Represented on this issue by Massachusetts Gov. Francis W. Sargent, R, chairman of the organization's transportation committee, the Governors are trying to make up for lost time.

Sargent—Sargent said in an interview that he was the first Governor to argue for a campaign to give states more flexibility in the use of highway aid, back when he attended his first Governors' meeting in 1969. Gradually, more Governors from urban states joined him in the issue.

"Finally, at the Governors' meeting last year in Puerto Rico, we voted to support the concept of breaking the Highway Trust Fund and having flexibility," he said.

"Now that doesn't mean that every Governor supports that, but we now do have a majority."

It also does not mean that the Governors support every provision in the Senate bill. They opposed strongly, for example, the pass-through provision that would allow cities of 400,000 or more population to receive federal highway aid directly, without involvement of state governments.

Sargent said he welcomes his role as leader for the Governors on this issue. He has used his authority in Massachusetts over the past three years to halt expressway construction in the Boston area and to shift the state government's emphasis to public transportation. *(For background, see Vol. 5, No. 8, p. 265.)*

He said that he worked to become chairman of the Governors' transportation committee so that he would have more clout with national officials who could change federal policies toward highway aid.

Lobbying—Making full use of his position. Sargent testified before both Public Works Committees on the highway bill, talked with many Senators on the issue and discussed the subject with Administration officials.

Sargent said he had not yet done much lobbying on the House side. "We have a lot more work to do in the House," he said.

"The man I think will have a great deal of influence in the House will be our own Congressman, 'Tip' O'Neill," he said. (Rep. Thomas P. O'Neill, Jr., D-Mass., this year became House majority leader.)

"I've had a number of talks with him. I think he strongly endorses the concept of flexibility, and he's a very important part of the machinery."

New issues: Although the issues of pollution and energy are not new ones, they have taken on new importance in this year's discussion of highway and transit funding.

White House—President Nixon has cited the pollution problem as a major reason for his proposal "that our states and communities be given the right to use a designated portion of the Highway Trust Fund for capital improvements in urban public transportation, including improvements in bus and rapid rail systems."

In the community development section of his State of the Union message, broadcast on radio March 4, Mr. Nixon said: "Changing the way we use the Highway Trust Fund should be one of the top items on our national agenda. If we do not act now, our children will grow up in cities which are strangled by traffic, raked by noise, choked by pollution."

Kramer—John Kramer, whose Highway Action Coalition was formed in 1971 by environmental groups chiefly to "bust the trust," said that his member organizations have more incentive this year than ever before to be successful.

He said that not only have 37 metropolitan areas been cited by EPA as needing some form of controls on transportation in order to meet federal air quality standards by 1975, but that the nation as a whole is entering an energy-and-fuels crisis as well. "We're reaching a crunch now," Kramer said.

He said that the main cause of these problems is the automobile, because it uses energy inefficiently and pollutes the air while doing it.

Ruckelshaus—William D. Ruckelshaus, EPA administrator, testifying this year for the first time on highway legislation, told the Senate Roads Subcommittee Feb. 15 that the trust fund should be opened for rail and bus transit so that cities can meet their transportation needs and still preserve air quality.

"In most of the (worst) regions," he said, "motor vehicle travel must be curtailed. . . . Curtailment of motor vehicle travel will only be possible if adequate alternative modes of transportation are made available."

Like Kramer, Ruckelshaus also mentioned that motor vehicles are using increasing amounts of petroleum products. This has created a greater dependence on imported fuel, bringing "the dual problems of balance of trade deficits and national security considerations," he said.

Kluczynski—These issues also formed the basis for Rep. Kluczynski's statement in support of using highway funds for transit.

"Over the past 50 years," he said, "the federal aid highway programs have undergone evolutionary growth to adapt to changing national needs and priorities.

"In light of today's energy crisis and environmental concerns, a need to reassess the direction of our transportation objectives has to be made. I believe that broadening the potential uses of the Highway Trust Fund will help the highway program to continue to meet the nation's transportation objectives."

Administration

The role of the Administration in lobbying for changes in highway funding this year has been a matter of speculation ever since President Nixon accepted the resignation of Transportation Secretary John A. Volpe last Dec. 7.

Volpe, now ambassador to Italy, took a great personal interest in opening the Highway Trust Fund for mass transit, and actively lobbied for the Administration in seeking that goal. Transit supporters had wondered whether the new Secretary, Claude Brinegar, would be as dedicated.

So far, Brinegar, a former senior vice president of the Union Oil Co. of California, has shown the same kind of determination that Volpe did in representing the Administration on this issue. And, although there are many other factors involved, he could succeed where Volpe failed.

Department changes: In addition to getting a new Secretary, the Transportation Department has undergone other changes in personnel and organization that may affect how it lobbies on the highway bill.

The former under secretary of Transportation, James M. Beggs, has been replaced by Egil Krogh Jr. Krogh had been deputy assistant to the President for domestic affairs.

Mr. Nixon on March 6 nominated Robert T. Monagan Jr., 52, to be assistant secretary of Transportation for congressional and intergovernmental affairs.

The position is a new one, established as part of the Nixon Administration's effort to place departmental lobbying under White House managerial control. *(For a report on Mr. Nixon's realignment of his congressional liaison staff, see Vol. 5, No. 2, p. 35.)*

Monagan, the Republican leader of the California Assembly, probably will not be confirmed by the Senate and sworn in much before a new highway bill is passed and therefore may not get involved in lobbying for the bill.

Effect of changes: The significance of the changes in the Transportation Department will not be known until issues such as highway and transit funding have been resolved.

Griffin—An optimistic view was expressed by Oscar O. Griffin Jr., the department's assistant director for information.

"Brinegar has already been more active than Volpe ever was," Griffin said. He said that the new Secretary has gone to Capitol Hill and talked with many Senators and Representatives on the highway issue.

"Volpe tended to alienate the congressional leadership by ignoring them and Brinegar is not going to do that," Griffin said. He said that Brinegar has discussed the issue with Rep. Gerald R. Ford, R-Mich., House minority leader.

Griffin said that the department does not expect to do well in the House Public Works Committee but is confident that the bill will be open to amendment on the House floor.

"We're pretty sure that we can get the equivalent of the Muskie-Baker amendment through the House," Griffin said.

Sargent—Massachusetts Gov. Sargent, who is a close friend of John Volpe's and who served as lieutenant governor of the state while Volpe was Governor, said he had confidence in the new department and he is happy to see the new office created.

"I'm glad he did," Sargent said. "Secretary Volpe liked doing it himself, knew how to do it himself, was a Governor who was used to working with legislators, be they in Congress or in the state legislatures."

Sargent said he thought this could be the year in which Congress decides to break open the Highway Trust Fund.

"I'm more optimistic than I've ever been," he said. "And I believe that with the Administration really working hard on this now, we've got a real shot at it." □

Congressional Actions

House hearings begin on consumer protection; Senate completes hearings on strip mining

The House Interstate and Foreign Commerce Subcommittee on Commerce and Finance began hearings March 19 on a bill (HR 20) to provide federal minimum-disclosure standards for written warranties on consumer products costing $5 or more. The Consumer Product Warranties and FTC Improvements Act of 1973 would allow class action or individual suits against manufacturers for breach of warranty.

FTC Chairman Lewis A. Engman said the FTC favors the minimum-disclosure standards for product warranties, but was withdrawing support for the bill's provision to authorize the FTC to issue rules defining acts or practices that are deceptive or unfair to consumers. Engman said the commission is apprehensive over the provision because it could "unnecessarily jeopardize the rapid passage of the other essential, but less controversial, provisions in the legislative package." Similar legislation died in the House committee last year because of the rule-making provision. The FTC expects to win an appeal to a ruling by the U.S. District Court for the District of Columbia prohibiting the commission from making rules defining unfair and deceptive practices.

Environment and resources

Strip mining: Testifying before the Senate Interior and Insular Affairs Committee in favor of the Administration's strip-mining bill, Assistant Secretary of the Interior John H. Kyl March 13 said that an environmental impact statement on Interior's overall coal-leasing program would be ready by Sept. 1.

An Interior Department source, who did not want to be named, later said he doubted the impact statement, required by the National Environmental Policy Act (83 Stat 852), would be ready before spring 1974. "They haven't assigned enough people; only one or two are working on that statement now," the source said.

The committee March 13-16 heard testimony on legislation to control strip mining.

The Administration bill (S 923) would allow states two years to impose surface-mining regulations before the federal government would impose standards. The legislation, which includes both coal and non-coal mining, would impose no slope limitations. A bill (S 425) sponsored by committee Chairman Henry M. Jackson, D-Wash., would give states one year to meet federal coal standards and two years for other minerals. The Jackson bill also has no slope limitations, but does provide for land reclamation.

Two House Interior and Insular Affairs subcommittees (Environment; Mines and Mining) have scheduled joint hearings in April.

Energy: Sen. Jackson, chairman of the Senate Interior and Insular Affairs Committee, March 19 introduced a bill (S 1283) to establish an energy research and development program that would receive $1.2 billion annually, and an Energy Management Project with an annual budget of $800 million. The aim of the legislation is to develop new energy sources. The areas marked for concentration are coal gassification, oil-shale development, advanced power cycles and coal liquification. The Energy Management Project would be designed to stimulate energy work currently under way and provide funds for research. The bill has 27 co-sponsors.

Human resources

Vocational rehabilitation: The House March 15 cleared and sent to the President a bill (S 7) to authorize $2.6 billion in grants to states for vocational-rehabilitation services. A similar bill was vetoed by the President last fall, and Senate Minority Leader Hugh Scott, R-Pa., said March 20 that he expected another veto this year.

Older Americans: The House March 13 passed, 329-69, a bill (HR 71) to aid older Americans. The bill would authorize $1.4 billion in special programs for the elderly over the next three years. The Senate version, passed Feb. 20, would have authorized $1.5 billion for the programs. Mr. Nixon vetoed a similar bill Oct. 30.

Pension plans: The House Education and Labor General Subcommittee on Labor March 20 concluded hearings on two bills (HR 2, HR 642) to revise private pension plans. Rep. John Dent, D-Pa., chairman of the subcommittee, said he expected "meaningful pension legislation" to pass this year. The bills would set standards for fiduciary responsibility, vesting, voluntary portability, funding and plan-termination insurance.

International commerce

Most-favored-nation: Sen. Jackson March 15 said that he will amend an appropriate trade bill to prohibit most-favored-nation status to Soviet Russia unless it rescinds exit taxes against its Jewish citizens. The amendment has 72 co-sponsors. Rep. Wilbur D. Mills, D-Ark., Feb. 7 introduced similar legislation. The Mills legislation has 262 co-sponsors.

Peter M. Flanigan, assistant to the President for international economic affairs, and William J. Casey, under secretary of State (economic affairs), appealed to Congress to grant most-favored-nation status to the U.S.S.R. Addressing a businessmen's trade conference in Washington Feb. 27, Flanigan said that consummation of World War II lend-lease settlements, negotiated in the U.S.-U.S.S.R. trade agreement last October, was "dependent on" granting Russia most-favored-nation status. Casey said that denial of most-favored-nation status "would be seriously detrimental to the whole design" of trade agreement. *(See Vol. 4, No. 48, p. 1799.)*

Justice

Law enforcement: A House Judiciary subcommittee held hearings March 14 on funds for the Law Enforcement Assistance Administration. Attorney General Richard G. Kleindienst told the subcommittee that LEAA had been a "success" and the Administration wanted to cut additional red tape to allow states to administer the program through special revenue-sharing legislation. Under the Administration's bill, $221 million would be distributed to states.

Politics

Republican campaign committee: Rep. Bob Wilson, R-Calif., March 15 resigned as head of the Republican Congressional Campaign Committee. Wilson, 56, had been chairman of the committee since 1961.

DSG: Rep. John C. Culver, D-Iowa, March 13 was elected to a two-year term as chairman of the Democratic Study Group. Culver, 40, succeeds Rep. Phillip Burton, D-Calif.

Joan C. Szabo

Vote Charts

Senate votes 32, 33, 34, 35, 36, 37

32—Veterans health care (S 59): March 6, 1973. The Senate passed, 86-2 (D 50-0; R 36-2), a bill authorizing $587 million over five years to provide impoved medical care to veterans and dependents and survivors of veterans, and to recruit career personnel for medicine and surgery.

33—National cemeteries (S 49): March 6, 1973. The Senate passed, 85-4 (D 50-0; R 35-4), a bill establishing a National Cemetery System within the Veterans' Administration.

34—Veterans drug and alcohol treatment and rehabilitation (S 284): March 6, 1973. The Senate passed, 87-2 (D 50-0; R 37-2), a bill requiring the availability of comprehensive treatment and rehabilitative services for veterans suffering from alcoholism and drug dependence.

35—Highway Trust Fund (S 502): March 14, 1973. The Senate agreed, 59-36 (D 44-9; R 15-27), to an amendment by Sen. Harrison A. Williams Jr., D-N.J., authorizing the Secretary of Transportation to make loans to states and localities for mass transportation system operating expenses on a two-thirds federal, one-third local matching-funds basis. The amendment also authorizes $3 billion in capital grants through fiscal 1977 for urban mass transportation.

36—Highway Trust Fund (S 502): March 14, 1973. The Senate rejected, 23-70 (D 11-41; R 12-29), an amendment by Sen. Edward M. Kennedy, D-Mass., to authorize the use of the Highway Trust Fund for rail and bus mass transit.

37—Highway Trust Fund (S 502): March 14, 1973. The Senate agreed, 49-44 (D 26-25; R 23-19), to an amendment by Sen. Edmund S. Muskie, D-Maine, encouraging cities to develop and improve mass transportation by allowing them to earmark up to $850 million from the Highway Trust Fund for these purposes.

Democratic Senators—57
Republican Senators—43
Democratic Representatives—241
Republican Representatives—192
Vacant House seats—2 (Illinois 7th, Louisiana 2nd)

Key

Y—Voted "yea"
N—Voted "nay"
+—Announced or paired "yea"
–—Announced or paired "nay"
*—Not voting, unannounced

Vote numbers in this chart correspond to the *Congressional Record*, Daily Edition. Quorum calls are not included.

Democrats

	32	33	34	35	36	37
Abourezk, S. D.	+	*	+	Y	Y	Y
Allen, Ala.	Y	Y	Y	N	N	N
Bayh, Ind.	+	+	+	+	–	–
Bentsen, Tex.	Y	Y	Y	Y	N	N
Bible, Nev.	Y	Y	Y	N	N	N
Biden, Del.	Y	Y	Y	Y	Y	Y
Burdick, N.D.	Y	Y	Y	Y	N	N
Byrd, Va. #	Y	Y	Y	Y	N	N
Byrd, W.Va.	Y	Y	Y	Y	N	N
Cannon, Nev.	Y	Y	Y	N	N	N
Chiles, Fla.	Y	Y	Y	Y	N	Y
Church, Idaho	Y	Y	Y	N	N	Y
Clark, Iowa	Y	Y	Y	Y	N	Y
Cranston, Calif.	Y	Y	Y	Y	Y	Y
Eagleton, Mo.	Y	Y	Y	*	*	*
Eastland, Miss.	Y	Y	Y	Y	N	N
Ervin, N.C.	*	*	*	N	N	N
Fulbright, Ark.	Y	Y	Y	N	N	N
Gravel, Alaska	Y	Y	Y	Y	N	N
Hart, Mich.	*	*	*	Y	Y	Y
Hartke, Ind.	Y	Y	Y	Y	N	N
Haskell, Colo.	Y	Y	Y	N	N	Y
Hathaway, Maine	Y	Y	Y	Y	Y	Y
Hollings, S.C.	Y	Y	Y	Y	N	N
Huddleston, Ky.	Y	Y	Y	Y	N	N
Hughes, Iowa	Y	Y	Y	Y	N	N
Humphrey, Minn	Y	Y	Y	Y	N	N
Inouye, Hawaii	Y	Y	Y	Y	N	Y
Jackson, Wash.	Y	Y	Y	Y	N	Y
Johnston, La.	Y	Y	Y	Y	N	N
Kennedy, Mass.	Y	Y	Y	Y	Y	Y
Long, La.	Y	Y	Y	Y	N	N
Magnuson, Wash.	Y	Y	Y	Y	N	+
Mansfield, Mont.	Y	Y	Y	Y	N	N
McClellan, Ark.	Y	Y	Y	N	N	N
McGee, Wyo.	Y	Y	Y	Y	N	N
McGovern, S.D.	Y	Y	Y	Y	N	Y
McIntyre, N.H.	Y	Y	Y	*	*	*
Metcalfe, Mont.	Y	Y	Y	Y	N	Y
Mondale, Minn.	Y	Y	Y	Y	N	Y
Montoya, N.M.	Y	Y	Y	Y	N	N
Moss, Utah	Y	Y	Y	Y	N	Y
Muskie, Maine	Y	Y	Y	Y	N	Y
Nelson, Wis.	Y	Y	Y	Y	N	Y
Nunn, Ga.	Y	Y	Y	Y	N	Y
Pastore, R.I.	Y	Y	Y	Y	Y	Y
Pell, R.I.	Y	Y	Y	Y	Y	Y
Proxmire, Wis.	Y	Y	Y	N	Y	Y
Randolph, W.Va.	Y	Y	Y	Y	N	N
Ribicoff, Conn.	Y	Y	Y	Y	Y	Y
Sparkman, Ala.	Y	Y	Y	Y	N	N
Stennis, Miss.	*	*	*	*	*	–
Stevenson, Ill.	Y	Y	Y	Y	N	Y
Symington, Mo.	Y	Y	Y	Y	N	Y
Talmadge, Ga.	Y	Y	Y	Y	N	N
Tunney, Calif.	+	+	+	Y	Y	Y
Williams, N. J.	+	+	+	Y	+	+

Republicans

	32	33	34	35	36	37
Aiken, Vt.	Y	Y	Y	N	N	Y
Baker, Tenn.	Y	Y	Y	N	N	Y
Bartlett, Okla.	Y	Y	Y	N	N	N
Beall, Md.	Y	Y	Y	N	N	Y
Bellmon, Okla.	Y	N	N	N	N	N
Bennett, Utah	N	N	N	N	N	Y
Brock, Tenn.	Y	Y	Y	N	N	Y
Brooke, Mass.	Y	Y	Y	Y	Y	Y
Buckley, N.Y. #	N	Y	Y	N	Y	Y
Case, N.J.	Y	Y	Y	Y	Y	Y
Cook, Ky.	Y	Y	Y	Y	N	N
Cotton, N.H.	Y	Y	Y	N	N	N
Curtis, Neb.	Y	Y	Y	N	N	N
Dole, Kan.	Y	Y	Y	N	N	N
Domenici, N.M.	Y	Y	Y	N	N	N
Dominick, Colo.	Y	Y	Y	*	+	Y
Fannin, Ariz.	*	*	*	N	–	N
Fong, Hawaii	Y	Y	Y	Y	N	Y
Goldwater, Ariz.	*	N	Y	N	N	N
Griffin, Mich.	*	*	*	N	N	Y
Gurney, Fla.	Y	Y	Y	N	N	N
Hansen, Wyo.	Y	Y	Y	N	N	N
Hatfield, Ore.	Y	Y	Y	Y	Y	Y
Helms, N.C.	Y	Y	Y	N	N	N
Hruska, Neb.	Y	Y	Y	N	N	N
Javits, N.Y.	Y	Y	Y	Y	Y	Y
Mathias, Md.	Y	Y	Y	Y	Y	Y
McClure, Idaho	Y	Y	Y	N	N	N
Packwood, Ore.	*	*	*	Y	Y	Y
Pearson, Kan.	Y	Y	Y	Y	N	Y
Percy, Ill.	Y	Y	Y	Y	Y	Y
Roth, Del.	Y	Y	Y	N	Y	Y
Saxbe, Ohio	Y	N	Y	Y	N	*
Schweiker, Pa.	Y	Y	Y	Y	N	Y
Scott, Pa.	Y	Y	Y	N	Y	Y
Scott, Va.	Y	Y	Y	N	N	N
Stafford, Vt.	Y	Y	Y	Y	N	Y
Stevens, Alaska	Y	Y	Y	N	N	N
Taft, Ohio	Y	Y	Y	Y	Y	Y
Thurmond, S.C.	+	+	+	N	N	N
Tower, Tex.	Y	Y	Y	N	N	N
Weicker, Conn.	Y	Y	Y	Y	Y	Y
Young, N.D.	Y	Y	Y	N	N	N

#—Byrd, Va., was elected as an independent; Buckley, N.Y., was elected on the Conservative Party ticket.

House votes 41, 42, 44, 45, 48, 50

41—Vocational rehabilitation (HR 17): March 8, 1973. The House rejected, 165-213 (D 39-168; R 126-45), an amendment, HR 4814, proposed as a substitute for HR 17, to authorize $610 million for fiscal 1973, $630 million for fiscal 1974 and $650 million for fiscal 1975 for comprehensive rehabilitation services for the handicapped.

42—Vocational rehabilitation (HR 17): March 8, 1973. The House passed, 318-57 (D 200-7; R 118-50), a bill establishing an Office for the Handicapped within the HEW Department and providing a statutory basis for the Rehabilitation Services Administration.

44—Older Americans (HR 71): March 13, 1973. The House rejected, 168-229 (D 38-181; R 130-48), an amendment, HR 4813, proposed as a substitute for HR 71, to authorize $80 million for fiscal 1973 and $80 million for fiscal 1974 for programs to aid older Americans.

45—Older Americans (HR 71): March 13, 1973. The House passed, 329-69 (D 216-4; R 113-65), a bill upgrading the Administration on Aging by transferring it to HEW's Office of the Secretary. It also authorizes $50 million for fiscal 1974 and $100 million for fiscal 1975 for programs to aid older Americans.

48—Rules of evidence (S 583): March 14, 1973. The House passed, 399-1 (D 222-0; R 177-1), a bill securing additional time for Congress to consider the rules of evidence for courts and magistrates, and amendments to the rules for federal civil and criminal procedure.

50—Public works and economic development (HR 2246): March 15, 1973. The House passed, 278-108 (D 207-11; R 71-97), a bill extending the Public Works and Economic Development Act of 1965 through June 30, 1974. The bill authorizes $1.2 billion for fiscal 1974.

Democratic Senators—57
Republican Senators—43
Democratic Representatives—241
Republican Representatives—192
Vacant House seats—2 (Illinois 7th, Louisiana 2nd)

Key

Y—Voted "yea"
N—Voted "nay"
+—Announced or paired "yea"
–—Announced or paired "nay"
*—Not voting, unannounced

Vote numbers in this chart correspond to the *Congressional Record*, Daily Edition. Quorum calls are not included.

Democrats

	41	42	44	45	48	50
Abzug, N.Y. 20	N	Y	N	Y	Y	Y
Adams, Wash. 7	N	Y	N	Y	Y	Y
Addabbo, N.Y. 7	N	Y	N	Y	Y	Y
Albert, Okla. 3	*	*	*	*	*	*
Alexander, Ark. 1	N	Y	N	Y	Y	Y
Anderson, Calif. 35	N	Y	N	Y	Y	Y
Andrews, N.C. 4	Y	Y	Y	Y	Y	Y
Annunzio, Ill. 11	N	Y	N	Y	Y	Y
Ashley, Ohio 9	*	*	N	Y	Y	Y
Aspin, Wis. 1	N	Y	N	Y	Y	Y
Badillo, N.Y. 21	*	*	*	*	*	*
Barrett, Pa. 1	N	Y	*	*	Y	Y
Bennett, Fla. 3	Y	N	Y	Y	Y	N
Bergland, Minn. 7	N	Y	*	*	*	*
Bevill, Ala. 4	N	Y	N	Y	Y	Y
Biaggi, N.Y. 10	*	*	*	*	*	*
Bingham, N.Y. 23	N	Y	N	Y	Y	Y
Blatnik, Minn. 8	*	*	*	*	*	*
Boland, Mass. 2	N	Y	N	Y	Y	Y
Bolling, Mo. 5	N	Y	N	Y	Y	Y
Bowen, Miss. 2	*	*	N	Y	Y	Y
Brademas, Ind. 3	N	Y	N	Y	Y	Y
Brasco, N.Y. 11	*	*	N	Y	Y	Y
Breaux, La. 7	*	Y	N	Y	Y	Y
Breckinridge, Ky. 6	N	Y	N	Y	Y	Y
Brinkley, Ga. 3	Y	Y	Y	Y	Y	Y
Brooks, Tex. 9	N	Y	*	*	Y	*
Brown, Calif. 38	*	*	N	Y	Y	Y
Burke, Calif. 37	N	Y	N	Y	Y	Y
Burke, Mass. 11	N	Y	N	Y	Y	Y
Burleson, Tex. 17	Y	Y	Y	Y	Y	N
Burlison, Mo. 10	Y	Y	Y	Y	Y	Y
Burton, Calif. 5	N	Y	N	Y	Y	Y
Byron, Md. 6	Y	Y	Y	Y	Y	Y
Carey, N.Y. 15	N	Y	N	Y	Y	Y
Carney, Ohio 19	N	Y	N	Y	Y	*
Casey, Tex. 22	Y	Y	Y	Y	Y	Y
Chappell, Fla. 4	*	*	*	Y	Y	Y
Chisholm, N.Y. 12	*	*	*	*	*	+
Clark, Pa. 25	N	Y	N	Y	Y	Y
Clay, Mo. 1	*	*	N	Y	Y	Y
Conyers, Mich. 1	N	Y	N	Y	Y	Y
Corman, Calif. 22	N	Y	N	Y	Y	Y
Cotter, Conn. 1	N	Y	N	Y	Y	Y
Culver, Iowa 2	N	Y	N	Y	Y	Y
Daniel (W. C. Dan), V	Y	N	Y	N	Y	N
Daniels, N.J. 14	N	Y	N	Y	Y	Y
Danielson, Calif. 29	N	Y	N	Y	Y	Y
Davis, Ga. 7	Y	Y	*	Y	Y	Y
Davis, S.C. 1	N	Y	N	Y	Y	Y
de la Garza, Tex. 15	N	Y	N	Y	Y	Y
Delaney, N.Y. 9	N	Y	*	*	Y	Y
Dellums, Calif. 7	N	Y	N	Y	Y	Y
Denholm, S.D. 1	N	Y	N	Y	Y	Y
Dent, Pa. 21	N	Y	N	Y	Y	Y
Diggs, Mich. 13	N	Y	N	Y	Y	Y
Dingell, Mich. 16	N	Y	N	Y	Y	Y
Donohue, Mass. 3	N	Y	N	Y	Y	Y
Dorn, S.C. 3	*	*	N	Y	Y	Y
Downing, Va. 1	*	*	Y	Y	Y	Y
Drinan, Mass. 4	N	Y	N	Y	Y	Y
Dulski, N.Y. 37	N	Y	N	Y	Y	Y
Eckhardt, Tex. 8	N	Y	N	Y	Y	Y
Edwards, Calif. 9	N	Y	N	Y	Y	Y
Eilberg, Pa. 4	N	Y	N	Y	Y	Y
Evans, Colo. 3	*	*	N	Y	Y	Y
Evins, Tenn. 4	N	Y	N	Y	Y	Y
Fascell, Fla. 15	N	Y	N	Y	Y	Y
Fisher, Tex. 21	Y	Y	Y	N	Y	Y
Flood, Pa. 11	N	Y	N	Y	Y	Y
Flowers, Ala. 7	N	*	N	Y	Y	Y
Flynt, Ga. 6	Y	Y	Y	Y	Y	N
Foley, Wash. 5	N	Y	N	Y	Y	Y
Ford, W., Mich. 15	N	Y	N	Y	Y	Y
Fountain, N.C. 2	Y	Y	Y	Y	Y	Y
Fraser, Minn. 5	N	Y	N	Y	Y	Y
Fulton, Tenn. 5	N	Y	N	Y	*	Y
Fuqua, Fla. 2	N	Y	N	Y	Y	Y
Gaydos, Pa. 20	N	Y	N	Y	Y	Y
Gettys, S.C. 5	Y	N	Y	Y	*	*
Giaimo, Conn. 3	N	Y	N	Y	Y	Y
Gibbons, Fla. 7	*	*	*	*	*	*
Ginn, Ga. 1	Y	Y	N	Y	Y	Y
Gonzalez, Ten. 20	N	Y	N	Y	Y	Y
Grasso, Conn. 6	N	Y	N	Y	Y	Y
Gray, Ill. 24	N	Y	N	Y	Y	Y
Green, Ore. 3	Y	Y	N	Y	Y	Y
Green, Pa. 3	N	Y	N	Y	Y	Y
Griffiths, Mich. 17	N	Y	N	Y	Y	*
Gunter, Fla. 5	Y	Y	Y	Y	Y	Y
Haley, Fla. 8	Y	Y	Y	Y	Y	Y
Hamilton, Ind. 9	N	Y	N	Y	Y	Y
Hanley, N.Y. 32	N	Y	N	Y	Y	Y
Hanna, Calif. 34	*	Y	N	Y	Y	Y
Hansen, Wash. 3	N	Y	N	Y	Y	Y
Harrington, Mass. 6	N	Y	N	Y	Y	Y
Hawkins, Calif. 21	N	Y	N	Y	Y	Y
Hays, Ohio 18	N	Y	N	Y	Y	Y
Hebert, La. 1	N	Y	Y	Y	Y	Y
Hechler, W.Va. 4	N	Y	N	Y	Y	Y
Helstoski, N.J. 9	N	Y	N	Y	Y	Y
Henderson, N.C. 3	Y	Y	Y	Y	Y	Y
Hicks, Wash. 6	N	Y	N	Y	Y	Y
Holifield, Calif. 19	N	Y	*	*	*	+
Holtzman, N.Y. 16	N	Y	N	Y	Y	Y
Howard, N.Y. 3	*	*	N	Y	Y	Y
Hungate, Mo. 9	N	Y	N	Y	Y	Y
Ichord, Mo. 8	Y	Y	N	Y	Y	N
Jarman, Okla. 5	Y	N	Y	N	Y	N
Johnson, Calif. 2	N	Y	N	Y	Y	Y
Jones, Tenn. 7	N	Y	N	Y	Y	Y
Jones, Ala. 5	N	*	N	Y	Y	Y
Jones, N.C. 1	Y	Y	Y	Y	Y	Y
Jones, Okla. 1	N	Y	Y	Y	Y	*
Jordan, Tex. 18	N	Y	N	Y	Y	Y
Karth, Minn. 4	N	Y	N	Y	Y	Y
Kastenmeier, Wis. 2	N	Y	N	Y	Y	Y
Kazen, Tex. 23	N	Y	N	Y	Y	Y
Kluczynski, Ill. 5	N	Y	N	Y	Y	Y
Koch, N.Y. 18	*	*	N	Y	Y	*
Kyros, Maine 1	*	*	*	*	*	Y
Landrum, Ga. 9	Y	Y	Y	Y	Y	Y
Leggett, Calif. 4	N	Y	N	Y	Y	*
Lehman, Fla. 13	N	Y	N	Y	Y	Y
Litton, Mo. 6	N	Y	N	Y	Y	Y
Long, Md. 2	N	Y	N	Y	Y	Y
Long, La. 8	*	Y	N	Y	Y	Y
Macdonald, Mass. 7	N	Y	N	Y	Y	Y
Madden, Ind. 1	N	Y	N	Y	Y	Y
Mahon, Tex. 19	Y	Y	Y	Y	Y	N
Mann, S.C. 4	Y	N	Y	Y	Y	Y
Mathis, Ga. 2	*	*	N	Y	Y	Y
Matsunaga, Hawaii 2	N	Y	N	Y	Y	Y
Mazzoli, Ky. 3	N	Y	N	Y	Y	Y
McCormack, Wash. 4	N	Y	N	Y	Y	Y
McFall, Calif. 15	N	Y	N	Y	Y	Y
McKay, Utah 1	N	Y	N	Y	Y	Y
McSpadden, Okla. 2	N	Y	N	Y	Y	Y
Meeds, Wash. 2	N	Y	N	Y	Y	Y
Melcher, Mont. 2	N	Y	N	Y	Y	Y
Metcalfe, Ill. 1	N	Y	N	Y	Y	Y
Mezvinsky, Iowa 1	N	Y	N	Y	Y	Y
Milford, Tex. 24	Y	Y	Y	Y	Y	N
Mills, Ark. 2	*	*	*	*	*	Y
Minish, N.J. 11	N	Y	N	Y	Y	Y
Mink, Hawaii 2	N	Y	N	Y	Y	Y
Mitchell, Md. 7	N	Y	N	Y	Y	Y
Moakley, Mass. 9	N	Y	N	Y	Y	Y
Mollohan, W.Va. 1	N	Y	N	Y	Y	Y
Montgomery, Miss. 3	Y	Y	Y	Y	Y	Y
Moorhead, Pa. 14	N	Y	*	*	Y	Y
Morgan, Pa. 22	N	Y	N	Y	Y	Y
Moss, Calif. 3	N	Y	N	Y	Y	Y
Murphy, N.Y. 17	N	Y	N	Y	Y	Y
Murphy, Ill. 2	N	Y	N	Y	Y	Y
Natcher, Ky. 2	N	Y	N	Y	Y	Y
Nedzi, Mich. 14	N	Y	N	Y	Y	Y
Nichols, Ala. 3	*	*	*	*	*	+
Nix, Pa. 2	N	Y	*	*	*	Y
Obey, Wis. 7	N	Y	N	Y	Y	Y
O'Hara, Mich. 12	N	Y	N	Y	Y	Y
O'Neill, Mass. 8	N	Y	N	Y	Y	Y
Owens, Utah 2	N	Y	N	Y	Y	*
Passman, La. 5	*	*	Y	Y	Y	Y
Patman, Tex. 1	N	Y	N	Y	Y	Y
Patten, N.J. 15	N	Y	N	Y	Y	Y
Pepper, Fla. 14	N	Y	N	Y	Y	Y
Perkins, Ky. 7	N	Y	N	Y	Y	Y
Pickle, Tex. 10	N	Y	Y	Y	Y	+
Pike, N.Y. 1	N	Y	N	Y	Y	*
Poage, Tex. 11	Y	Y	N	Y	Y	Y
Podell, N.Y. 13	N	Y	N	Y	Y	Y
Preyer, N.C. 6	Y	Y	Y	Y	Y	Y
Price, Ill. 23	N	Y	N	Y	Y	Y
Randall, Mo. 4	N	Y	N	Y	Y	Y
Rangel, N.Y. 19	N	Y	N	Y	Y	Y
Rarick, La. 6	Y	N	*	*	*	*
Rees, Calif. 26	N	Y	N	*	*	Y
Reid, N.Y. 24	N	Y	N	Y	Y	Y
Reuss, Wis. 5	N	Y	N	Y	Y	Y
Riegle, Mich. 7 #	N	Y	N	Y	Y	Y
Roberts, Tex. 4	*	*	Y	Y	Y	Y
Rodino, N.J. 10	N	Y	N	Y	Y	Y
Roe, N.J. 8	N	Y	N	Y	Y	Y
Rogers, Fla. 11	Y	Y	Y	Y	Y	N
Roncalio, Wyo. AL	N	Y	N	Y	Y	Y
Rooney, Pa. 15	N	Y	N	Y	Y	Y
Rooney, N.Y. 14	*	*	*	*	*	+
Rose, N.C. 7	Y	Y	N	Y	Y	Y
Rosenthal, N.Y. 8	N	Y	N	Y	Y	*
Rostenkowski, Ill. 8	*	*	N	Y	Y	Y
Roush, Ind. 4	N	Y	N	Y	Y	Y
Roy, Kan. 2	N	Y	*	*	Y	Y
Roybal, Calif. 30	N	Y	N	Y	Y	Y
Runnels, N.M. 2	Y	Y	Y	Y	Y	Y
Ryan, Calif. 11	N	Y	N	Y	Y	Y
St. Germain, R.I. 1	N	Y	N	Y	Y	Y
Sarbanes, Md. 3	N	Y	N	Y	Y	Y
Satterfield, Va. 3	*	*	Y	N	Y	N
Schroeder, Colo. 1	N	Y	N	Y	Y	Y
Seiberling, Ohio 14	N	Y	N	Y	Y	Y
Shipley, Ill. 22	N	Y	N	Y	Y	N
Sikes, Fla. 1	*	*	Y	Y	Y	Y
Sisk, Calif. 16	*	Y	N	Y	Y	Y
Slack, W.Va. 3	N	Y	N	Y	Y	Y
Smith, Iowa 4	N	Y	N	Y	Y	Y
Staggers, W.Va. 2	N	Y	N	Y	Y	Y
Stanton, J. V., Ohio 20	N	Y	N	Y	Y	Y
Stark, Calif. 8	*	*	N	Y	Y	Y
Steed, Okla. 4	Y	*	Y	Y	Y	Y
Stephens, Ga. 10	Y	Y	N	Y	Y	Y
Stokes, Ohio 21	N	Y	N	Y	Y	Y
Stratton, N.Y. 28	N	Y	N	Y	Y	Y
Stubblefield, Ky. 1	N	Y	N	Y	*	Y
Stuckey, Ga. 8	Y	Y	Y	Y	Y	Y
Studds, Mass. 12	N	Y	N	Y	Y	Y
Sullivan, Mo. 3	N	Y	N	Y	Y	Y
Symington, Mo. 2	N	Y	N	Y	Y	Y
Taylor, N.C. 11	Y	Y	N	Y	Y	Y
Teague, Tex. 6	Y	N	Y	Y	Y	*
Thompson, N.J. 4	N	Y	N	Y	Y	Y
Thornton, Ark. 4	N	Y	N	Y	Y	Y
Tiernan, R.I. 2	N	Y	N	Y	Y	Y
Udall, Ariz. 2	N	Y	N	Y	Y	Y
Ullman, Ore. 2	N	*	N	Y	Y	Y
Van Deerlin, Calif. 41	N	Y	N	Y	Y	Y
Vanik, Ohio 22	N	Y	N	Y	Y	Y
Vigorito, Pa. 24	N	Y	N	Y	Y	Y
Waggonner, La. 4	Y	Y	Y	Y	Y	Y
Waldie, Calif. 14	*	*	*	*	*	*
White, Tex. 16	N	Y	N	Y	Y	Y
Whitten, Miss. 2	Y	Y	Y	Y	Y	Y
Wilson, C., Calif. 31	N	Y	N	Y	Y	Y
Wilson, Tex. 2	N	Y	N	Y	Y	Y
Wolff, N.Y. 6	N	Y	N	Y	Y	Y
Wright, Tex. 12	*	*	N	Y	Y	Y
Yates, Ill. 9	N	Y	N	Y	Y	Y
Yatron, Pa. 6	N	Y	N	Y	Y	Y
Young, A. Ga. 5	N	Y	N	Y	Y	Y
Young, Tex. 14	N	Y	N	Y	Y	Y
Zablocki, Wis. 4	N	Y	N	Y	Y	Y

#—Feb. 27 changed party affiliation from Republican to Democrat.

Republicans

	41	42	44	45	48	50
Abdnor, S.D. 2	Y	Y	Y	Y	Y	Y
Anderson, Ill. 16	Y	Y	N	Y	Y	N
Andrews, N.D. AL	Y	Y	N	Y	Y	Y
Archer, Tex. 7	Y	Y	Y	N	Y	N
Arends, Ill. 15	Y	N	Y	N	Y	N
Armstrong, Colo. 5	Y	*	Y	N	Y	N
Ashbrook, Ohio 17	Y	N	Y	N	Y	*
Bafalis, Fla. 10	Y	N	*	*	*	–
Baker, Tenn. 3	Y	Y	Y	N	Y	Y
Beard, Tenn. 6	Y	Y	Y	Y	Y	Y
Bell, Calif. 28	N	Y	*	*	Y	*
Biester, Pa. 8	N	Y	N	Y	Y	Y
Blackburn, Ga. 4	Y	N	Y	N	Y	N
Bray, Ind. 6	Y	Y	Y	Y	Y	*
Broomfield, Mich. 9	Y	Y	N	Y	Y	N
Brotzman, Colo. 2	Y	Y	Y	Y	Y	*
Brown, Ohio 7	Y	N	Y	Y	Y	Y
Brown, Mich. 3	*	Y	Y	Y	Y	N
Broyhill, N.C. 10	Y	Y	Y	Y	Y	Y
Broyhill, Va. 10	*	*	Y	N	Y	N
Buchanan, Ala. 6	N	Y	Y	Y	Y	N
Burgener, Calif. 42	N	Y	Y	N	Y	N
Burke, Fla. 12	Y	N	Y	Y	Y	N
Butler, Va. 6	Y	N	Y	N	Y	Y
Camp, Okla. 6	*	*	Y	N	Y	Y
Carter, Ky. 5	N	Y	N	Y	Y	Y
Cederberg, Mich. 10	Y	N	Y	N	Y	N
Chamberlain, Mich. 6	Y	Y	Y	Y	Y	N
Clancy, Ohio 2	Y	N	Y	N	Y	N
Clausen, Calif. 1	Y	Y	Y	Y	Y	Y
Clawson, Calif. 23	Y	N	Y	N	Y	N
Cleveland, N.H. 2	N	Y	N	Y	Y	Y
Cochran, Miss. 4	Y	Y	Y	Y	Y	Y
Cohen, Me. 2	N	Y	N	Y	Y	Y
Collier, Ill. 6	*	*	*	*	*	N
Collins, Tex. 3	Y	N	Y	N	Y	N
Conable, N.Y. 35	Y	N	Y	N	Y	N
Conlan, Ariz. 4	Y	N	Y	N	Y	–
Conte, Mass. 1	N	Y	N	Y	Y	Y
Coughlin, Pa. 13	Y	Y	Y	Y	Y	N
Crane, Ill. 12	*	*	Y	N	Y	N
Cronin, Mass. 5	Y	Y	N	Y	Y	Y
Daniel, R., Va. 4	Y	N	Y	N	Y	N
Davis, Wis. 9	Y	N	Y	N	Y	N
Dellenback, Ore. 4	N	Y	N	Y	Y	Y
Dennis, Ind. 10	Y	Y	Y	N	Y	N
Derwinski, Ill. 4	Y	Y	Y	N	Y	N
Devine, Ohio 12	Y	N	Y	N	Y	N
Dickinson, Ala. 2	*	*	Y	N	Y	+
Duncan, Tenn. 2	Y	Y	Y	Y	Y	Y
du Pont, Del. AL	N	Y	N	Y	Y	Y
Edwards, Ala. 1	Y	Y	Y	N	Y	N
Erlenborn, Ill. 14	N	Y	N	Y	Y	N
Esch, Mich. 2	N	Y	N	Y	Y	N
Eshleman, Pa. 16	N	Y	N	Y	Y	–
Findley, Ill. 20	Y	N	Y	N	Y	N
Fish, N.Y. 25	N	*	N	Y	Y	*
Ford, G., Mich. 15	Y	N	Y	N	Y	N
Forsythe, N.J. 6	N	Y	N	Y	Y	N
Frelinghuysen, N.J. 5	Y	N	*	*	Y	N
Frenzel, Minn. 3	N	Y	N	Y	Y	N
Frey, Fla. 9	Y	Y	N	Y	Y	N
Froehlich, Wisc. 8	Y	Y	Y	Y	N	Y
Gilman, N.Y. 20	Y	Y	N	Y	Y	N
Goldwater, Calif. 27	Y	N	Y	N	Y	N
Goodling, Pa. 19	Y	N	Y	N	Y	N
Gross, Iowa 3	Y	N	Y	N	Y	N
Grover, N.Y.	Y	Y	Y	Y	Y	N
Gubser, Calif. 10	Y	Y	N	Y	Y	N
Gude, Md. 8	N	Y	N	Y	Y	N
Guyer, Ohio 4	Y	Y	Y	N	Y	N
Hammerschmidt, Ark. 3	N	Y	Y	Y	Y	Y
Hanrahan, Ill. 3	Y	Y	Y	Y	Y	Y
Hansen, Idaho 2	N	Y	N	Y	Y	N
Harsha, Ohio 6	Y	Y	*	*	Y	*
Harvey, Mich. 8	*	*	*	*	*	*
Hastings, N.Y. 39	N	Y	Y	Y	Y	Y
Heckler, Mass. 10	N	Y	N	Y	Y	Y
Heinz, Pa. 18	N	Y	N	*	Y	Y
Hillis, Ind. 5	N	Y	Y	Y	Y	N
Hinshaw, Calif. 39	*	*	Y	Y	Y	*
Hogan, Md. 5	N	*	N	Y	Y	N
Holt, Md. 4	Y	N	Y	Y	Y	N
Horton, N.Y. 34	Y	Y	N	Y	Y	Y
Hosmer, Calif. 32	*	*	*	*	*	–
Huber, Mich. 18	Y	N	Y	N	Y	N
Hudnut, Ind. 11	Y	N	Y	Y	Y	N
Hunt, N.J. 1	Y	N	Y	Y	Y	N
Hutchinson, Mich. 4	Y	N	Y	N	Y	N
Johnson, Colo. 4	Y	Y	Y	N	*	N
Johnson, Pa. 23	Y	Y	Y	Y	Y	N
Keating, Ohio 1	N	Y	Y	Y	Y	Y
Kemp, N.Y. 38	N	Y	Y	N	Y	Y
Ketchum, Calif. 36	Y	N	Y	N	Y	N
King, N.Y. 29	*	*	*	*	*	–
Kuykendall, Tenn. 8	Y	N	Y	N	Y	*
Landgrebe, Ind. 2	Y	N	Y	N	Y	N
Latta, Ohio 5	Y	Y	Y	N	Y	N
Lent, N.Y. 4	Y	Y	N	Y	*	N
Lott, Miss. 5	Y	Y	Y	Y	Y	Y
Lujan, N.M. 1	Y	Y	Y	Y	Y	Y
Madigan, Ill. 21	Y	Y	Y	Y	Y	N
Mailliard, Calif. 6	Y	Y	N	Y	Y	N
Mallary, Vt. AL	N	Y	Y	Y	Y	Y
Maraziti, N.J. 13	Y	Y	Y	Y	Y	N
Martin, Neb. 3	Y	N	Y	N	Y	N
Martin, N.C. 9	Y	N	Y	N	Y	Y
Mathias, Calif. 18	Y	Y	Y	Y	*	Y
Mayne, Iowa 6	Y	Y	N	Y	Y	N
McClory, Ill. 13	N	Y	Y	Y	Y	N
McCloskey, Calif. 17	N	Y	N	Y	Y	Y
McCollister, Neb. 2	Y	Y	Y	N	Y	N
McDade, Pa. 10	N	Y	N	Y	Y	Y
McEwen, N.Y. 30	*	*	*	*	*	+
McKinney, Conn. 4	N	Y	N	Y	Y	Y
Michel, Ill. 18	Y	N	Y	N	*	N
Miller, Ohio 10	Y	Y	Y	Y	Y	Y
Mills, Md. 1	Y	Y	Y	Y	Y	N
Minshall, Ohio 23	Y	N	Y	Y	*	*
Mitchell, N.Y. 31	Y	Y	Y	Y	Y	+
Mizell, N.C. 5	Y	Y	Y	Y	Y	Y
Moorhead, Calif. 20	*	*	Y	Y	Y	N
Mosher, Ohio 13	N	Y	N	Y	Y	N
Myers, Ind. 7	Y	Y	Y	Y	Y	Y
Nelsen, Minn. 2	*	*	Y	N	Y	N
O'Brien, Ill. 17	Y	N	Y	Y	Y	*
Parris, Va. 8	Y	N	Y	N	Y	N
Pettis, Calif. 33	Y	Y	Y	Y	Y	Y
Peyser, N.Y. 23	N	Y	N	Y	Y	Y
Powell, Ohio 8	Y	Y	Y	N	Y	*
Price, Tex. 13	*	*	*	*	*	–
Pritchard, Wash. 1	N	Y	N	Y	Y	Y
Quie, Minn. 1	N	Y	N	Y	Y	Y
Quillen, Tenn. 1	Y	Y	Y	Y	Y	Y
Railsback, Ill. 19	*	*	N	Y	Y	N
Regula, Ohio 16	Y	Y	Y	N	Y	N
Rhodes, Ariz. 1	Y	N	Y	N	Y	–
Rinaldo, N.J. 12	Y	Y	N	Y	Y	N
Robinson, Va. 7	Y	N	Y	N	Y	N
Robison, N.Y. 27	Y	Y	Y	Y	Y	Y
Roncallo, N.Y. 3	Y	Y	Y	Y	Y	N
Rousselot, Calif. 24	*	*	Y	N	Y	N
Ruppe, Mich. 11	N	Y	N	Y	*	Y
Ruth, N.C. 8	Y	Y	Y	Y	Y	Y
Sandman, N.J. 2	Y	Y	Y	Y	Y	N
Sarasin, Conn. 5	N	Y	N	Y	Y	Y
Saylor, Pa. 12	Y	N	Y	N	Y	N
Scherle, Iowa 5	N	Y	Y	N	Y	Y
Schneebeli, Pa. 17	*	*	Y	N	Y	N
Sebelius, Kan. 1	Y	Y	Y	Y	Y	N
Shoup, Mont. 1	Y	Y	N	Y	Y	N
Shriver, Kan. 4	Y	Y	Y	Y	Y	Y
Shuster, Pa. 9	Y	N	Y	N	Y	Y
Skubitz, Kan. 5	Y	Y	Y	Y	Y	Y
Smith, N.Y. 36	Y	Y	Y	Y	Y	Y
Snyder, Ky. 4	Y	Y	Y	N	Y	Y
Spence, S.C. 2	Y	N	Y	Y	Y	Y
Stanton, J.W., Ohio 11	Y	Y	Y	Y	Y	Y
Steele, Conn. 2	N	Y	N	Y	Y	Y
Steelman, Tex. 5	Y	Y	*	*	Y	N
Steiger, Ariz. 3	*	*	Y	N	Y	N
Steiger, Wis. 6	N	Y	*	*	Y	N
Symms, Idaho 1	Y	N	Y	N	Y	N
Talcott, Calif. 12	*	*	N	Y	Y	N
Taylor, Mo. 7	Y	N	Y	N	Y	Y
Teague, Calif. 13	Y	Y	Y	Y	Y	N
Thomson, Wis. 3	Y	Y	Y	Y	Y	Y
Thone, Neb. 1	Y	Y	Y	Y	Y	Y
Towell, Nev. AL	N	Y	Y	N	Y	N
Treen, La. 3	Y	N	Y	N	Y	N
Vander Jagt, Mich. 9	N	Y	N	Y	Y	Y
Veysey, Calif. 43	*	*	Y	Y	Y	Y
Walsh, N.Y. 33	Y	Y	N	Y	Y	Y
Wampler, Va. 9	Y	Y	Y	Y	Y	Y
Ware, Pa. 5	Y	Y	Y	N	Y	N
Whalen, Ohio 3	N	Y	N	Y	Y	Y
Whitehurst, Va. 2	Y	N	Y	N	Y	N
Widnall, N.J. 7	Y	Y	*	Y	Y	Y
Wiggins, Calif. 25	Y	N	Y	N	Y	N
Williams, Pa. 7	Y	N	Y	N	Y	N
Wilson, R., Calif. 40	Y	N	Y	N	Y	N
Winn, Kan. 3	Y	Y	Y	Y	Y	*
Wyatt, Ore. 1	N	Y	N	Y	Y	N
Wydler, N.Y. 5	Y	N	Y	N	Y	N
Wylie, Ohio 15	Y	Y	Y	Y	Y	N
Wyman, N.H. 1	Y	Y	Y	Y	Y	Y
Young, Ill. 10	Y	Y	Y	Y	Y	N
Young, Alaska AL					*	Y
Young, Fla. 6	Y	N	Y	Y	Y	Y
Young, S.C. 6	Y	*	Y	Y	Y	Y
Zion, Ind. 8	Y	Y	Y	Y	Y	Y
Zwach, Minn. 6	N	Y	N	Y	Y	Y

Senate votes 38, 39, 40, 41, 42, 43

38—Highway Trust Fund (S 502): March 14, 1973. The Senate rejected, 29-59 (D 10-38; R 19-21), a motion to table an amendment by Sen. Henry Bellmon, R-Okla., that would bar impoundment of highway trust funds by the executive branch.

39—Highway Trust Fund (S 502): March 14, 1973. The Senate agreed, 64-21 (D 44-3; R 20-18), to the amendment by Sen. Bellmon to bar executive impoundment of highway trust funds.

40—Highway Trust Fund (S 502): March 15, 1973. The Senate rejected, 43-50 (D 25-27; R 18-23), an amendment by Sen. James L. Buckley, Con-N.Y., to cancel the clause in S 502 ending federal aid for construction of the San Antonio (Texas) North Expressway.

41—Highway Trust Fund (S 502): March 15, 1973. The Senate rejected, 23-67 (D 7-44; R 16-23), an amendment by Sen. Clifford P. Hansen, R-Wyo., to eliminate vehicle size and weight limitations on Interstate highways.

42—Highway Trust Fund (S 502): March 15, 1973. The Senate rejected, 14-68 (D 5-43; R 9-25), an amendment by Sen. Paul J. Fannin, R-Ariz., to permit buses of 102-inch width to operate on Interstate highways, subject to state and local approval.

43—Highway Trust Fund (S 502): March 15, 1973. The Senate passed, 77-5 (D 47-1; R 30-4), a bill authorizing $1 billion for each of the fiscal years 1974, 1975 and 1976 for federal primary and secondary rural roads. The bill also authorizes $1.2 billion for urban roads for each of those fiscal years.

Democratic Senators—57
Republican Senators—43
Democratic Representatives—241
Republican Representatives—192
Vacant House seats—2 (Illinois 7th, Louisiana 2nd)

Key

Y—Voted "yea"
N—Voted "nay"
+—Announced or paired "yea"
–—Announced or paired "nay"
*—Not voting, unannounced

Vote numbers in this chart correspond to the *Congressional Record*, Daily Edition. Quorum calls are not included.

Democrats

	38	39	40	41	42	43
Abourezk, S. D.	N	Y	Y	N	N	Y
Allen, Ala.	Y	N	N	N	N	Y
Bayh, Ind.	*	*	*	N	Y	Y
Bentsen, Tex.	Y	N	N	N	Y	Y
Bible, Nev.	N	Y	N	Y	N	Y
Biden, Del.	N	Y	Y	N	N	Y
Burdick, N.D.	N	Y	N	N	N	Y
Byrd, Va. #	Y	Y	N	N	*	*
Byrd, W.Va.	Y	Y	N	N	N	Y
Cannon, Nev.	N	Y	Y	N	N	Y
Chiles, Fla.	N	Y	N	N	N	Y
Church, Idaho	N	Y	Y	N	N	Y
Clark, Iowa	N	Y	Y	N	N	Y
Cranston, Calif.	N	Y	Y	N	*	*
Eagleton, Mo.	*	*	Y	N	*	*
Eastland, Miss.	Y	Y	N	N	N	Y
Ervin, N.C.	N	Y	N	N	N	Y
Fulbright, Ark.	*	*	N	N	N	Y
Gravel, Alaska	Y	*	*	*	*	*
Hart, Mich.	N	Y	Y	N	N	Y
Hartke, Ind.	N	Y	N	N	N	Y
Haskell, Colo.	N	Y	Y	N	N	Y
Hathaway, Maine	N	Y	Y	N	N	Y
Hollings, S.C.	N	Y	N	Y	N	Y
Huddleston, Ky.	N	Y	N	*	Y	Y
Hughes, Iowa	N	Y	Y	N	N	Y
Humphrey, Minn.	N	Y	N	N	N	Y
Inouye, Hawaii	N	Y	Y	Y	N	Y
Jackson, Wash.	N	Y	N	N	N	Y
Johnston, La.	Y	Y	N	N	N	Y
Kennedy, Mass.	N	Y	Y	N	N	Y
Long, La.	Y	Y	N	N	N	Y
Magnuson, Wash.	N	Y	N	Y	N	Y
Mansfield, Mont.	–	–	N	N	N	Y
McClellan, Ark.	N	Y	N	N	N	Y
McGee, Wyo.	N	Y	N	Y	Y	Y
McGovern, S.D.	N	Y	Y	N	N	Y
McIntyre, N.H.	*	*	*	*	*	*
Metcalfe, Mont.	N	Y	Y	N	N	Y
Mondale, Minn.	N	Y	*	*	*	*
Montoya, N.M.	N	Y	N	N	N	Y
Moss, Utah	N	Y	N	Y	N	Y
Muskie, Maine	N	Y	Y	*	*	*
Nelson, Wis.	N	Y	Y	N	*	*
Nunn, Ga.	N	Y	Y	N	N	Y
Pastore, R.I.	+	+	Y	N	N	Y
Pell, R.I.	Y	Y	Y	N	N	Y
Proxmire, Wis.	Y	N	Y	N	N	N
Randolph, W.Va.	N	Y	N	Y	Y	Y
Ribicoff, Conn.	*	*	Y	N	N	Y
Sparkman, Ala.	N	Y	N	N	N	Y
Stennis, Miss.	*	*	*	*	*	*
Stevenson, Ill.	N	Y	Y	N	N	Y
Symington, Mo.	N	Y	Y	N	N	Y
Talmadge, Ga.	*	*	N	N	N	Y
Tunney, Calif.	N	Y	Y	N	N	Y
Williams, N. J.	N	Y	N	N	N	Y

Republicans

	38	39	40	41	42	43
Aiken, Vt.	Y	N	N	Y	N	Y
Baker, Tenn.	N	Y	Y	N	N	Y
Bartlett, Okla.	N	Y	Y	N	*	*
Beall, Md.	N	Y	N	N	N	Y
Bellmon, Okla.	N	Y	*	*	*	*
Bennett, Utah	Y	N	Y	Y	*	+
Brock, Tenn.	Y	N	Y	N	N	N
Brooke, Mass.	N	Y	Y	N	N	Y
Buckley, N.Y. #	*	*	Y	N	*	*
Case, N.J.	N	Y	Y	N	N	Y
Cook, Ky.	N	Y	N	+	*	+
Cotton, N.H.	Y	N	N	Y	Y	Y
Curtis, Neb.	Y	*	N	Y	Y	Y
Dole, Kan.	N	Y	N	N	N	Y
Domenici, N.M.	Y	N	N	N	*	Y
Dominick, Colo.	Y	N	Y	Y	N	+
Fannin, Ariz.	Y	N	N	Y	Y	N
Fong, Hawaii	Y	N	N	Y	N	Y
Goldwater, Ariz.	Y	*	Y	Y	Y	Y
Griffin, Mich.	Y	N	Y	N	N	Y
Gurney, Fla.	N	Y	N	N	N	Y
Hansen, Wyo.	Y	N	N	Y	Y	Y
Hatfield, Ore.	N	Y	+	+	–	+
Helms, N.C.	Y	N	N	Y	Y	N
Hruska, Neb.	Y	N	N	Y	N	Y
Javits, N.Y.	N	Y	Y	N	N	Y
Mathias, Md.	N	Y	Y	N	N	Y
McClure, Idaho	N	Y	Y	Y	Y	Y
Packwood, Ore.	N	Y	Y	N	N	Y
Pearson, Kan.	N	Y	N	N	N	Y
Percy, Ill.	N	N	Y	N	N	Y
Roth, Del.	Y	N	Y	N	N	N
Saxbe, Ohio	*	*	N	+	*	+
Schweiker, Pa.	N	Y	Y	N	N	Y
Scott, Pa.	Y	N	N	Y	N	Y
Scott, Va.	*	*	N	N	N	Y
Stafford, Vt.	Y	N	N	N	N	Y
Stevens, Alaska	N	Y	N	Y	*	*
Taft, Ohio	Y	N	N	N	N	Y
Thurmond, S.C.	N	Y	N	N	Y	Y
Tower, Tex.	Y	N	N	Y	Y	Y
Weicker, Conn.	N	Y	Y	N	N	Y
Young, N.D.	N	Y	N	Y	N	Y

#—Byrd, Va., was elected as an independent; Buckley, N.Y., was elected on the Conservative Party ticket.

Executive Actions

EPA takes action on wetlands preservation; Nixon remains opposed to farm-price controls

The Environmental Protection Agency March 14 announced a national wetlands protection and preservation policy. Saying that wetlands "require extraordinary protection," EPA Administrator William D. Ruckelshaus announced that preservation of the existing wetlands ecosystem will be given high priority in plans for construction of federally financed waste-water treatment facilities, dredging or filling practices, alterations in the natural flow of water nourishing wetlands, solid-waste management practices, and additions of salts, pesticides or toxic materials arising from non-point source wastes and construction activities. *(For background on coastal areas legislation, see Vol. 4, No. 50, p. 1889.)*

The economy

Inflation: President Nixon March 15 told a news conference he remained opposed to direct controls on farm prices and to absolute ceilings on wholesale and retail food prices.

Emphasizing steps the government could take to encourage an increase in farm products, the President announced his intention to seek removal of the 3-cents a pound duty on imported beef. Rather than impose direct controls on prices, Mr. Nixon said, "the better way is to open our imports to the greatest extent that we possibly can."

As a further means to increase supply and reduce inflation, Mr. Nixon said the government would begin sales from its $6.5-billion stockpiles of metals and other basic commodities.

Consumer affairs

Consumer protection: The Food and Drug Administration March 13 issued a set of final rules and tentative proposals on food labeling that would go into effect in 22 months. The action is designed to prevent consumers from being deceived by labels on food packages, and to encourage food manufacturers to improve the nutritional contents of their products. By setting nutritional guidelines, the Food and Drug Administration hopes to eliminate promotional advantages a manufacturer might gain by excessive fortification of foods.

Communications

Broadcast licenses: The White House March 13 sent legislation to Congress that would increase from three years to five years the length of radio and television broadcast licenses and would redefine the standards for license renewals. The legislation, drafted by the White House Office of Telecommunications Policy, requires stations to "be substantially attuned to the public needs and interests," and to "afford reasonable opportunity for the discussion of conflicting views." The Federal Communications Commission would no longer use stricter programming standards, such as the amount of news or public affairs programming, to grant or deny a license.

The bill also would make challenges more difficult by allowing the FCC to renew an existing license without holding hearings and by putting the burden of proof on the challenger.

Executive appointments

HEW: President Nixon March 13 nominated **Dr. Charles C. Edwards** to be assistant HEW secretary (health). He will succeed Dr. Merlin K. DuVal Jr. who resigned in December. Edwards, 49, of Bethesda, Md., has been commissioner of HEW's Food and Drug Administration since December 1969. From 1967 until joining HEW, he was vice president and managing officer (health and medical division) of Booz, Allen and Hamilton Inc. in Chicago, Ill., and from 1962 to 1967 he was an official with the American Medical Association.

On March 6 the President nominated **John R. Ottina** as U.S. commissioner of education in HEW's Office of Education, succeeding Sidney P. Marland Jr. Ottina, 41, of Los Angeles, Calif., has been acting education commissioner since November 1972.

Labor: The President March 12 nominated Washington state Sen. **John H. Stender,** R, to be assistant Labor secretary (occupational safety and health), succeeding George C. Guenther. Stender, 56, of Auburn, Wash., has been a state senator since 1962 and international vice president of the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers (AFL-CIO) for the Northwest region since 1958.

Transportation: Mr. Nixon March 6 nominated **Robert T. Monagan Jr.** to be assistant Transportation secretary (congressional and intergovernmental affairs). Monagan, 52, of Tracy, Calif., has been a member of the California Assembly since 1961, serving as speaker (1969-70) and Republican leader (1965-68, 1971-73). He has also been a partner in the Monagan-Miller-McInerney Insurance Agency since 1955.

CAB: The President nominated **Lee R. West** March 12 to be a member of the Civil Aeronautics Board for a term expiring Dec. 31, 1978. West, 43, of Ada, Okla., has been a district judge in Oklahoma's 22nd judicial district since 1965. He will succeed Robert T. Murphy, whose term on the five-member board expired Dec. 31, 1972.

Commerce: President Nixon March 14 nominated **Betsy Ancker-Johnson** to be assistant Commerce secretary (science and technology), succeeding James H. Wakelin Jr., who resigned in August 1972. Mrs. Ancker-Johnson, 43, of Seattle, Wash., has been with the Boeing Co. in Seattle since 1961, most recently as an academic/science adviser to the Research and Engineering Group and as head of the advanced energy systems for Boeing's Aerospace Group. Since 1964 she has been a professor of electrical engineering at the University of Washington.

Commerce Secretary Frederick B. Dent March 13 appointed **Jeb S. Magruder** to be director of the Commerce Department's Office of Policy Development. Magruder, 38, of Santa Monica, Calif., had been deputy communications director and special assistant to the President since October 1969. During 1972 he was deputy director of the Committee for the Re-election of the President and executive director of the Inaugural Committee. He will succeed James L. Mitchell, who was confirmed March 15 as HUD general counsel.

Interior: Secretary Rogers C. B. Morton appointed **Duke R. Ligon** March 13 to be director of the Interior Department's Office of Oil and Gas, succeeding Gene P. Morrell, who resigned in December. Ligon, 31, of Houston, Tex., had been an adviser (oil and gas) to the Treasury Secretary since May 1972. From 1970 until joining Treasury, he was an administrative assistant with the Continental Oil Co.

Linda E. Demkovich

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Correction

Vol. 5, No. 10, p. 343 identified Lawrence M. Kushner as leaving the Administration. With the National Bureau of Standards since 1948, and acting director since May 1972, Kushner has resumed his post as deputy director.

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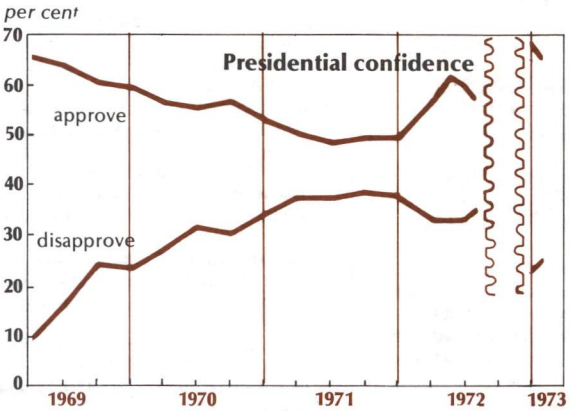

Budget deficit

Federal budget outlays will exceed receipts for fiscal 1973 by $24.8 billion, according to a revised estimate in the President's budget submitted to Congress Jan 29. The Joint Committee on the Reduction of Federal Expenditures reported Oct. 23 that outlays will top receipts by $30.8 billion.

Consumer prices

The Consumer Price Index rose 0.3 per cent in January to 127.7 per cent of the 1967 average, the Labor Department reported Feb. 22. The index rose 0.5 per cent after seasonal adjustment. During the 14 months since the start of Phase 2 economic controls, the index has risen at an annual rate of 3.7 per cent, compared with 3.8 per cent in the nine-month period before the August 1971 wage-price freeze.

Crime

Serious crime increased 1 per cent during the first nine months of 1972 as compared with a 6-per cent increase during the same period of 1971, the Federal Bureau of Investigation reported Dec. 28. Of the two categories of serious crimes, violent crimes rose 3 per cent and property crimes did not change.

Economy

The Commerce Department's composite index of leading economic indicators increased 1.2 per cent in January from the revised December index of 153.3 to 155.1 per cent of the 1967 average, the department reported Feb. 27. Six of the eight components improved—initial claims for unemployment insurance, industrial materials prices, stock prices, price-labor cost ratio, contracts and orders for plant and equipment, and new orders for durable goods. Two components declined—average workweek and building permits.

This page records the current level of 12 economic, social and business indicators. Recent data is charted at the top of the page and all items are updated regularly. (For additional background on each of the indicators, see Vol. 5, No. 2, p. 66e.)

GNP

The Gross National Product rose $30.9 billion in the fourth quarter of 1972 to $1,194.9 billion in current dollars, on a seasonally adjusted basis, according to revised figures released by the Commerce Department Feb. 20. In 1958 dollars, GNP rose $15.5 billion to $811.6 billion. GNP in 1958 dollars increased at an annual rate of 8.0 per cent in the fourth quarter, up from the 6.3-per-cent rate achieved in the third quarter of 1972.

Housing

Privately owned housing starts decreased 2.0 per cent from January to February to a seasonally adjusted rate of 2,444,000, the Commerce Department reported March 16. The department also revised upward its January rate to 2,496,000. It revised upward its December rate to 2,369,000.

International trade

The United States imported $303.8 million worth of goods more than it exported during the month of January, the Commerce Department reported Feb. 24. This is a decrease of 45.1 per cent from the revised December deficit of $441.1 million. The January totals brought the U.S. trade deficit for 1973 to $303.8 million, the department said.

Presidential confidence

In a Gallup Poll conducted Feb. 16-19, 65 per cent of those polled said that they approved of the way Richard Nixon is handling his job as President. Twenty-five per cent said that they disapproved and 10 per cent said they had no opinion. *(See chart.)* The President's highest rating was 68 per cent in January, to match that of November 1969, and his lowest rating was 48 per cent in June 1971.

Production

Industrial production during February rose 0.8 per cent from January's revised level of 119.9 per cent of the 1967 average, the Federal Reserve Board reported March 16. The February level of 120.8 is 9.8 per cent above that of a year ago, the board also said.

Unemployment

Unemployment in February was 5.1 per cent of the labor force, equal to January's revised figure of 5.1 per cent, the Labor Department reported March 9. *(See chart.)* Total employment increased 572,000 to 83,127,000 seasonally adjusted, the department also said. The Conference Board reported March 7 that its help-wanted index advanced in January to 120 per cent of the 1967 average from December's revised level of 117, seasonally adjusted.

Welfare

The number of persons receiving public assistance decreased 0.05 per cent in October from 15,182,000, the HEW Department reported Mar. 5. 15,099,000 persons received public assistance in October, an increase of 5.9 per cent above October 1971. Expenditures for public assistance increased from $1,641,617,000 in September to $1,660,850,000 in October. This increase in expenditures in October reverses a one-month decrease.

Wholesale prices

The wholesale price index increased 1.9 per cent in February from 124.5 in January to 126.9 per cent of the 1967 average, the Labor Department reported March 8. The industrial-commodities component of the index rose 1.0 per cent in January to 121.3 per cent. The department also reported that the seasonally adjusted index for all commodities rose 1.6 per cent. During the first part of Phase 3 economic controls, the index for all commodities rose 1.6 per cent. During Phase 2 economic controls the index for all commodities rose at an annual rate of 7 per cent.

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Full employment *by Daniel J. Balz* 443

Full employment generally refers to a situation in which everyone willing and able to work can find a job. But at what point does this exist? The President's Council of Economic Advisers promised an analysis of the matter for its 1973 Economic Report. The analysis was not in the report, which said only that an unemployment rate of 4.5 per cent by the end of 1973 was an appropriate goal. The council did, however, complete an analysis and a chapter was drafted for the Economic Report. The unused chapter suggests that changes in the composition of the work force might make it necessary to use a jobless rate of 4.5 per cent as a full-employment rate.

Fighting crime *by Judith Axler Turner* 450

The federal government's biggest anticrime program will come to an end June 30 unless Congress renews authorization for the five-year-old Law Enforcement Assistance Administration. The LEAA is not in any serious trouble, even though Members of Congress have railed at it in the past.

NSF's new role *by Claude E. Barfield* 460

Under President Nixon's reorganization of the executive branch, the National Science Foundation was designated adviser to the Administration for a federal research and development budget of more than $17 billion. The move has prompted misgivings among leaders of the scientific community who question whether the small NSF, a second line agency that has been primarily a dispenser of grants, will have the ability to handle its new assignment.

CAB selection process *by Dom Bonafede* 467

In picking Oklahoma Judge Lee R. West as a member of the Civil Aeronautics Board, President Nixon has stirred industrial and political circles into a debate that could erupt into a public controversy. Sponsored by Sen. Henry Bellmon, R-Okla., and House Speaker Carl Albert, D-Okla., West would succeed Robert T. Murphy, a consumer-oriented board member who incurred the displeasure of American Airlines.

Federal road show *by Joel Havemann* 470

Regional administrators of federal programs for cities and states are visiting local officials with whom they work in an effort, they say, to explain President Nixon's fiscal 1974 budget. Equally important, however, is another reason for the federal road show—the effort to build support for Mr. Nixon's revenue sharing proposals.

Trade sanctions *by Richard S. Frank* 472

International sanctions against nations unwilling to reduce their chronic balance-of-payments surpluses are part of the Administration's proposals to reform the international monetary system. Congress will be asked to authorize the President to impose higher tariffs and other trade restrictions as unilateral U.S. actions.

Economic Report/JEC recommendations refuel debate over appropriate full-employment target

by Daniel J. Balz

Recommendations in the 1973 annual report of the Joint Economic Committee of Congress (JEC) have refueled a protracted debate over a clear definition of "full employment."

The phrase—abstract, symbolic and politically sensitive—traditionally refers to a situation in which all persons willing and able to work can find jobs. The level at which "full employment" is considered to exist is a major factor in determining national economic policy, and affects not only the ease with which people can find work, but the price of goods and services as well.

The JEC recommendations (which reflect the ideas of the Democratic majority) released March 26, call for a reduction in the unemployment rate to 4.0 per cent—the commonly accepted level of full employment—by the end of 1973, and set 3.0 per cent as an appropriate long-range full-employment target.

Those recommendations are in direct conflict with the ideas of the President's Council of Economic Advisers. Its annual report, released in January, said that an unemployment rate of 4.5 per cent by the end of 1973 was appropriate, considering other economic goals. More important, the council refused to quantify either an interim or long-range target level at full employment, arguing that because of various changes in the composition of the nation's work force, trying to define full employment in terms of a single number was both foolhardy and impossible.

Council: The council devoted most of 1972 to studying the full-employment issue, trying to resolve to the satisfaction of the JEC and itself two fundamental questions:

- Has the traditional balance between inflation and unemployment worsened, implying a higher rate of inflation at any given level of unemployment?
- If the balance has worsened, has the level of purely cyclical unemployment, which is affected by aggregate demand, risen so high that national economic policy cannot lower it to the traditionally acceptable level of 4.0 per cent without forcing intolerable inflation?

In the January 1972 Economic Report, the Council of Economic Advisers said the questions were "highly relevant to future economic policy. The Council . . . will be making an intensive study of them during 1972, with the assistance of experts from other agencies of government."

In October 1972, testifying before the Joint Economic Committee, Council Chairman Herbert Stein was asked by his most persistent critic, Sen. William Proxmire, D-Wis., what the study showed.

"We are not prepared to state the conclusions of that study today," Stein said. "The study is going forward. A number of people on our staff under Mr. Solomon's (Ezra Solomon, who is leaving the council to return to Stanford University) direction are working on it. We will have more to say about it in our report."

"That was almost a year ago," Proxmire said.

"Well," Stein said, "we have several months before our 1973 report comes out."

But when the 1973 Economic Report was released in late January, there was only a prediction of where the unemployment level would be at the end of 1973: 4.5 per cent. Missing was an analytical study of the problems which had touched off the debate over the Administration's economic priorities.

Consequently, the Democrats on the committee specifically requested the CEA to study "all major changes in the labor market" during the past 20 years.

Draft chapter: The council, however, prepared a study draft, totaling 59 pages of typescript, as a chapter for the 1973 Economic Report. But it was not included, said Solomon, "because it did not lead to any specific policy recommendations."

Solomon described the chapter as an "educational tool for the public" better suited for textbooks than for the Economic Report of the President.

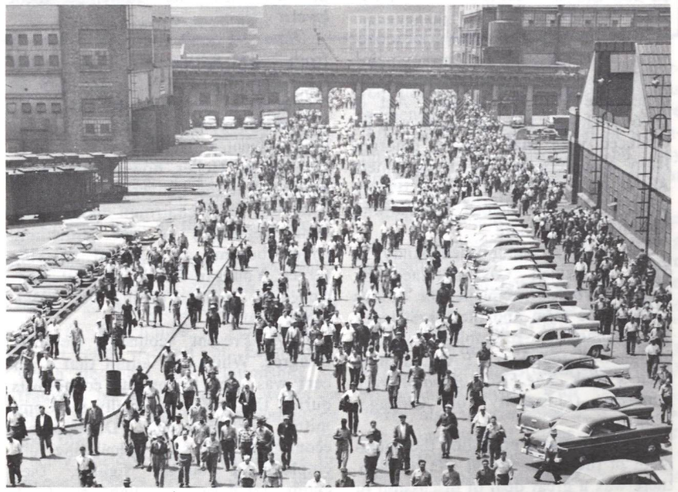
Another CEA staff member said the draft chapter had been circulated among various government agencies for comments and criticism. He said it was not published, in part, because "we didn't feel we had come up with anything new."

He said the report had been a "very thorough review of the economic literature" on the subject, and that it had confirmed what other economists already had shown.

Just what other economists have proven, however, is a matter of considerable dispute, as evidenced by the passion exhibited during hearings of the Joint Economic Committee by CEA members, Proxmire, Rep. Henry S. Reuss, D-Wis., labor leaders and professional economists.

The council's unpublished study says that because of various changes in the composition of the nation's work force—primarily more participation by women and teenagers—the level of purely cyclical unemployment has risen above the 4-per cent level which was commonly accepted in past years. The study does not precisely quantify how much of a shift has occurred, but suggests a level more than 0.5 per cent higher than before.

Those findings, based on an analysis of unemployment figures produced by the Bureau of Labor Statistics (BLS),



Automobile workers leave the Ford Motor Co. plant in Dearborn, Mich.

coincide with statements by Stein and Solomon, who have refused to specify a level of "full employment." They offer the first official analysis justifying the Administration's argument that trying to reduce unemployment to 4 per cent using only macroeconomic policy would touch off more inflation than the nation could tolerate. (Macroeconomic policy refers to government actions intended to affect the national economy as a whole. Its principal tools are fiscal policy and monetary policy. An alternate approach is "microeconomic policy," which is designed to affect specific sectors of the national economy.)

Background

Just what a national commitment to "full employment" means is disputed by Nixon Administration economic advisers and their critics. The phrase traditionally referred to a situation in which every person willing and able to work could secure a job. Excluded is what economists call "frictional" or "transitional" unemployment, people either moving between jobs or out of work due to imperfections in the labor market.

Since the early 1950s, the commonly accepted rate of unemployment at a "full employment" level has been 4.0 per cent of the work force. Since the end of World War II, the average rate of unemployment has been about 4.5 per cent. Current figures show an overall unemployment rate of 5.1 per cent. Each percentage point in the unemployment rate accounts for about 806,000 people.

Most participants in the debate over what constitutes "full employment" point to a 1946 law often mistakenly called the Full Employment Act of 1946. Although the legislation was introduced with that title, it emerged from Congress as the Employment Act of 1946 (60 Stat 23). That semantic difference has helped confuse and complicate the debate.

The CEA's unpublished study, a copy of which was obtained by *National Journal*, explains the origins of both the term and the target level. The explanation resembles a similar explanation found in CEA Chairman Stein's book, *The Fiscal Revolution in America* (University of Chicago, 1969).

"In the debates preceding the enactment of the Employment Act of 1946, there was a great deal of discussion of the meaning of the term 'full employment,' as the goal was initially stated," said the CEA study. "In the end, Congress not only abandoned the term 'full employment' in favor of 'maximum employment,' but also refrained from providing either a conceptual definition or numerical standard of 'maximum employment.' Given the lack of data then available, we believe that Congress was wise in this approach."

In his testimony and his book, Stein stressed that while maximum employment was one goal of the act, there were two others: maximum production and maximum purchasing power (or minimum inflation). He said this trio of goals makes it necessary to balance the nation's drive to reduce unemployment with the avoidance of inflation.

But to Democrats such as Proxmire, the act meant something different. To them, both "full employment" and a target of 4 per cent are as appropriate now as they ever were. When Stein pointed to the other two goals of the act, Proxmire said:

"But as you know, Mr. Stein, the Employment Act is not called the Price Stability Act, it is not called the Production Act; it is called the Employment Act for a very good reason. The principal concern of Congress was to achieve a low level of unemployment and full utilization of our manpower resources, and we have not achieved that."

Origin of 4 per cent: There is nearly as much disagreement over how the nation came to use 4-per cent unemployment as the full-employment level.

Okun—"I don't know where it came from," said Arthur M. Okun, former CEA chairman (1968-69) and now an economist at the Brookings Institution in Washington. "The Democrats didn't invent it. Heller didn't invent it. (Walter W. Heller, now an economics professor at the University of Minnesota, was CEA chairman under President Kennedy.) It was something which became a practical working target. You can find 4 per cent mentioned in reports during the Eisenhower years."

CEA—Present council members disagree. While they admit that 4 per cent was used by private economists during the 1950s, especially by Committee for Economic Development economists who were calculating full-employment budget figures, they claim that it first saw light in a CEA report in 1961.

"The first time the council put forward a figure was in 1961," Solomon said. "They said we think the employment rate can be raised to 96 per cent. There were many studies done at the time. It looked kind of right. I think they were right."

The CEA's unpublished analysis said that the first 16 reports of the Council of Economic Advisers do not mention any numerical unemployment rate as representing either full employment or a target of policy.

In a 1961 statement, released shortly after President Kennedy's council under Heller took over, the 4-per cent unemployment figure was offered as a target. The council said that while that level had not often been achieved during the 1950s, "the fault lies in our poorer marksmanship." (The average level of unemployment in the post-World War II years has been around 4.5 per cent.)

In its 1962 annual report, the council reaffirmed its faith in the 4-per cent level as an "interim target," and said that "further expansion for goods and services, and for labor to produce them, would be met by only minor increases in employment and output and by major increases in wages and prices."

In other words, 4 per cent remained a breaking point. A lower rate would lead to an inflationary spiral so acute—without reducing the level of joblessness—that it was not worth the economic pain to stretch macroeconomic policy beyond it.

Heller—Walter Heller said the 4-per cent target chosen by his council had "lots of antecedents." His council had studied various relationships, he said, and agreed that 4 per cent was a fair full-employment level.

"We looked at the problem from several perspectives," he said recently, "and 4 per cent seemed to come up on all sides. In those days, we estimated that 4 per cent would bring about a 2-2.5-per cent rise in prices. That seemed reasonable."

Change—The unpublished CEA analysis said that the Heller council noted that "circumstances could affect the rate that should be considered a prudent employment target for stabilization policy and suggested that changes in composition of the labor force was one factor that could influence the 'prudent rate.' "

Citing those changes in composition as evidence, the current council has argued that even if 4 per cent once was an appropriate target, it no longer is, and that it is as much as half a point higher. Beyond that level, the council has said, monetary and fiscal policy can have little effect, other than to boost inflation.

Disagreement: Almost on a purely partisan basis, economists, politicians and policy makers who might agree that shifts in the composition of the work force have taken place, disagree vehemently over whether that means 4 per cent is now an inappropriate full-employment target.

The Nixon Administration, conscious of the vicious problems inflation caused in 1971, has chosen to live with higher unemployment as the cost of more price stability.

Democrats argue that instead of tolerating more unemployment to keep inflation down, the nation is—and should be—willing to tolerate more inflation to keep more people employed. And when the Senate okayed a year's extension of the Economic Stabilization Act of March 20 (S 398), but Amendments of 1971 reaffirm the 4-per cent level as the national target was added.

Phillips Curve—Both groups center their arguments around an equation known as the Phillips Curve, named after A. W. Phillips, an economist at the London School of Economics, which describes the relationship, or tradeoff, between prices and wages on the one hand and unemployment on the other. Phillips argued that reducing unemployment required an increase in prices. After a certain point, the tradeoff was not worth the cost.

Most of the participants in the current debate agree that the tradeoff has worsened—that there is now more inflation at any given level of unemployment than in the past—but they disagree on the amount of either that should be tolerated.

"This remains," Okun said, "the most ideological question among economists. Tell me how a person stands on the question of pressure and I'll tell you how he votes and how he thinks about a lot of other questions."

Perry article—There have been a variety of private studies suggesting a worsening tradeoff, with George L. Perry, also an economist at Brookings, the acknowledged leader in the field. His article "Changing Labor Markets and Inflation," published in 1971 in the *Brookings Papers on Economic*

Democrats Say Phase 3 Hurts Job Rate

Elimination of most mandatory wage and price controls under Phase 3 has significantly damaged the chances of the Nixon Administration to lower inflation to a 4-per cent "full employment" level, say former members of the Council of Economic Advisers and Democratic critics in Congress.

In recent interviews, two former CEA chairmen, Walter W. Heller, now an economics professor at the University of Minnesota, and Arthur M. Okun, an economist at the Brookings Institution in Washington, D.C., argued that because Phase 3 is weaker than Phase 2, it will not be able to control inflationary pressures adequately. That, in turn, will force the Administration into more restrictive monetary and fiscal policies. These restrictive policies to reduce inflation are the opposite of policies designed to lower national unemployment.

Agreeing with Heller and Okun, but embellishing their views with more political overtones, were Sen. William Proxmire, D-Wis., and Rep. Henry S. Reuss, D-Wis., two Members who have pressed the Administration over full employment.

Heller said a tough incomes policy, "one with clout," is the "single most important scheme for improving the tradeoff" between unemployment and inflation.

"I think Phase 3 is structurally good, but it is really a Phase 4," he said. "It was premature. It has many of the earmarks of a longer-run wage-price guideposts policy with clout which we could hold in place to make 4-per cent unemployment an achievable full-employment goal. He called Phase 3 too weak, adding, "now, that was partly a public relations fiasco in which Phase 3 was made to sound much more voluntary than it really is. But they've never really recovered, and it is awfully hard to restore credibility and conviction once it has been destroyed. If they were to put a freeze on food prices, then the system might carry conviction."

Okun said that while he had "no debate over the Administration's over-all stance of their policy this year," he said he differed sharply "on my willingness to put up with a tougher and longer-term wage-price program.

"You've got to be on their wavelength for 1973," Okun said, "whether you believe the target for unemployment is 4.0 or 3.5 or 3.0 per cent, because you can't get there unless you move gradually."

But Okun said once at full employment, the economy needed a foundation of manpower programs and a tough incomes policy to move unemployment even lower, and that Phase 3 failed to provide it.

Reuss criticized the Administration for not being willing to attack the inflationary problem. "They are still inadequate on the inflation side because they won't use Phase 3," he said. "The weaker Phase 3, the worse the tradeoff. You don't stop inflation by overdoing monetary and fiscal restraint and putting the economy back into a recession. Yet they're tempting themselves again to try the recession path, which failed earlier. So I advocate direct controls so you don't have to overdo the monetary and fiscal brake." He introduced legislation (HR 5803) on March 19 to freeze prices at their March 16 levels.

Proxmire took a slightly different path to reach the same point. "A large part of our inflation is not connected with labor-market problems," he said. "I think there are monopolistic elements and concentrations that have gotten more intense which give us more inflation.

"Phase 3 only exacerbates the problem. I think we're really in for trouble. Inflation is going to be very serious over the next six months, and the effort to choke it off could lead to a recession and more unemployment next year."

Ezra Solomon, the CEA member who has worked most closely with the unemployment problem, termed this argument a "non-sequitor to which I cannot really reply."

He said the change in the tradeoff between unemployment and inflation that the Administration has been discussing "is a permanent one," while any change based on Phase 2 or Phase 3 would not be permanent.

Activity, helped start the debate, and his work has been subject to differing interpretations, including one that says 4 per cent is no longer an appropriate full-employment target. Perry disagrees with that interpretation of his work.

There have been other studies, including reports submitted to the Joint Economic Committee, which have described the various changes in the composition of the work force, but there has been nothing "official" from the Council of Economic Advisers.

That is why Proxmire showed so much interest in the work of the council, and why the unpublished report offers at least a semi-official rationale for the policies of the Nixon Administration.

CEA findings

"We looked at the problem from a lot of different angles," said a CEA staff member who did not want his name used. "What you could say is that we did a thorough review of the literature on the subject."

The fundamental conclusion of the study said:

". . . The 4-per cent rate used by the council in the 1960s cannot be regarded as an objective or precise guide for the future. Rather, it is a useful indication of the probable zone toward which expansionary macroeconomic policies can safely steer the economy in years ahead.

"The actual limits of macroeconomic instruments in the early 1970s will depend on two as yet unknown factors: the extent to which institutional changes in the economy have altered the probable level of purely non-cyclical unemployment on the one hand and the future response of wage-price-productivity behavior to high employment on the other.

"The implication for the conduct of future macroeconomic policy is that once the economy approaches the zone of purely non-cyclical unemployment, the use of any explicit numerical target for unemployment, as a single guide to policy formulation would be counterproductive. If in fact the unknown 'correct' level of achieveable unemployment is below the target selected, expansionary policy would be halted prematurely; if the reverse were true, it would be pursued unwisely, and thus risk inflationary distortions that culminate in an economic downturn."

Organization: The council studied un-

Arthur M. Okun

employment figures in many different ways—it looked at over-all averages historically and studied labor-market fluidity and the duration and frequency of unemployment over a period of time. It studied geographical differences within the United States, compared U.S. patterns with those of other countries, analyzed shifts in the average unemployment rate caused by better education and fewer seasonal influences and analyzed the effects of more participation in the work force by women and teenagers.

Historical patterns—The study indicates a difference in the average level of unemployment in defense-dominated years. A paragraph crossed out in one draft copy said: "Subject to the limitations outlined above, the level of non-cyclical unemployment lies between 2.7 and 4.3 per cent. Excluding the periods of extraordinary defense-related employment, the level of purely non-cyclical unemployment between 1954 and 1965 appears to lie between 4.00 and 4.25 per cent."

Age-sex changes—The study said that changes in the composition of the work force are the most significant cause of the increase in the full-employment level. "Clearly, the change since 1955 in age-sex composition alone had added 0.3 percentage points to the unemployment rate for 1965," the study stated.

"The shift in composition after 1965 has been even more rapid than it was in the decade before 1965. The specific rates experienced in November 1972 would have averaged out to an over-all rate of 4.4 per cent with the 1955 age-sex composition. In fact, with the sharply changed composition, it averaged out to 5.2 per cent.

Education, seasons—The study said the level of education and seasonal-employment factors had the opposite effect of age-sex changes on the employment rate. It said seasonal employment reduced the average unemployment rate by "perhaps 0.1 percentage point."

The study said increased education among workers also had helped to reduce purely the non-cyclical rate of unemployment, "but the net effect has not been measured." Solomon described the effect as "trivial."

Dispersion—The study found that the difference in unemployment suffered by various groups had widened since 1955 when the teenage-unemployment rate was 3.5 times higher than the rate for males 25-54. By 1972, the unemployment rate among teenagers was almost 5.5 times higher.

The study said that changes in the definition of what constitutes unemployment had affected the rates of various groups. "But even after an appropriate allowance is made for definitional changes, differences among age-sex unemployment rates have widened since the 1950s," it said.

Distribution—Teenagers, blacks and women suffer the greatest levels of unemployment, the study reports. It blamed part of this, at least for women and teenagers, on their more frequent movement into and out of the labor force than men.

"In 1971, 88.0 per cent of all men were in the labor force for 50-52 weeks. While a majority of women and teenagers were in the labor force at some time during the year, the proportions remaining in . . . for the entire year were much smaller, 38.2 and 20.2 per cent respectively."

Partially explaining this, the study said that "many among the teenage and female unemployed do not seem to search with the same intensity as do adult men. Indeed they seem to view their own labor-force status with some ambiguity."

The study said strikingly different levels of teenage and female unemployment were found when the CEA compared the results of the monthly Bureau of Labor Statistics household survey (used to calculate the monthly level of employment) and an annual "work experience" survey, which asked participants to review the previous year.

"Women, and even more so young people, report much less unemployment when asked to recall the experiences of the preceding year than they do in the monthly surveys," the study said. "In contrast, adult males report slightly more unemployment in the work-experience survey."

Fluidity—The study said available data shows "considerable turnover in employment and unemployment." In 1969 an average of 77.9 million persons were employed during any given month; yet 92.5 million persons held jobs during the year, and 93.6 million persons actually participated in the labor force at some time (including 1.1 million who moved in and out of the labor force without working). If those 1.1 million were included, about 11.7 million persons, or 12.5 per cent of all participants in the labor force, experienced some unemployment in 1969.

Duration—"Most of the 11.7 million . . . suffered relatively short spells of joblessness. . . ." The study reported that 74 per cent of those 11.7 million were unemployed for fewer than five weeks, while about 570,000 were unemployed 27 weeks or more.

The study later said that "around 65 per cent of non-cyclical unemployment in 1969 was associated with fluidity and partly voluntary movement into and out of the labor markets and employment. The remaining 35 per cent, which represents an average level of about 1 million persons, represents unemployment due to layoffs or the loss of jobs."

Geographic—The council found that unemployment levels vary in different areas of the country. San Francisco, for example, suffered a consistently higher rate of unemployment than New York or Washington. The study said, ". . . some of the persistence merely reflects the fact that the underlying demographic, industrial, occupational, seasonal and other forces are themselves long-lived."

But the study also said that workers may migrate to high-wage, high-unemployment-rate areas. "From a search point of view, the probability of landing a job is lower, but if one is successful, the payoff is higher."

International—"The U.S. has shown a rather persistent tendency to have one of the highest unemployment rates among the highly industrialized nations," the study said.

It blamed this in part on faster growth in the U.S. labor force. ". . . With everything else being the same, the United States would tend to have a higher unemployment rate than (France, West Germany, Japan and Sweden) because its faster labor-force growth rate means that its labor force contains a larger proportion of new entrants, who as a group have relatively higher unemployment rates."

The study also said that turnover in other countries is likely to be less than in the United States, and that the rates for various groups within the labor force are significantly different. Teenagers, especially, had lower unemployment abroad than in the United States.

Another difference cited by the study is that a worker in another nation may be kept on a payroll during slack times, even if he is not really working, while in the United States the worker is likely to be laid off. "If he (the American worker) collects unemployment compensation and is covered by a collective-bargaining agreement which provides 'supplementary unemployment benefits,' then there may be no real difference between his situation and that of a foreign 'permanent' worker—except that the laid-off worker would be counted as unemployed."

Measuring current levels—The study said that because of the various changes in the composition of the work force, the official unemployment rate may give a misleading picture of labor-market tightness. It argued that even though the November 1972 unemployment rate was 0.8 percentage points higher than in 1955, "the market for adult men 25 years and older, who comprise about 50 per cent of the labor force, was clearly tighter in 1972 than it had been in 1955."

Conclusions: "What we are saying," Solomon said, "is that there is no one number; you cannot look at one and forget the others.

"We are saying that when Congress refused to put maximum employment in terms of a single number, they were right. You can't do it any more for that than you can for beauty. It is a condition. You know what it is when you're there. You know prosperity, you know inflation. One looks at the constellation of variables."

Dispute

Part of the misunderstanding in the debate over what full employment is involves the interconnection between what can be done to reduce joblessness only through macroeconomic policy and what must be done with manpower and other structural programs. For the most part, the Nixon Administration has hinged its arguments of a worsening tradeoff on the issue of macroeconomic policy. Critics accuse the Administration of failing to lower unemployment either way.

(A report on the Administration's manpower proposals will be in a subsequent issue of National Journal.)

There are other economists and politicians who also question the hypothesis that the tradeoff between inflation and unemployment has worsened. Both they and those who might agree with the evidence offered to support that idea, however, question the Administration's commitment to lower unemployment levels.

Macroeconomic influences: "Our task, with macroeconomic policy," Solomon said, "is to get the economy to the zone of full employment, defined as the potential capacity of operations of gross national product, and to get it there in a manner that once we get there we can keep it there—which we have never done in the United States.

"So we're not going to get caught on any single criterion or number. There are many variables involved. We're not saying that whatever the rate is, that when we get there to paradise and see what it is, that it is sacred in any way. We can reduce it, but not by macroeconomic means. Macro would be the wrong tool for that. We've been saying that, but then I don't know of any single academic economist who has been saying otherwise."

Solomon also said that Administration critics were more interested in rosy predictions than accurate projections and a period of stable, full employment.

"It seems to me there is a preference to have the council say every year, 'We're going to get unemployment down to 4 per cent.' It must be a fixation. We get criticized for making a highly accurate forecast because it wasn't ambitious enough. Is it the function of a forecast to be ambitious or to be accurate?

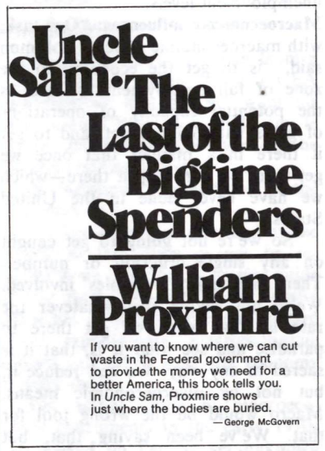
"Nobody criticized the Heller council—they were going to get it down to 4 per cent in 1963 and it went up—because their heart was in the right place. Well, do you want results, or do you want yak?

"In February 1962, at the time their report came out, the unemploy-

One Good Story Deserves Another

Herbert Stein, chairman of the President's Council of Economic Advisers, has been a frequent visitor to the Joint Economic Committee of Congress during the past few years, and his appearances have sparked some of the most memorable and humorous exchanges found in the voluminous and often dry pages of testimony published by congressional committees.

Most often his exchanges have been with Sen. William Proxmire, D-Wis., JEC chairman in the 92nd Congress and currently vice chairman of the committee.



"It is $6.95."

In October 1972 the two debated the full-employment question. Ironically, it was the Employment Act of 1946, the law which has served as the springboard for much of the dispute, which created both the JEC and the CEA.

Both men—the witty and often irreverent Stein and the aggressive, penetrating Proxmire—were in top form that day. Their discussion included the following excerpts:

Proxmire: "The fact that you are able to put 2.5 million more people to work in a larger country with an expanding population is something that is an achievement all right. But when you are saying you are holding unemployment at a recession level, it seems to me it is disappointing and can only be classified as a failure."

Stein: "Well, Senator, you remind me of a story about the Jewish mother who gave her son two sweaters for his birthday. She saw him one day wearing one of the sweaters and she burst into tears. He said, 'What is the matter, Mom?'

"She said, 'What is the matter, you didn't like the other sweater?' "

Proxmire: "That is a good story, except we are not wearing either one of the sweaters. We are using them to wipe off the car."

Later, Proxmire tried in vain to get Stein to set a figure as the level of full employment, and it produced this exchange among them and Ezra Solomon, another CEA member:

Stein: "In our first Economic Report we set forward a goal of 3.8 per cent in February 1970. What we are trying to get away from is the notion that the unemployment rate at this moment or some other particular moment must be judged either a failure if it is above 4 per cent or a success if it is below 4."

Proxmire: "You called my attention to something I have forgotten, and I think this is very important. You said in your first economic statement, you made it 3.8 per cent. That is no longer a goal which you will stand by. You indicated on CBS, Mr. Solomon has indicated, Mr. (John B.) Connally (former Treasury Secretary, 1971-72) has indicated, you are not going to accept even a 4-per cent goal, let alone a 3.8-per cent goal."

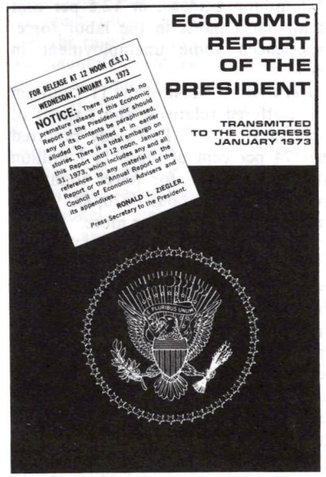
Stein: "But I am not going to accept a number bigger or smaller than that. If you like, I will accept 2 per cent. Two per cent is my goal."

Solomon: "Make it zero. I think it ought to be zero."

Proxmire: "Well, let's be serious about this."

In a later discussion, the Wisconsin Democrat tried to get Stein to discuss probable cuts in the fiscal 1974 budget, and that led to an exchange over the relative worth of their various literary ventures.

Proxmire: "I suggest if you are having trouble sleeping at night, and you want something which will help put you to sleep, you might read a book which I recently completed,



"We don't charge you. . . ."

published on October 6, called *Uncle Sam: The Last of the Bigtime Spenders.*

"I have a whole series of reductions which should take place, not only in the military but other areas. I recommend it to you."

Stein: "If you want to send me a copy."

Proxmire: "It is $6.95."

Stein: "We don't charge you for our reports."

Proxmire: "Well, I think that both reports are priced right."

ment rate was 5.2 per cent. They said 4.0 per cent was their target; that was their goal. Well if that was their goal, what were they doing for 30 months?"

Picking up a book containing the monthly figures over the past two decades, Solomon began reading the unemployment levels in 1963. They were all well above the 4-per cent target. ". . . And this goes on with dreary monotony for three years. What were they doing if they really believed that was the target?" he asked.

"This thing is complex. I think we oversimplify it by talking about specific numerical targets. They were not etched in stone. They may have been correct judgments. We prefer to say, 'Let's see what happens, if we get to 4.5 per cent and there is still some give in the economy and inflation is behaving itself, and wage pressures are not strong, there's no reason why it can't be pushed up a quarter or two beyond its normal growth rate, until we get to some zone that looks like reasonable capacity operations without stresses and strains and hope that we can slide in that path,' " Solomon said.

Critics: Administration critics fall into two groups. The first group says the tradeoff has not worsened, and therefore 4 per cent remains an appropriate full-employment target. The second group says that while the tradeoff may have worsened, that is no excuse to adopt a target higher than 4 per cent.

Research—The 1973 JEC annual report rejected the contention that age-sex changes in the workforce had worsened the tradeoff between inflation and unemployment, arguing that other changes had offset them.

"Our conclusion," the committee majority said, "is that available information concerning changes in labor market structure is not only deficient but misleading because disproportionate importance has been attached to changes in the age and sex composition of the labor force while equally important changes in average educational levels and in the occupational and industrial structure of employment have been ignored. There is no persuasive evidence that 4 per cent has become an unrealistically ambitious unemployment target. The intractability of inflation in the past few years stems not from labor-market changes, but from policy errors, such as the abandonment of incomes policy in early 1969, when inflation was so obviously a problem."

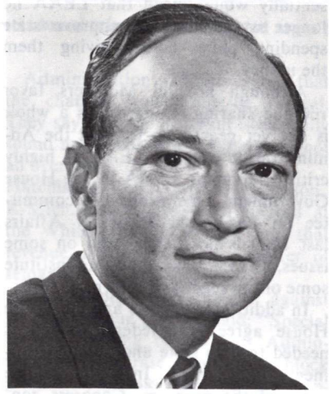
Former CEA chairman Okun said he does not accept the argument that because of the compositional changes, a low rate of unemployment among adult males represents a tighter labor market now than in the past.

"I see less turnover than before," he said, "so I think it is a somewhat easier labor market." That implies less inflationary pressure than the Administration argues.

Commitment—Perry's article that touched off the debate concluded with these sentences: "To choose a higher average-unemployment rate as a target for policy is to choose higher unemployment rates for all labor force groups. What is needed is not a way to rationalize unemployment, but a way to reduce it where it is now highest."

Perry said recently that he believes the Administration has chosen to rationalize the higher unemployment levels, rather than to attack the problem areas.

His Brookings colleague, Okun, agreed. "The question isn't whether it is easier or harder to reach full employment, but rather what your priorities are," Okun said. "There is a feeling among liberals that there is more to low unemployment than just job creation. There is more upward mobility, better jobs, more prosperity, plus a lot more output. The difference



Ezra Solomon

between 4.0 per cent unemployed and 4.5 is about $18-$20 billion in output.

"Adopting a high unemployment target as an insurance policy against inflation is a high-priced policy, which hasn't provided very good insurance. I'm amazed that everyone has accepted 3 per cent as tolerable inflation. We're adjusted to living with a higher rate."

Solomon said he accepted Okun's argument about increased prosperity, but said the real issue was not reaching a specific target number, but sustaining "maximum employment." He said employers "tend to create more jobs if they believe prosperity is sustainable. The challenge is how to create employment at both a high level and a sustainable level. Sustainability is what we're after."

Rep. Reuss, who has been one of the Administration's most severe critics on this issue, said the Nixon policies have not grappled with inflation or unemployment.

"Those idiots are practicing a vulgarized, bastardized version of Keynesian economics," he said. "They can only think of vastly overheating the sector of the economy which provides them with their campaign contributions, and then they hope for some trickle-down effect for the unemployed workers in the other sectors."

Reuss, a member of the Joint Economic Committee and the House Banking and Currency Committee, said the Administration fails to work on the inflation side of the Phillips Curve, as evidenced by Phase 3 *(see box, p. 445)*. "You have to work that side so you can have an expansive monetary and fiscal policy (to reduce joblessness)," he said.

The Wisconsin representative also criticized the Administration for using "silly 1965 policies when their own research tells them the problems are not 1965 problems."

Outlook

Ironically, there is some basis for agreement between Administration critics and CEA economists.

Okun, for example, said he thought the Administration's latest prediction that unemployment would be reduced to about 4.5 per cent by the end of 1973 was "about right."

"You've got to be on their wavelength for 1973, whether you believe the target for unemployment is 4.0 or 3.5 or 3.0 per cent. But the Administration wants no more than 4.5."

On the issue of a single-target number, Perry said that "if we knew more we wouldn't settle for a single number. Some people say 4 per cent is too low because we court too much inflation; others want lower rates. One view takes the market mechanism as too sacred, while the other side is a little blind to some of the realities of the labor market, which does exclude some workers."

Solomon, meanwhile, tried to counter Administration critics who say the Administration does not want to get below 4.5 per cent.

"We are now moving back toward full potential. The plan this time is not to cross it, but to just touch it. If we do reach potential and the unemployment number happens to be 3.8 per cent, I'm not going to say, we're going too fast, slow down. But if the number happens to be 4.4 per cent, I'm not going to say, we're going too slowly," he said. □

Justice Report/Congress holds past criticism in check as it considers revenue-sharing role for LEAA

by Judith Axler Turner

In keeping with his New Federalism policy, President Nixon is trying to get the federal government out of its close involvement with the local crime-fighting business.

Congress's mood is quiet on the issue. While there is agreement that the Law Enforcement Assistance Administration program will not be allowed to die, battle lines have not yet been drawn on how it should be allowed to live.

The federal government got into local crime fighting in a major way five years ago when it created LEAA to funnel federal crime-fighting money to state and local governments.

The LEAA is the federal government's biggest crime program, with a budget double that of the Federal Bureau of Investigation.

This year, with the LEAA authorization expiring June 30, the Nixon Administration proposes to modify the federal role somewhat by giving the states and localities a bit more money and a lot more discretion in spending it.

Last year, state spending of LEAA money came under great criticism by Congress, but that criticism has died down and the excitement has not resurfaced in the House hearings on the Nixon bill. *(For a report on the LEAA controversy, see Vol. 4, No. 5, p. 181.)*

The White House sent legislation (S 1234 and HR 5613) to Congress on March 14 that would change LEAA's block-grant format to a special revenue-sharing format. The House hearings began March 15.

The Administration bill would increase LEAA funding from the fiscal 1973 total of $855 million to $891 million for fiscal 1974.

(The actual outlays for LEAA will be $590.5 million in fiscal 1973 and are estimated by the Office of Management and Budget to reach $790.1 million in fiscal 1974. LEAA is allowed to spend its authorization over a three-year period.)

The present formula mandating that 85 per cent of general-purpose grants go directly to the states and 15 per cent be kept for discretionary spending by LEAA would be retained.

The change to revenue sharing essentially would mean that LEAA no longer would have to approve state spending plans before giving them the money.

Although not all Members favor revenue sharing, Congress as a whole is not yet geared up to fight the Administration over the LEAA. A highly critical report on LEAA by the House Government Operations Subcommittee on Legal and Monetary Affairs last May is no longer valid on some issues, as LEAA has moved to institute some of the suggested reforms.

In addition, Congress and the White House agree that federal money is needed to help state and local governments fight crime. In the first five years of the program, Congress consistently has authorized more money for LEAA than the President has requested.

Some Members of Congress, state officials and Administration officials say they feel that LEAA already is moving in the direction of more discretion for the states, and that therefore the Administration proposal is not a substantive change.

The essential question is whether, in the end, LEAA will be changed in law, in fact, or at all.

Washington, D.C., police gather on street near White House

Administration

Of all federal programs, the one administered by LEAA would have the shortest leap to revenue sharing.

The Nixon Administration inherited the program in a form already loosely tailored to the New Federalism concept that Mr. Nixon began enunciating two years later, in 1971.

Now the Administration is proposing to remove the few strings that keep the LEAA program from being a full-fledged model of revenue sharing.

Ironically, Congress, which has been cool to the revenue-sharing idea, was largely responsible for choosing this approach to fighting crime when it created LEAA through the 1968 Omnibus Crime Control and Safe Streets Act (82 Stat 197).

Although he called it "direct federalism," President Johnson's LEAA proposal was more like the typical categorical-grant program than the one that emerged from Congress. Categorical grants are narrowly targeted and the recipient agencies have little discretion in using the money.

Under the 1968 act, LEAA block grants go directly to the states to be spent by state and local agencies with the approval of LEAA.

Nixon bill: The Nixon proposal would remove the requirement for prior LEAA approval for spending of the state grants, which are distributed according to population.

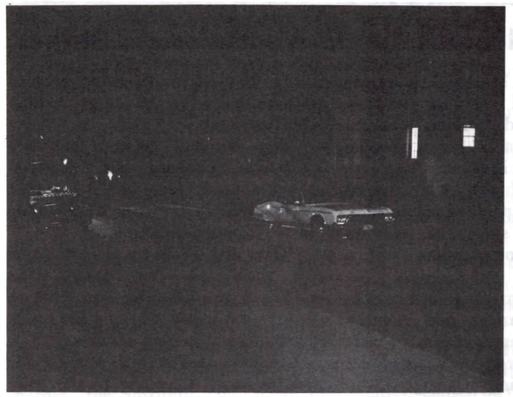
Other changes proposed in the legislation would:

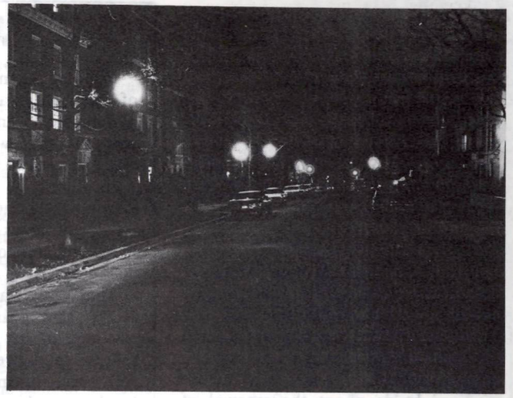
- remove matching requirements for the grants and add a maintenance-of-effort provision that would prevent state and local governments from using LEAA funds to cut back their own spending;
- remove the limitation on what portion of the funds may be used for salaries;
- drop LEAA's troika arrangement—in which the administrator and two associates must make majority decisions on policy—and give control to a single administrator;
- make the administrator responsible to the Attorney General rather than directly to the President;
- eliminate the requirement that states establish state planning agencies to draw up comprehensive plans and administer the spending of LEAA money and substitute a general requirement for "multi-jurisdictional planning and policy-development organization;"
- require that 50 per cent of the members of any planning body be elected local officials;
- require LEAA to comment on state plans (which must be submitted every three years) and make the comments public;
- add two new categories of allowable spending: diagnostic services for juveniles, and court-administration and law-reform programs within the civil courts;
- remove the requirement that a specific portion of block-grant money be spent for corrections.

"Applied to crime reduction, the New Federalism has meant, through the block-grant approach of the LEAA program, returning in substantial measure both tax funds and decision making to the levels of government where they belong," Attorney General Richard G. Kleindienst told the House Judiciary subcommittee in his testimony on the bill.

"The proposal for special revenue sharing for law enforcement will carry that process to its logical and most effective conclusion," he said.

Criticism: Some Members of Congress and others contend the changes are in name only and that LEAA already is doing what the legislation would have it do.





Dark streets breed crime . . . well-lighted areas curb crime

Administration officials agree that the changes would not be radical. They say that the program is basically sound and needs only a tuning up, not an overhaul.

Hutchinson: Rep. Edward Hutchinson, R-Mich., who introduced the bill at the White House's request, said that revenue sharing is "just a matter of semantics."

Hutchinson, who voted against general revenue sharing, said: "Special revenue sharing is just this Administration's phraseology for block grants." He said that he has supported block grants in the past.

Intriago: Charles A. Intriago, former general counsel to the House Government Operations Subcommittee on Legal and Monetary Affairs, which last year conducted the only major investigation of LEAA, said that the plan-review authority and the matching-fund requirements were "being neglected anyway."

"LEAA was not reviewing plans adequately," Intriago said. He cited the subcommittee's findings that states had changed plans after they were approved, and that LEAA either did not know or did not care about the changes.

Devine: Within LEAA there is agreement that the changes are not substantive. "We've always been pretty close to special revenue sharing anyway," said James T. Devine, assistant administrator, Office of Criminal Justice Assistance. (Devine heads the section that oversees the spending of action funds.) "Our main concern is that the states develop a comprehensive plan and that the planning procedure is good," Devine said.

Administrator: The White House is girding for a fight that may not come on one part of the legislation: the provision that would make the LEAA administrator responsible to the Attorney General, rather than directly to the President.

"It is not proper for a statute to delegate responsibility to anyone lower than a department head," said an Administration official who did not want to be identified.

"That's what's wrong with the Office of Education; the commissioner is not responsible to the HEW Secretary."

Troika—The fight over this proposed change may never materialize because Attorney General Kleindienst has not been subjected by Congress to the "soft-on-crime" criticism that was directed against Attorney General Ramsey Clark in 1968 when LEAA was created.

At that time, in order to bypass Clark, Congress set up LEAA in the Justice Department with a tripartite leadership that was enjoined from acting unless all three administrators agreed.

This arrangement was so unworkable that from the first everyone involved clamored for a change. In 1970, Congress amended the act and made an important change in the troika set up. The troika was modified so that the administrator needed the concurrence of only one of the associate administrators to act, and then only on matters of policy. The determination of "policy" matters was left to the administrator's discretion.

Santarelli—Mr. Nixon on March 19 nominated Donald E. Santarelli,

35, to succeed Jerris Leonard as LEAA administrator. Santarelli currently is associate deputy attorney general for criminal justice.

Leonard, who had been administrator since May 1971, resigned late last year but agreed to stay on the job until the LEAA bill went to Congress. *(For background on Leonard, see Vol. 4, No. 5, p. 185.)*

Congress

In marked contrast to the situation a year ago, when LEAA was a highly volatile subject on Capitol Hill, few Members of Congress appear agitated about the agency.

This tends to obscure what Congress might do about the renewal of LEAA's authority and the Administration's special revenue-sharing proposal for law enforcement.

One reason why Congress has calmed down is that LEAA during the past year moved to improve its effectiveness and eliminate some of the highly publicized abuses that aroused congressional anger. (One of them concerned the purchase of an airplane with LEAA funds for use by a former Governor of Indiana.)

Former LEAA Administrator Leonard, who helped to cool down the situation, says that he is concerned now about the lack of excitement.

"That's why government programs fail," Leonard said in an interview. "People say, 'It's working pretty good and we ought to leave it alone.' Government programs change every day, like people. To maintain the status quo would be a step backward. We are ready to move on."

Status quo: But whether the Administration wants it or not, the status quo is likely to be what it will get.

A Senate Judiciary Committee staff member, who did not want to be quoted by name, predicted that congressional hearings will show equal support for more and less federal control of LEAA programs, and that Congress will compromise on a bill that essentially preserves the status quo.

The Senate aide said that Members will try through categorical-grant bills to exert more control over the programs, while the Administration seeks to decrease control through revenue sharing.

A House Judiciary Committee staff member, who also declined to speak for attribution, said: "There is no question that no one will vote against funds for law enforcement. The question is not whether but how."

House hearings: The opening round of congressional hearings on the Administration bill provided few clues to the direction Congress will take.

Subcommittee 5 of the House Judiciary Committee, headed by Rep. Peter W. Rodino Jr., D-N.J., (Rodino also is the new chairman of the full committee), began hearings on LEAA March 15, less than 24 hours after the bill was introduced. Attorney General Kleindienst was the first witness.

Committee and staff members said in interviews that the subcommittee had no specific objectives in the hearings. Rep. Hutchinson generalized that the subcommittee wanted to investigate "how the LEAA has been working and what changes have been proposed."

In his opening statement, Rodino said: "The focus of these hearings, of course, will be the future of LEAA, but what we are really examining is the whole future of the federal leadership role in fighting crime."

A member of Rodino's staff said the chairman felt the question was: "Is special revenue sharing an abandoning of federal leadership, or is it the best way to ensure the money will be wisely spent?"

Another committee staff member said it was "unusually quiet."

"There was more noise the second and third year of the (LEAA) program, when we were modifying it, than there is now when the proposal is to change it," he said.

Senate: The Senate for the most part had its way in setting up LEAA. A combination of politics and strong leadership from Sen. John L. McClellan, D-Ark., chairman of the Judiciary Subcommittee on Criminal Laws and Procedures, made the LEAA essentially a Senate creature.

Any changes in the legislation probably will reflect the desires of McClellan and Sen. Roman L. Hruska, R-Neb., the ranking minority member of the Judiciary Committee.

"McClellan controls about 25 votes in the Senate, and Hruska another 15," a staff member said. "Between them they can get almost any bill passed the way they want it."

McClellan's position, according to an aide, will be to hold extensive hearings on LEAA, listen to all sides and then decide what is politically possible. (McClellan has not yet scheduled LEAA hearings.)

A staff member working on the legislation said: "I think they're going to look into LEAA and if they do it fairly they'll find it's working pretty well for a federal program. It's not perfect, but it's not terrible, either."

Hruska, who introduced a special revenue-sharing bill for LEAA on behalf of the President last year, also introduced the Administration bill by request this year. He said in an interview that he basically favors the major changes Mr. Nixon proposes. Hruska said it is "too early to say" whether the Nixon bill will be passed in the Senate, but said he was "cautiously optimistic."

According to some Senators and staff members, McClellan will not be able to devote much time to LEAA because of his involvement in the revision of the criminal code and his new responsibilities as chairman of the Appropriations Committee.

Missions for LEAA's National Institute:

One day when Martin B. Danziger of the National Institute of Law Enforcement and Criminal Justice was out of town, a large package was delivered to his office.

In it was a highly sophisticated viewing instrument designed to look into tight, dark spots and refer an image to someone standing quite a distance away.

That day, Danziger's former secretary sent Danziger her monthly envelope of the unused jam packets that were delivered with her sweet roll every morning. Danziger, who lunches at his desk, is a peanut-butter-and-jelly afficionado.

The institute staff, eager to try the shiny new machine, peeked into the envelope and identified the jam.

That was the only time the expensive machine was used.

"It was a $50,000 investment and we don't know what to do with it," Danziger said. "We gave the money, the contractor produced exactly what we asked for. It works. But we don't know what kind of problems it can solve. We're looking for a problem now."

Danziger said that the machine had been ordered before he got to the institute in October 1971.

New course: Danziger and his former boss, Jerris Leonard, administrator of the Law Enforcement Assistance Administration from May 1971 until March 18, 1973, set the institute on a different course. (Danziger heads the institute as an LEAA assistant administrator.)

"We've forced the institute to come up with a definitive plan, a rational basis for the things we do," Danziger said.

"The national institute has two purposes," Leonard said. "First, it has a support function. It's got to be involved in the over-all planning of this agency's direction.

"Over and above that, it has to be the spearpoint, the catalyst, the cutting edge—whatever you want to call it—out in front asking the tough questions and finding answers."

Congress sees a third purpose for the institute: according to the May 1972 report of the House Government Operations Subcommittee on Legal and Monetary Affairs, LEAA has to evaluate more of the innovative programs and pass upon the information gained in the evaluation. The institute is uniquely equipped to serve this function, the report said.

Grantsmen: This year, the institute's budget is $31.6 million, of which $6.4 million went to help finance the Office of Drug Assistance Law Enforcement in the Justice Department. Another $4.6 million went to a special narcotics program.

The remaining $22.6 million is available for administration of the institute's 80-person office and for research and development grants.

Institute staff members are not merely check writers and auditors. Danziger rewrote all job descriptions when he took over to include "publish-or-perish" rules requiring staff members to do original research along with their regular jobs.

Research, Evaluation and Acting as the 'Cutting Edge'

"They published eight papers and designed the impact program in the 18 months I've been here," Danziger said. "Before that they published only one paper and they didn't even write that."

Evaluation: Danziger and Leonard see eye-to-eye on the importance of the institute's leadership role in evaluating innovative state programs.

When Massachusetts' corrections department closed all the juvenile penal institutions and converted entirely to a community-based system of halfway houses and strict parole, the institute contracted to evaluate the program.

"The institute had to be up there right away and be involved in the evaluation of that effort," Leonard said.

"We have to evaluate what happens. Is it any good? What are its strengths and weaknesses? Making the results of evaluation available to the nation is important in the leadership role of LEAA," Danziger said.

Leadership: Danziger describes the institute as LEAA's leadership vehicle. He cited five major programs that are designed for this:

Equipment systems improvement—As part of this program, this year the institute put 14 systems analysts with engineering backgrounds in nine operating agencies—police and sheriff's offices, district attorney's offices and corrections systems' headquarters—responsible to their immediate supervisors but paid by the institute. These analysts are using operations-research techniques to help the agencies evaluate their needs and assist with problem solving.

"We're trying to prove to the states that systems analysts can help them," Danziger said. "For us, these guys are tentacles in the field to let us know what is needed."

The institute has set aside $7 million for the equipment systems-improvement program this year. Most of the money goes for analyzing equipment.

Pilot cities—In May 1970, the institute committed funds to eight cities, chosen on the basis of systems-improvement possibilities, to set up programs that would bring the research world closer to operating agencies. In each city a research group in criminal justice—often from a university—was invited to work on the city's crime problems on a project basis.

In the past year the institute has designed a sophisticated evaluation system to find out why one city is more receptive to this approach than another, and to identify, evaluate and transfer information on workable programs and to study the interaction between the groups. This year $2 million has been budgeted for this program.

Impact program—In the spring of 1972, an institute-designed program went into effect under the LEAA aegis. Eight cities in the high-crime category were selected for large grants of funds that would be used to introduce "the crime-oriented planning module into the litany," Danziger said. With the funds, cities would set goals of cutting down on high-fear crimes, and then go through the process of getting the data, analyzing it, developing programs based on it, quantifying their goals and then evaluating the program.

The institute contributed $5.6 million to this program this year, which supplemented the nearly $80.0 million in discretionary funds contributed by LEAA.

Law enforcement science advisers—The institute—with help from the National Science Foundation, if it is available—will place science advisers in from three to eight state planning agencies (SPAs) later this year. They will function as a mechanism for conveying information back and forth.

"If we can validate that a science adviser is a legitimate tool for an SPA, maybe more SPAs will use one," Danziger said.

Environmental design—The institute shortly will put out a request for bids on a program that would apply theories of environmental design to crime fighting. Several projects have shown that correctly designed high-rise, low-income housing units can help cut down on crime. The institute wants to apply this theory to schools, transportation and other types of housing. Two million dollars have been allocated for the program, but the actual expenditures will depend on how the proposal is accepted.

Hruska has said, however, that he would be glad to run the LEAA hearings for McClellan, and that he is certain that "when it comes to a floor fight on something fundamental like block grants, I think Sen. McClellan will participate."

Monagan report: In its deliberations on LEAA and special revenue sharing for law enforcement, Congress will take into account the findings of the House Government Operations Subcommittee on Legal and Monetary Affairs. The report was published in May 1972 (HRept 92-1072).

The subcommittee, headed by former Rep. (1959-73) John S. Monagan, D-Conn., held hearings over a three-month period in 1971 to see how the block-grant program was working out.

The subcommittee report was relentlessly critical. It began:

"The block-grant programs of LEAA have too often been characterized by inefficiency, waste, maladministration and, in some cases, corruption. They have had no visible impact on the incidence of crime in the United States. Moreover, state and local governments have not received meaningful leadership or direction from LEAA to enable them to find new ways to reduce crime and improve the operations of the system of criminal justice."

The subcommittee's investigative staff found mismanagement or misspending of funds in several states, and cited specifics. (A Senate staff member, who followed the hearings closely, said that the Monagan investigators went only to the states that were doing a bad job, not to the others.)

Rebuttal—"The Monagan report shows the pointlessness of so much of the criticism of LEAA," Sen. Hruska said. "Of course, crime is still with us: nobody ever said this would abolish it. But there has been a reduction. And the malfunctioning of the program is not in Washington. The criticism should be of New Jersey, New York, Florida. We are not running their departments; the plans are not to blame."

The revelations in the Monagan report still carry an impact on Capitol Hill, despite some feeling among Republicans that the investigation was a political attack on revenue sharing.

"Most people read the newspaper accounts of the hearings rather than the report, and they remember the Governor who bought a plane with LEAA funds for his personal use," a Senate Judiciary staff member said.

Attorney General Kleindienst, in his testimony before the Rodino subcommittee, said: "Long before the House Government Operations subcommittee hearings began, LEAA had sent its auditors into those states, and the irregularities they uncovered were promptly corrected."

"We did the work and handed them the information and they beat us over the head with it," an Administration official said.

Recommendations—The Monagan report made recommendations to correct the flaws it found in LEAA.

Generally the recommendations dealt with getting the money faster from the federal government to crime-fighting programs; federal, state and local audits and accountability; standards for evaluation; bidding and contract compliance procedures and technology transfer.

In August 1972, Jerris Leonard, then LEAA administrator, reported to the Government Operations Committee on the status of the recommendations.

Some, such as a recommendation that funds be withheld from state and local governments until these units are prepared to spend it, LEAA had rejected as "a breach of faith with state and local governments."

Others, such as a recommendation that LEAA set effectiveness standards, already were in the works when the committee report was published.

Still other recommendations, such as one that LEAA "establish limits of permissible use of outside consultants by states," were taken from the report and implemented.

Leonard said in a letter accompanying his report, that "the time period dealt with in the subcommittee recommendations and report relates to fiscal years 1969, 1970 and 1971—the first three operational years of a fledgling program of unique and somewhat experimental design."

"The program came into being in one moment, and the next moment it was expected to cure all ills," said Martin B. Danziger, assistant LEAA administrator who heads the National Institute of Law Enforcement and Criminal Justice. "A voodoo princess can do that; an agency cannot."

New chairman—Monagan's successor as chairman of the subcommittee, Rep. William J. Randall, D-Mo., said that he has no plans to follow up on the LEAA investigation. "I suspect there may be something in the next two years, but we have no immediate plans to look into LEAA," Randall said.

Categorical approach: Law enforcement is one area where all Members of Congress want to get into the act.

With law and order a popular issue, many Members want to have their names on legislation aimed at fighting crime.

And the easiest way for this to be done is through sponsorship of a bill zeroing in on some specific aspect of crime control or prevention.

As a result, there are more than 200 categorical bills in the House and Senate hoppers designed to help the government fight crime—and incidentally thwart the Administration's objective of getting the federal government away from specific programs to combat unorganized crime. (Many of these are victims' compensation bills, which would not necessarily fall under the aegis of LEAA.)

There are many bills that would provide funds to municipalities for bright streetlighting. Streetlighting bills are considered by federal criminal-justice planners to epitomize the worst kind of categorical legislation for crime-fighting, since no studies have been made to determine whether bright lights really help to deter street crimes. (One LEAA staffer said that the Washington street on which Sen. John C. Stennis, D-Miss., was shot is a dark street adjacent to a street that recently was illuminated by strong "daylight" lights.)

Former LEAA Administrator Leonard said that categorical-grant legislation can be headed off "if we have some champions—and I think there are some up there—who do their homework and are willing to provide leadership. If not, this program will look like a Christmas tree."

Tunney plan: One Member of Congress who has come up with an original major alternative during this session to both the Nixon proposal and the block-grant approach is Sen. John V. Tunney, D-Calif.

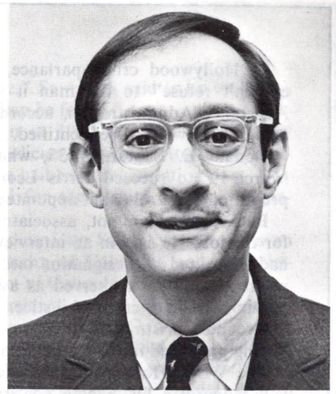
Tunney's proposal would completely bypass the states in giving no-strings money to large cities.

The Tunney proposal, to be introduced shortly, is a two-phase plan to meet some of the objections to LEAA's present operation. Tunney met with criminal-justice officials in California and a handful of eastern states, and based his legislation on their complaints and suggestions.

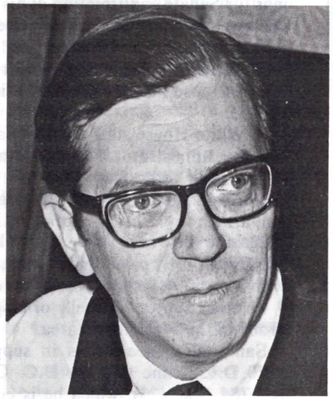
The first phase of his proposed program, which would go into effect next Jan. 1, is a means of easing into the remodeling of LEAA, which would begin a year and a half later.

Tunney's first phase would:

- require that grant applications on all government levels be processed in 60 days;
- require LEAA's National Institute of Law Enforcement and Criminal Justice to follow a standardized, rational evaluation procedure;
- suggest regional planning for larger states;



Donald E. Santarelli



Jerris Leonard

- establish federal credit funding, which would reimburse government units for innovative criminal-justice programs that have proven effective, based on standards established by LEAA.

The last item, according to Meldon E. Levine, Tunney's legislative assistant, would encourage state and local governments to try innovative programs even if they were not initially funded by LEAA.

Phase 2, which would begin July 1, 1975, and run for two years, would:

- maintain Phase I reforms;
- send funds directly to units of local government with populations of at least 100,000 (Tunney would submit that figure to further debate), and through the states to all government units with smaller populations;
- require that at least 10 per cent of all funds go to each of the following areas: planning, law enforcement, courts, corrections and juvenile justice, with no more than 40 per cent of the funds to go to any one area.

Direct federalism—The proposal to send funds directly to large cities is similar to the "direct federalism" proposed in the original Omnibus Crime Control and Safe Streets bill offered by the Johnson Administration in 1967.

Under direct federalism, state and local governments would be essentially equal in their ability to apply for grants and in the requirements they have to meet.

The House and Senate Judiciary Committees each held long series of hearings on the bill, each committee reported it out with only minor changes and each chamber changed it on the floor—after lengthy debate—from direct federalism to a block-grant system.

A Senate Judiciary Committee staff member involved in the new legislation said it is unlikely that Tunney can muster sufficient support for the direct federalism approach that Congress rejected five years ago.

Stanton plan—In the House, Rep. James V. Stanton, D-Ohio, has introduced HR 5746, which also would enable cities to receive money directly from LEAA. Co-sponsors of the bill are Reps. Charles W. Sandman Jr., R-N.J., and John F. Seiberling, D-Ohio. The bill would allow cities over 250,000 in population to apply directly for funds if they control all parts of the criminal-justice system for their jurisdictions, or to apply in conjunction with their suburban governments if they share control of parts of the system.

Decentralization

Even without special revenue sharing, LEAA has moved toward more state control over the block-grant funds.

Jerris Leonard's major move, when he took over the agency in the spring of 1971, was to decentralize approval of state plans for using the grant money.

Leonard established 10 regional offices, corresponding to the 10 Federal Regional Council districts, and gave them responsibility for approving plans of the states in their districts.

Leonard also instructed the national and regional staffs to concentrate more on the planning process than on the plans themselves.

They were aided in this by the 55 state planning agencies (SPAs)—including those of American Samoa, the District of Columbia, Guam, Puerto Rico and the Virgin Islands—which adopted their own minimum standards above and beyond the federal requirements set out in the law.

Maryland example: Richard C. Wertz, executive director of the Maryland Governor's Commission on Law Enforcement and the Administration of Justice, was instrumental in getting the National Conference of State Criminal Justice Planning Administrators to set the minimum standards in August 1972.

Wertz said that although the LEAA has basic standards for SPAs, such as requiring a full-time director and permanent staff, these standards are not the result of experience, nor do they set goals for SPAs.

The national conference standards, he said, are "minimum standards to do the job halfway adequately."

Wertz said he feels that at least a fourth of all SPAs have so exceeded the national conference's minimum standards that they are "capable of exercising stewardship over the block-grant program." SPAs do not have complete control of their funds now; they require prior LEAA approval before spending their grants.

In an effort to prove that the states could and should control their funds more than they do now, the Maryland SPA, with the approval and encouragement of both the national conference and the LEAA, has been negotiating with the Philadelphia regional office for more control of the Maryland LEAA program.

Certification—The LEAA has dubbed the process "certification."

"In certification, the state planning agency's objective is to demonstrate to the LEAA that it is able to effectively administer its portion of the safe streets act and, as a result, to obtain from LEAA relief from certain general federal guidelines or restrictions and, thus, greater programming flexibility," Wertz said.

"Such a demonstration requires the state planning agency to be operating above the conference's minimum standards in most areas of concern."

The Maryland planning agency invited LEAA's Philadelphia regional office to inspect its setup and procedures. The inspection, by a team of auditors and other LEAA professionals, took several days, dozens of meetings between Maryland SPA staff members and the Philadelphia group, and unlimited access to all records.

"We are kind of feeling our way along," Wertz said. "We are a kind of guinea pig in terms of setting up the procedure."

Objectives—Maryland went into the process with a number of objectives in mind. "For example, we are required to update our 'Comprehensive Criminal Justice Improvements Plan' annually," Wertz said. "Our plan is about 1,200 pages, and several of the required chapters are descriptive in nature and change little within 12 months. We've got a handshake agreement to update only certain select chapters annually.

"We figure that will save us six man-years of time, and the staff manpower savings would be used to increase our efforts in program evaluation."

Maryland also wanted to have a freer hand in reprogramming funds after the general plan was approved, and to set up its own program-evaluation system. Regional administrator Charles Rinkevich has agreed in principle to these and other changes.

Hinges on revenue sharing: Other states, including Texas and Michigan, also are interested in and—in LEAA's opinion—capable of certification, but former LEAA Administrator Leonard ordered the program shelved until the special revenue-sharing bill is approved or disapproved by Congress. Approval would make the certification process unnecessary.

Leonard agreed that certification is a step toward state control of LEAA funds, but he said that it is too slow.

"We'd like to say to hell with the 30 states that are doing the job, and spend our time with the 25 that can't," Leonard said. "The regional offices are bogged down in paperwork—plan review, plan changes, etc. The state people are far better qualified to do this than we are. We go to them for the expertise anyway. We ought to get off the backs of those who are doing their jobs."

Planning

The issue of separate funds for planning was a subject of great controversy while the Administration was drafting its LEAA bill.

In the final bill, planning funds were kept separate from the special revenue-sharing pot, but only after the state, city and county lobbies put pressure on the White House. They threatened to withhold support of law enforcement revenue sharing unless planning money were insulated from the pressures to use it for action programs to fight crime.

The bill would guarantee each state $200,000 for planning, with the amount to increase to 5 per cent of the total action grant, which is based on population.

Mandated planning: LEAA wanted the money for support of the SPAs to be in a block grant, rather than as part of the undifferentiated special revenue-sharing funds.

The agency's position was supported by the so-called Big Seven of the state and local government lobbies—the National Governors' Conference, the Council of State Governments, the National Legislative Conference, the National Association of Counties, the National League of Cities, the U.S. Conference of Mayors and the International City Management Association. The groups told the White House they would not support special revenue sharing for LEAA unless plan monies were kept separate, and a pass-through was included to mandate money for local planning groups.

They argued that since planning for law enforcement was still such a new concept, if money was not set aside for it, some states and localities would be pressured into disbanding their planning agencies and using the funds for action programs.

"Planning gets the least priority," a member of the Governors' conference staff said. "This is probably because it doesn't have a constituency."

"If there is no money for planning, the only alternative for the distribution of money is on a per-capita basis," said Allen E. Pritchard Jr., executive vice president of the National League of Cities. He said this would not get the money where the problems are.

A state official involved in his state's criminal-justice planning agency, who did not want to be identified, said: "We have to have planning mandated because there is not the same level of approach in all the states. In my state we would plan anyway, but in a lot of states this is not a popular concept. There is a tendency among some states to take the entire lump sum and parcel it out among the political pressure groups. The fear is that Congress will point to the bad states and condemn all the block-grant programs."

Administration reluctance: The White House initially was reluctant to separate planning funds.

One Administration official who worked on the legislation said that part of the reluctance was based on the philosophy of New Federalism.

"We really believe state and local governments ought to be responsible, that Washington doesn't know best, and that more flexibility is better. Why must we protect the mayors and the Governors from themselves by isolating planning money?"

He said that the White House finally capitulated to expediency. "We put in a bill with planning because it

Donald E. Santarelli:

A Reluctant Nominee

In Hollywood crime parlance, the White House made "an offer he couldn't refuse" to the man it wanted to head the Law Enforcement Assistance Administration, according to a Nixon Administration official who did not want to be identified.

Donald E. Santarelli, 35, who was nominated by President Nixon March 19 to succeed Jerris Leonard as administrator of the anticrime program, was a reluctant appointee, the same official said.

But, reluctant or not, associates describe Santarelli as highly qualified for the job. He said in an interview that he was "ready for a change." He had submitted his resignation late last year from the Justice Department, where since 1969 he served as associate deputy attorney general for the administration of criminal justice.

Around Christmastime, he was, according to a friend on Capitol Hill, "being pressured into a job he didn't want."

The White House is not worried that Santarelli's apparent reluctance will jeopardize his Senate confirmation. "After they finish with Gray, there won't be anything left to hit Don with," according to an Administration official. (L. Patrick Gray III has been undergoing intensive hearings for Senate confirmation of his nomination to be FBI director.)

Debater: "There are very positive reactions to him (Santarelli) from almost everybody at LEAA," said Martin B. Danziger, assistant LEAA administrator. "They have respect for a guy who is articulate, who is willing to expose his views and who is willing to argue issues with his staff," he said.

A White House staff member said that Santarelli "will be an absolutely superb administrator. He is a fantastic idea man."

Santarelli, who has done the course work on a master's degree in rhetoric at the University of Virginia, is known for his debating ability. An article by Shelby Coffey III in *The Washington Post's Potomac* magazine in June 1970 said: "His rhetoric glows like phosphorescent jellyfish in a tropical night ocean. Or it swoops, falcon-style or blasts out with a rat-a-tat Kennedyesque volley of facts and opinions. . . ."

Another source also tells of a speech Santarelli made to a liberal black group in the Washington area.

Santarelli's speech was in support of the no-knock provision of the 1970 D.C. crime bill, the D.C. Court Reform and Criminal Procedures Act (84 Stat 473), which he is credited with writing. The group was opposed to no-knock and hostile to Santarelli, an avowed conservative. When he finished they applauded and a woman at the back of the room stood to say, "I never heard a more eloquent exposition of a more intolerable position in my life."

"I enjoy public discourse and dialogue," Santarelli said in an interview. "Out of the crucible of debate the truth can be found."

Background: The Nixon Administration in 1969 hired Santarelli away from his job as counsel to the Senate Judiciary Subcommittee on Constitutional Rights, where he was working on bail-reform legislation.

Before that he was minority counsel for the House Judiciary Committee.

A graduate of the University of Virginia Law School, he also was an assistant corporation counsel in the District of Columbia and an assistant United States attorney for the District of Columbia.

Santarelli's task in the Justice Department was to clean up crime in the District of Columbia. Besides writing the tough D.C. crime bill, which allowed wiretapping, stop-and-frisk and no-knock procedures, he also worked on gun-control legislation. "Over the past three years I have worked to develop a statute to control Saturday-night specials (cheap handguns). So far the Administration has not yet finally adopted that statute," he said.

Role at LEAA: Santarelli said he would not necessarily take his hard-line position with him to LEAA. "Here, I am an advocate for the Administration. There I am supposed to be more independent. Many things that LEAA sponsors are not necessarily Administration policy. I don't think it's a prerogative of LEAA to tell the states what position to take with respect to the Administration policy. Generally speaking, we are not supposed to impose our ideas on the states."

Advocate of free speech: Santarelli does not always take himself seriously. In 1972 he was accused of saying to a job applicant, "Frankly, we don't give a damn about an individual's civil liberties. We're out to do one thing: prosecute criminals."

Santarelli said he does not remember saying that particularly, but adds, "If I'm not entitled to a little hyperbole in discussion with a young and zealous speaker of the left, free speech is dead in America. I agree with (Supreme Court Associate Justice) William O. Douglas that we have to suffer a little outrageous comment once in a while to keep free speech alive and viable."

Santarelli, a native of Hershey, Pa., is married to the former Anne Constance (Connie) Dunlap. She said he is "one of the most romantic men in the world." They have one child, two-year-old Louisa. "Like all Italians I'm mad for my little daughter," Santarelli said. "I'm glad she can't say Cadillac."

LEAA 'Cookbook of Recipes' for State-Local Guidance

The Government Printing Office soon will publish a 4,000-page, six-part, 1.5-million word report that is designed to enable state and local governments to decide where they are on the road to crime reduction and where they should be going.

The report is the product of nearly 18 months work by the Law Enforcement Assistance Administration's National Advisory Commission on Criminal Justice Standards and Goals.

"This is a cookbook of recipes for crime reduction in very great detail," said Joseph R. Rosetti, a commission staff member.

The commission, headed by former Delaware Gov. (1969-73) Russell W. Peterson, R, was made up of experts in all facets of the criminal-justice system. The commission report contains recommendations for making positive change in every part of the system.

The creation of the commission and the necessity for the report had two stimuli. One was the need for evaluation of state and local crime-fighting programs; they could not be evaluated without specific goals or standards to measure them against.

Targeting: The other was the introduction of "crime-specific planning" by Jerris Leonard, who was LEAA administrator from May 1971 until March 14. *(For background, see Vol. 4, No. 5, p. 185.)*

When Leonard took office, his challenge was to "improve the criminal-justice system," according to the legislation.

"We were tinkering around with the system," Leonard said. Programs were created on the basis of "wouldn't it be a good idea if. . . ."

"We had to define what we were in business for and develop alternatives," he said. He defined the business as reducing crime, and set the agency and its state and local affiliates to achieving that goal.

Each request for funds was weighed against the impact the money would have on reducing a specific crime.

"Instead of a police chief thinking that a program means more patrol cars or more prisons, he would think of a program as a means of cutting down on rapes or burglaries," Leonard said.

The approach was to look at all the data on the crime, decide what the problems are and develop solutions.

Program: The commission's report attempts to answer these problems.

"By setting specific standards, the commission has tried to offer a tool by which each component of each criminal-justice system (in the states) can measure its progress—or lack of progress," Peterson said.

"Now if someone wants to do something on the state and local level, he doesn't have the excuse of not knowing how," said Joseph Rosetti, a former regional administrator for LEAA who was borrowed from his present job at International Business Machines Corp. to put the finishing touches on the conference and the report. "We give the best ideas here, so nobody has to re-invent the wheel," Rosetti said.

Commission: The National Advisory Commission on Criminal Justice Standards and Goals was created by Leonard in October 1971, with Peterson as chairman and Sheriff Peter J. Pitchess of Los Angeles County as vice chairman of the 20-member panel. Members included Governors, mayors, police chiefs, SPA (state planning agency) directors, lawyers, judges and private citizens.

Conference: In January, some of the standards and goals were aired at the LEAA-sponsored National Conference on Criminal Justice.

Delegates to the conference included minority and majority leaders of state legislatures and of their judiciary and finance committees.

"Traditionally, people thought the leaders in law enforcement were the police chiefs, and as a result we were dealing until now with the people in the business and not those in the leadership role who could affect change," Rosetti said.

The working papers for the conference, clad in a 2½-inch-thick beige looseleaf binder, included many—although not all—of the most controversial standards and goals established by the commission. Leonard called it "the single most important thing we've done—next to crime-specific planning."

Plea bargaining: The standard to receive the most objection was the one that required the elimination of plea bargaining.

The commission's working papers recommended "as soon as possible, but in no event later than 1978, negotiations between defendants and their attorneys and prosecutors concerning concessions to be made in return for guilty pleas should be abolished."

Opponents of the measure argue that having to try every case in an adversary proceeding would hopelessly clog the courts.

Maximum sentences: Other highly controversial standards limit maximum prison sentences to five years for "any offender not specifically found to represent a substantial danger to others" and 25 years—except for murder—for a defendant who is a public danger *and* who is a "persistent felony offender, a professional criminal or a dangerous offender."

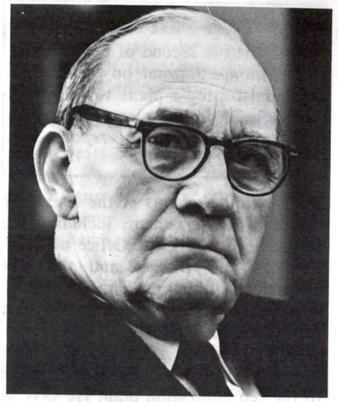
Community action: Less controversial but perhaps more far-ranging are the standards set for corrections and for community crime prevention.

The corrections report calls for a strong emphasis on community-based correctional programs rather than large, fortress-type jails. It also outlines a bill of rights for prisoners which includes the right to access to courts, legal services and the public, the right to protection against personal abuse, the right to grievance procedures and suggested remedies for violation of an offender's rights.

The community crime-prevention section suggests: getting jobs for ex-prisoners and former drug addicts, less emphasis on college in public schools and recreational facilities to prevent young people from using crime as a recreational activity.

This section stresses the importance of community involvement in crime prevention to prevent the "fortress mentality," because the commission believes that community involvement is the best way to cut crime. "The chapter (on community crime prevention) is both a 'call to action' and a 'how to' guide for citizen action in community crime prevention," the report says.

Richard G. Kleindienst



John L. McClellan

Richard C. Wertz

will get through the Hill easier."

SPA representation: There were many requests that regulation of SPAs be written into the bill, mostly from groups that felt they were under-represented on the state planning agencies. These same groups are expected to appeal to Congress for amendments to the bill.

NACO—The National Association of Counties complained because most members of SPA boards (the boards make policy for the SPA staff) are specialists in the criminal-justice system, such as police, judges and prison officials. NACO contended that only elected officials have the necessary overview and are responsive enough to the citizens to plan comprehensively. The county lobby wanted elected officials to comprise 50 per cent of SPA boards.

Judges—Members of the judiciary felt left out because, although their ranks were represented, they did not have a voice in the selection process. The National Center for State Courts proposed that the judicial-branch members of the SPA board be designated by responsible leaders of the judiciary rather than by the Governor.

Police—Quinn Tamm, executive director of the International Association of Chiefs of Police, said that police are underrepresented on SPA boards, based on the proportion of funds that go to the police.

Blacks—Members of the Congressional Black Caucus have said that minorities are underrepresented on SPA boards.

Elected officials—The White House acceded to NACO's request and wrote into its bill a clause that requires state planning boards to be made up at least 50 per cent by elected local officials.

"They (NACO) had a good point," said an Administration official who worked on the legislation but did not want to be identified.

(An LEAA study recently showed there was no correlation between the percentage representation of police, courts and corrections officials on SPA boards and the percentage of action funds that go to the parts of the system they represent.)

Optional agencies: The White House bill does not call for state planning agencies, as the existing legislation does.

"It's not exactly the kind of planning the states and cities wanted," said the same Administration official.

Under the proposed legislation, the existence of a state planning agency is left to the discretion of the Governor. The only requirement is that a state establish some sort of planning process, "for the preparation, revision and implementation of the state plans."

State plans "for the reduction and prevention of crime and delinquency" must be submitted to LEAA every three years, with annual updates.

Although planning bodies must take into account the opinions of experts in various parts of the criminal-justice system, under the proposed legislation the makeup of the planning board is not specified.

Leonard said that LEAA still could influence the planning process because it would be difficult to create a plan that would meet even the broad requirements of the bill without an effective planning mechanism.

Outlook

Both the White House and Congress are ready to deal in depth with the problem of federal aid to state and local law-enforcement programs.

But this probably means that there will be no rush to pass new legislation for LEAA by June 30, when the authorization runs out.

Members of the Judiciary Committees have said that they would rather review the subject adequately. This can be done because there are ways to keep LEAA programs going until the review is completed.

One alternative—favored both in the White House and on Capitol Hill—is a continuing resolution from the Appropriations Committees. This would enable LEAA to continue disbursing money at a rate equal to that of proposed budget rate, the fiscal 1973 appropriation or the authorization level passed by one chamber—whichever is the lowest figure. Continuing resolutions are for limited periods, usually a few months.

Another alternative—one tested by Sen. Hruska earlier this year when he proposed it as an amendment to another Senate bill—is a simple extension of the safe streets act for a year.

But even though he made this suggestion, Hruska said that now is the time to make the important decisions on the future of LEAA.

The White House, too, wants to see the question settled because law enforcement was one of the first special revenue-sharing programs proposed to Congress and its fate could indicate the possible outcome of other New Federalism programs. □

Science Report/Presidential revamping of science tasks upgrades National Science Foundation role

by Claude E. Barfield

The National Science Foundation, a small agency which concentrates on financing basic research in academic institutions, suddenly has been told by President Nixon to advise the entire executive branch on a federal R and D budget totaling more than $17 billion, most of it devoted to applied research and development.

This new role for the NSF was devised by White House reorganization specialists as part of a sweeping overhaul of the Executive Office of the President, an effort that included complete dismantling of the Presidential science-advisory structure that had developed over the past 15 years.

The move has produced profound misgivings among leaders of the scientific world, both as to the wisdom of abolishing the old institutions and as to the NSF's ability to handle its new assignment.

Many of these leaders say it makes little sense to give a second-rank agency with limited expertise in applied research and development responsibility for advising on technological projects undertaken by more powerful elements of the bureaucracy, including the Defense, HEW and Transportation Departments, the Atomic Energy Commission and the National Aeronautics and Space Administration. And they fear that the end of the old advisory system is ill-timed in light of the increasing number of pressing domestic issues that require sophisticated scientific judgments.

Reorganization: In reorganization moves announced in January, the President said he would abolish the position of special assistant to the President for science, the White House Office of Science and Technology (OST) and the President's Science Advisory Committee (PSAC), a prestigious 18-member group of nongovernment scientists.

In a last-minute decision, Mr. Nixon decided to designate the NSF and its director to pick up the functions performed by the machinery he was eliminating. The White House says that the NSF director, who has assumed the title of "science adviser," will henceforth be called upon to:

- conduct policy studies and make recommendations regarding federal science and technology policies;
- appraise and evaluate the effectiveness of national programs in science and technology;
- coordinate federal R and D programs;

Two-Part Series

This is the second of two reports in *National Journal* on the Nixon Administration's plans to reorganize the federal science advisory system. *(For the first report, see Vol. 5, No. 12, p. 405.)*

- advise all elements of the Executive Office of the President, including the Domestic Council, the Office of Management and Budget and the new counselors to the President;
- act as a link between public and private R and D efforts.

NSF Director H. Guyford Stever was not in on the discussions that led to the reorganization plan. He says he has spoken only a "few words" to the President since it was announced.

However, after a somewhat shaky initial appearance at a Jan. 26 news briefing to explain his new duties, Stever has moved to defend the plan with vigor, reassure the scientific community that science has not been downgraded and begin the process of creating mechanisms to carry out his broadened mandate.

Stever's plans for meeting the responsibilities thrust upon him by the White House still are in a very preliminary state, but some steps have been announced.

The NSF director will establish a small science-policy staff in his office. He has been given no extra money for personnel for this staff, and thus the positions will be created by leaving vacancies in the agency unfilled.

Stever also will assemble several task groups on national R and D problems, coordinated through his science policy staff and composed of line-agency personnel, regular NSF employees and outside consultants.

H. Guyford Stever

Finally, he will give the NSF line organization the new responsibility of providing detailed studies and assessments of federal R and D programs and national problems related to science and technology.

In an interview, the NSF director said his "first priority will be to take a hard look at the civilian science area, to find out what civilian problems are the most pressing and where R and D can make a contribution. I want to talk to people from the academic community, industry and the government agencies. Then, we can organize the work here on a problem basis."

Energy and the environment are two areas where Stever wants to move quickly to bring to bear scientific and technical expertise for the benefit of the White House and line agencies.

"Energy policy involves a number of complicated political, economic and national security questions—but it also must have a strongly based across-the-board knowledge of R and D possibilities, opportunities—and traps," said Stever.

Reaction: Because the White House plan was announced only two months ago, with little warning, there still is much uncertainty as to its ultimate effects.

The scientific community, and Congress too, has little inclination to attempt to reverse the President's decision. Said William D. Carey of Arthur D. Little Inc.: "There's no sense lighting candles in an empty church. . . . Every President inherits a whole lot of monumental artifacts that don't respond to his needs or priorities—and after all, it's Mr. Nixon's White House." Carey served in the Budget Bureau for many years before joining Arthur D. Little in 1969. He is a recognized authority on science and government.

Even those with the strongest reservations say that the issues involved are too important to the nation for the scientific community to turn its back on the Administration. This attitude was summed up by James R. Killian Jr., President Eisenhower's first science adviser, who said: "It's true that some aspects of the recent changes worry a number of us deeply, but I think the predominant resolve is 'Let's make it work and help shore up the weaknesses.' "

Some prominent scientists, however, believe that the Administration's decision to remove science policy making from the White House and place it in a second-line agency reflects a lack of understanding of the place of science and technology in political decision making.

Among them is Harvey Brooks, dean of Engineering and Applied Science at Harvard University and a leading expert on science policy and organization, who said: "In one real sense, the move is a downgrading of science."

Brooks recalled an occasion in mid-January when George P. Shultz, Secretary of the Treasury and assistant to the President for economic affairs, spoke to the National Science Board, the governing body of the NSF. It was clear then, Brooks said, "that he regarded OST and PSAC merely as hangovers from the crash drive after Sputnik to upgrade U.S. science. He did not regard OST or a scientific input as necessary for policy formulation at the White House today; science is considered just a part of the lower-level operations at the department and agency level.

"That view, I think, represents a misperception of the role of science in public policy. Other nations are more and more coming to see the urgency of ending the isolation of science from policy making and are making provisions to incorporate it at the very top levels of government. We seem by this action to have moved in the opposite direction." (In 1971, Brooks chaired a multinational panel of the Organization for Economic Cooperation and Development (OECD) which strongly recommended the integration of science into the social and economic planning of all countries.)

Philip Handler, president of the National Academy of Sciences, said he did not "think the reorganization should be painted all black," but that he "was apprehensive about some of the models used in explaining it."

Handler referred to the Administration's argument that science should no more occupy a special place in the White House hierarchy than welfare, education or agriculture, and said: "I fear there is a lack of understanding of the pervasive role of science and technology in all areas of public policy.

"What also bothers me is the lack of an objective voice in the executive office viewing agency proposals from a technical point of view. Dr. Stever's role is still quite vague, and I suspect that the reorganization may have left the President naked before competing agencies with their own bureaucratic biases and blindspots."

National Science Foundation

Ten years ago, President Kennedy removed from the NSF the duties now being returned to it, implicitly acknowledging at the time that the agency had failed to accomplish these tasks.

Asked what had changed over the past decade, NSF Deputy Director Raymond L. Bisplinghoff replied: "NSF is, I think, a very different place than it was ten years ago. It has, so to speak, come out of the ivory tower and into the real world during that time span."

Nature of agency: By that, Bisplinghoff meant that the foundation had moved in recent years to expand its activities in the field of applied research-targeted efforts to achieve specific technologies.

But the NSF's budget still is heavily concentrated on the agency's original mission—support of basic research. This has raised doubts among many scientists about the capability of the NSF staff to provide useful advice to the White House, which has demonstrated more interest in applied research and development to meet national needs than in untargeted basic research.

The NSF began to broaden the range of its activities after Congress in 1968 passed legislation (82 Stat 360) broadening the agency's charter. The 1968 law, which Bisplinghoff said was of "major significance in expanding our capabilities and horizons," gave the agency a mandate to support applied research relevant to national problems. At the same time, the agency's status in the bureaucracy was upgraded: its director was given more authority and more pay, and five additional Presidential appointments (a deputy director and four assistant directors) were authorized.

It was not until 1971 that the NSF moved seriously to upgrade its applied research activities, with establishment of the Research Applied to National Needs (RANN) program. RANN now has a budget of $80 million devoted to financing problem-oriented civilian research.

In 1972, at the direction of the White House, NSF also set up its National R and D Experimental Incentives Program, which is designed to study and foster the process of technological innovation in private industry.

Congress appropriated $18.5 million for this program last year, but OMB has allowed the NSF to obligate only about $2 million. The impoundment was not made for budgetary reasons, OMB officials say, but rather because the NSF's planning and management have been badly flawed.

In a negative assessment of the experimental incentives program on March 16, *Science*, the magazine of the American Association for the Advancement of Science, said that "outsiders familiar with the program" believe the NSF staff "is not sufficiently dynamic, or politically attuned to do the job" and that the staff does not have "sufficient prior background in the innovation process or with . . . past government attempts to improve U.S. technological innovation."

These and other NSF ventures into the field of applied research have not been on a grand scale, and in fiscal 1974 only 17 per cent of the agency's research budget will finance applied research. (The research budget is $554 million out of a total fiscal 1974 NSF budget of $641 million.)

The remainder will be devoted to basic research, with the biggest single item, $275 million, financing research grants to individuals in the physical, biological and social sciences, and in engineering.

Most of the NSF's 1,150 employees are involved in processing the grants and in other administrative chores.

Replies to criticism: During the past six weeks Stever and Bisplinghoff have moved to counter early criticism of the reorganization by scientific organizations like the Federation of American Scientists and congressional leaders in the science-policy field, such as Sen. Edward M. Kennedy, D-Mass., and Rep. John W. Davis, D-Ga.

Rebutting the charge that the movement of the science structure out of the White House represents a "downgrading of science," Stever said: "That is not what the President intended. I think a lot of people are making too much, symbolically, about a two-block move down the street. (NSF is located two blocks from the White House.)

"Some of the overreaction, I think, stems from a lack of understanding of

how the White House operates. There is the illusion that everybody over there has had ready access to the President. That just hasn't been the case. George Shultz has one of the strongest positions in the White House and I think that through the conduit of Shultz and his staff we will be in an excellent position to make our voice heard.

"A lot depends, finally," said Stever, "on how well we do our job—how useful we are to the White House and to other agencies in questions relating to science and technology."

Bisplinghoff noted: "We cannot dictate priorities or policies to other agencies; we can however, provide options and disinterested evaluation for Ash, or Shultz, or Butz or whoever."

Roy L. Ash is director of the OMB; Earl L. Butz is Secretary of Agriculture and counselor to the President; and George P. Shultz is Secretary of the Treasury and an assistant to the President. It is to Shultz that Stever reports.

As to possible complications stemming from his multiple roles as NSF director, science adviser and inheritor of OST's responsibilities, Stever pointed out that all of the President's new supercounselors, Shultz included, have similar problems. All head operating departments, while at the same time exercising policy-making and evaluative functions in the White House.

Said Stever: "I shall have to just make clear which hat I am wearing in each instance—and to separate out the judgments I make on budgetary matters for NSF, for instance, and other R and D budgetary advice I might be asked to contribute to Roy Ash and his staff."

Some critics of the changes have contended that a second-line agency like NSF will have no chance to exercise influence—particularly given the history of the reorganization and the clouded mandate it received in January—without some special word from the President himself.

But said William O. Baker: "If the reorganization plan itself does not make it perfectly clear that NSF is now the agency to be listened to on matters pertaining to science and technology in the federal government, there is no doubt in my mind that the President will act to put the point across."

Baker, who is president of Bell Telephone Laboratories Inc., was co-chairman of a 27-member Science and Engineering Council for Mr. Nixon's reelection. He is a key link between the science community and the White House.

Scientists' views: The scientific community's mixture of optimism and skepticism about the President's science reorganization was nowhere more apparent than in comments made on the assignment of new roles to the NSF.

Edward E. David Jr., the last Presidential science adviser (he left the White House Dec. 29), was among the most sanguine. He said he did not "doubt that Guy Stever and his staff are up to the jobs they've inherited" and that he thought Shultz "will help greatly."

Another optimistic view was offered by Roger W. Heyns, president of the American Council on Education and vice chairman of the National Science Board, a 24-member group of nongovernment scientists which reviews NSF policies and grants. Heyns said he had "felt for several years that NSF should press for larger responsibilities. The President's action will mean profound changes for NSF and for the board, but it's time, I think, for us to get more into the mainstream."

Philip Handler said that "one clear plus under the new arrangement is the mandate to NSF to undertake major policy studies, particularly with regard to allocation of federal resources. OST never had the staff or funds or time to do this."

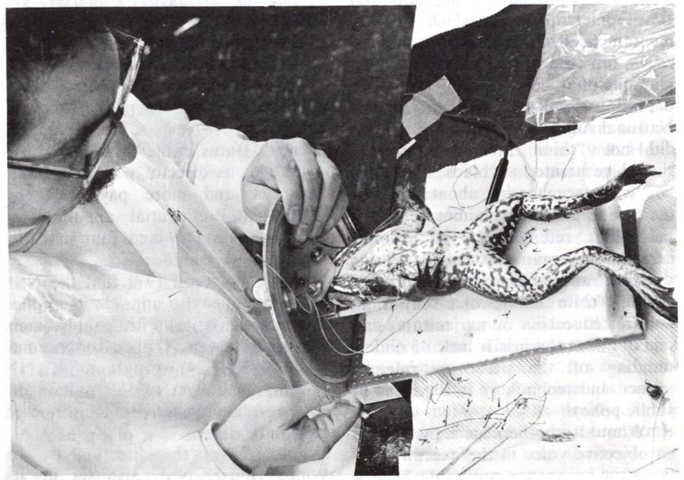
Very much divided in his reaction to the new arrangement was William D. McElroy, former director (1969-1972) of NSF and now chancellor of the University of California at San Diego. Of all NSF directors since the agency's creation in 1950, McElroy moved most naturally and easily in the political world of Congress, the White House and the bureaucracy.

"In some ways I think the change is to the good," said McElroy. "I think NSF has been greatly transformed over the last decade and is more capable today of setting out priorities for science and using its strong constituency in the universities to advise the government on policy options."

"However," he said, "they're going to have to have a hell of a lot more resources to perform these new tasks than they now have. Two years ago, the Administration was talking about a $1-billion budget for NSF within three to four years. That is even more imperative now."

McElroy said he is worried that the NSF staff would be cut up when it attempted to set priorities and evaluate federal R and D programs. "There are many fine people at NSF," he said, "but they have no tradition or taste for the kind of political and bureaucratic infighting they will face if the Administration is serious in its plans for them. It's a tough world out there dealing with the big bureaucracies—they've all got a highly developed sense of turf, and don't brook interference lightly."

Others echoed McElroy's doubts about the NSF staff's ability to assert itself in the political world of resource allocation—doubts stemming from the agency's history as a grant dispenser for academic science.



A scientist in Wallops Station, Va., tests a frog's adaptability to weightlessness

Said William D. Carey: "I found it surprising that the ball was lobbed into NSF's court. . . . They are still a very conservative agency when it comes to proposing national science priorities or judging the quality of the nation's scientific effort. They've just never developed enough self-confidence."

And Harvard chemistry professor Paul M. Doty, who served on an NSF advisory-planning committee from 1969 to 1972, said: "I saw the inside, and the quality of the staff, I guess, as close as anyone—it's pretty mediocre. There were a few strong points, but by and large, they're just not equipped to deal with the alleged new responsibilities for NSF." (Doty believes that the Administration's claims that it will use NSF are a sham, that they were made only to assuage the scientific community. "Stever's phone will never ring," he predicted.)

Potential conflicts arising from the NSF director's multiple roles, as head of an operating agency and as science adviser to the White House, also give rise to worries among leading scientists.

"The trouble," said Brooks, "is that you can never separate the various hats he's wearing. Suppose, for instance, Stever were asked to give advice on a new SST and through an advisory panel came out negatively. He would risk antagonizing powerful interests and jeopardizing NSF's budget and function. Two years ago, Sen. (Gordon) Allott (R-Colo., 1955-1973) raised hell about the technological-assessment funds in the NSF budget because he thought it was a means of killing the SST. Other Members of Congress will inevitably attack NSF if Stever renders advice adverse to their interests."

Independent advisory system

The federal government has used academic and industrial experts in science and technology as a source of independent advice since the beginning of World War II. In 1957, the advisory system was institutionalized, with establishment of the President's Science Advisory Committee, one of the organizations abolished by President Nixon in his recent reorganization of the federal science system.

Over the past three decades, U.S. Presidents have felt a particular need for independent evaluations of projects promoted by the military establishment, and the PSAC and its subcommittees have had a notable influence in the defense area.

In recent years, the government increasingly has sought outside advice on civilian science and technology questions. Here, the advisory system has proved less useful, according to recent Administration statements.

Defense advice: Although its percentage of the federal research and development budget has declined steadily over the past two decades, the Defense Department remains by far the largest consumer of R and D funds. In an extremely tight fiscal 1974 budget, the Pentagon's R and D budget rose $536 million from fiscal 1973, to $8.5 billion. Defense work to be performed by other agencies (primarily the Atomic Energy Commission) brings the over-all military R and D budget to $9.4 billion, or 53 per cent of the $17.4 billion the federal government projects it will spend on R and D in fiscal 1974.

Military programs in the works include the B-1 bomber, the Trident submarine missile, an expensive bomber-penetration decoy system, a site-defense system for the land-based Minuteman intercontinental missile, a close-support aircraft for the air force, a new strategic submarine-launched cruise missile and a new army tank. In addition, Pentagon-financed basic research in areas such as materials, lasers, radar and undersea sound detection are slated for sizable increases.

Administration arguments—In the document announcing the White House science reorganization, the Administration argued that the Pentagon has developed "strong capabilities for assessing weapons needs and for undertaking new weapons development." The Administration said that in special situations it would call upon the National Security Council and the NSF director (in his role as science adviser) for independent assessments.

In defense of the action, a National Security Council staff member argued that the military establishment "is no longer a monolithic organization; there are plenty of sources from which the President can receive differing viewpoints. In the first place, each of the services has its own R and D apparatus; then there's the Office of the Director of Defense Research and

NSF Leadership

Although the National Science Foundation concentrates heavily on basic research, its two top leaders have backgrounds in applied research and development. Both NSF Director H. Guyford Stever and Deputy Director Raymond L. Bisplinghoff are aeronautical engineers with strong ties to the federal government's space and defense programs.

Stever: Stever, 51, came to his current post as NSF director in February 1972, after serving for seven years as president of Carnegie-Mellon University, Pittsburgh, Pa. Before that, he had spent his entire academic career at the Massachusetts Institute of Technology. At MIT, he was professor of aeronautical engineering and from 1961 to 1965 chairman of the Departments of Mechanical Engineering, Marine Engineering and Naval Architecture.

Stever has served on advisory committees and boards for the Defense Department and NASA since the Second World War, including the science advisory board to the U.S. Air Force chief of staff (1947-1969); the Pentagon's technical advisory panel on aeronautics (1956-1962); and NASA's advisory committee on missile and spacecraft aerodynamics (1959-1965). In 1955-1956, he was chief scientist for the Department of the Air Force.

Bisplinghoff: Except for a brief stint at the University of Cincinnati (1941-1943), Raymond L. Bisplinghoff, 56, also spent his entire academic career (1946-1962, 1966-70), at MIT. He was successively associate professor and then professor of aeronautical engineering and dean of the School of Engineering.

From 1962 to 1966, Bisplinghoff was in federal government service as associate administrator for advanced research and technology in NASA.

He is a member of both the National Academy of Sciences and the National Academy of Engineering. Additionally, he has served as a consultant and an adviser to a number of aerospace and airline companies. He was appointed to his current position in 1970.

Engineering (DDR&E) that reports directly to the Defense Secretary; and finally there's an outside Defense Science Board. There can also be independent assessments by the Central Intelligence Agency and the Arms Control and Disarmament Agency."

(All of the agencies he cited have been in existence for at least a decade, a period during which PSAC played an influential role in stopping some projects advanced by the military, notably including the proposed B-70 advanced bomber.)

The aide also said that the NSC, pursuant to its new responsibilities, "is exploring ways of independently tapping into the scientific community. We'll need a string of these people on call."

Outside dissent—Outside experts said the White House science reorganization could have particularly damaging consequences in the defense area. And few of those interviewed were impressed with the Administration's alternate plans for obtaining advice on military-technology issues.

The argument was put most strongly by President Eisenhower's science advisers, George B. Kistiakowsky and James Killian. Said Killian: "Under the new plan, despite what the Administration has said, there doesn't seem to be any way the President can get objective viewpoints that are not in some way encumbered with a vested interest."

And Kistiakowsky argued that "the nation and the President desperately need outside independent advice on defense matters. The questions of weapons systems—the B-1 bomber, Trident submarine, MIRV (missiles carrying multiple warheads)—are very much alive, and you cannot expect to get trustworthy information from the military."

Kistiakowsky expressed doubts that there were effective checks and balances and differing points of view within the Pentagon. He said, "the services grease each other's way; the Defense Science Board has always been heavily made up of scientists and engineers from companies dependent on defense contracts; and DDR&E in its first years represented an independent source, but now is almost completely under the thumb of the military."

Many of those interviewed also expressed doubts that the NSC staff would be able to offer an independent check on the military's claims. Among them was Paul Doty of Harvard, a friend and former colleague of Henry A. Kissinger, assistant to the President (national security affairs), whom Kissinger has called on occasionally since 1969 as an independent channel to the scientific community. In an interview, Doty said that the capacity of Kissinger and his staff to act as a real check on the military was strictly limited.

He said: "Henry did interest himself in 1969 and 1970 in defense and disarmament questions, but then he got on the international circuit and since then just hasn't had the time. We've pressed him on a few important problems, but he's ended up saying 'I know they're important, and if I could just get three weeks alone to get on top of them I could help you.' But, it isn't going to work out I'm afraid."

Doty said that the "NSC staff has some very capable people but they are already overwhelmed with work. On a given problem DOD can simply swamp them with information against which there is no check."

Domestic advice: Even the stoutest defenders of the OST-PSAC system admit that in the area of civilian science and technology the task of providing useful advice to White House policy makers had proved difficult and exasperating.

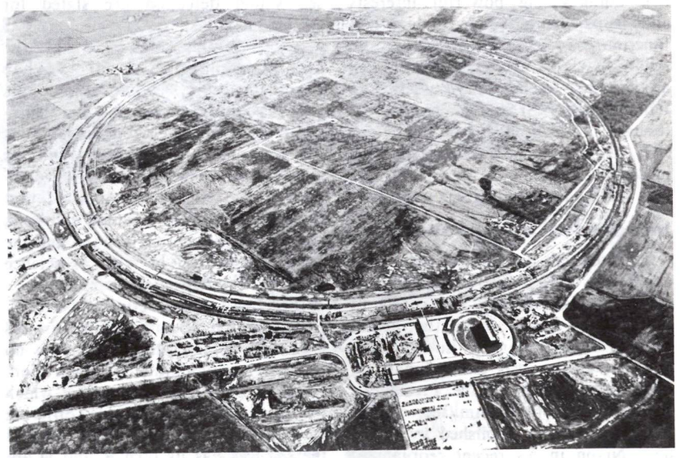
From its origin in 1957 until the mid-1960s, PSAC was composed largely of scientists and engineers expert in defense and space issues and drawn mainly from the physical sciences. Many had worked together in the World War II Office of Science Research and Development and, said Harvey Brooks, "Everybody knew everybody and we spoke almost in code."

In the 1960s, as the government began to deal more with science and technology problems in domestic affairs, the composition of the committee changed, at some expense to the old feeling of commonality and rapport. Said Brooks: "As other disciplines were added in the biological and social sciences, you did get more viewpoints but easy communication and an identity of purpose became more difficult."

PSAC members found that domestic problems they were asked to address often were closely associated with social and political judgments of a kind that made them more complex in many ways than the military projects PSAC had concentrated on before.

A young former OST staff member, who worked for Edward David, said that during the past two years he had attended meetings and discussions with present and former PSAC members, and that "it was striking how few of them were comfortable with or understood the problems associated with the application of civilian research to society. They were still very hardware oriented, and as Ed David learned, it was very hard to mix rocket scientists and sociologists and get people talking on the same wave length."

Although the President "has



An aerial view of the National Accelerator Laboratory, Batavia, Ill., used to study the nature and behavior of nuclear and subnuclear particles

chucked away his institutional advisory structure," said William Carey, "he hasn't closed off other options. I don't personally think it has been proven that a built-in advisory system is superior to the ad hoc approach the Administration seems about to take. The public task forces—mixing scientists, economists, lawyers and industry types—for instance, that Johnson and Nixon have used, may be a better method. It is a rare thing indeed for an advisory committee composed solely of scientists and engineers to be capable of assessing the political values or risks of the advice it is transmitting—or of packaging the advice in language or terms usable by the President."

David—Acutely aware of the problems both PSAC and the OST staff had experienced in providing the White House useful advice in civilian areas, David had actively been exploring ways to upgrade the advisory system in these fields during the last six months of his tenure.

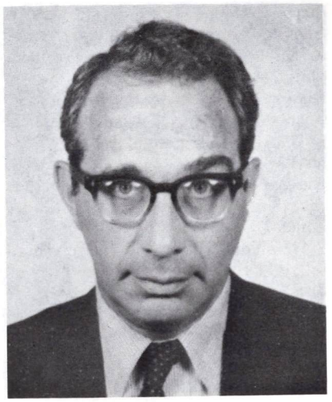
Before the President's science reorganization decisions were made, David had been planning to restructure part of the OST staff along problem-solving lines, following the model established by the office's energy-policy division.

Lawrence A. Goldmuntz, former exective director (1970-72) of the Federal Council for Science and Technology, with whom David consulted, said "the idea was to link a number of skills around a problem focus—to put together a lawyer, an economist, a social scientist and somebody expert in the hardware related to the problem."

In a speech given on Dec. 13, two weeks before he resigned, David identified several civilian R and D program areas which he said "required a strategic plan" and that spanned "several agencies of government and so the management and planning have to have a centralized focus, rather than being lodged in one agency."

"Further," said David, "the funding of these programs has already increased to a level where some over-all accounting is required. By accounting I mean what direction are these programs going, why they are going there and what progress are they making?" The program areas included energy, health, transportation, natural resources, education and social systems.

"The most representative one," said David, "... is energy. The energy dilemma is not only a tech-



Lawrence A. Goldmuntz

nological problem, it's an economic problem, a social problem, legal, political, environmental and even to some degree a moral problem. Reconciling these various factors, which fall outside of science, with science and engineering possibilities is the crucial issue in national programs of R and D."

David also identified technical advice for regulation and standard-setting—particularly in the environmental field—as a second major task for federal science policy making during the next decade.

He has often stated his belief that Congress, in passing the Clean Air Act Amendments of 1970 (84 Stat 1676), required stringent automotive-pollution controls without regard to the availability or the cost of technology to meet standards set in the law, and without benefit of adequate scientific advice from any source. He alluded to the problem in his Dec. 13 speech, predicting that automotive pollution-control measures would cost the public $100 billion between 1975 and 1985 and saying that where such "a monumental expense" was involved, "some rationalization of regulation is going to be necessary."

He concluded: "The nation needs strategies for achieving the qualities of life, in this case the quality of air.... I hate to say it, but I think we do not yet have that strategy in effect nor for that matter in view."

The speech could be interpreted as a warning to the White House that banishing science from the top levels of decision making could have deleterious consequences. But David loyally says now that he thinks that "the new mechanisms the President has established will create a focus to bring together all the elements I listed in my speech."

The budget process

"When most people talk about federal science policy," said Lee A. DuBridge, President Nixon's first science adviser, "what they really mean is 'Where's the money going?'"

Decisions involving the federal government's large R and D budget ($17.4 billion in fiscal 1974) was in fact one of the most important areas in which the science adviser and the OST played a part. And DuBridge's comment points to what may be the greatest loss in the abolition of OST: the close working relationship that had developed over the years between its staff and the staff of the President's budget office.

Although OMB benefited from the scientific expertise the relationship afforded it, there are no current plans to increase the budget agency's staff to make up for the loss. Charles F. Bingman, who heads the government organization branch of OMB's Office of Management Systems, said: "Over the years there's been a continuing debate as to whether the budget bureau should develop a specialized staff. The prevalent opinion still holds that the bureau should retain general rather than technical or special skills."

OMB-OST liaison: The liaison between OMB and the OST goes back to the late 1950s, when President Eisenhower's science advisers began to gather a small staff that grew throughout the 1960s with the creation of OST and a gradual increase in its membership. (At the end of 1972 OST had 22 professional staff members.)

Said William Carey, who had a major responsibility for R and D programs in the budget bureau until he left the agency in 1969: "The OST-OMB partnership was always an unequal one, with the budget bureau dominant at all times. But at least all the time I was around, OST people played an important part in the definition of questions, the analysis of options and even in the balloting on the outcome."

Individual relationship—OMB-OST teamwork was rooted in the day-to-day relations between individual budget bureau examiners and their staff counterparts in OST. "What we tried to do," DuBridge said, "was to have individual OST staff members pro-

vide the technical expertise and backup for key budgetary R and D decisions—in effect, to form a kind of technical arm of the budget bureau."

"By and large," said S. David Freeman, who headed OST's energy-policy staff from 1968 to 1971, "I think most of the budget bureau people felt that the OST staff tried hard to give objective, impartial advice and not fall into the role of advocates for certain programs."

The setting of long-range priorities for expenditure of federal R and D money never was OST's strong suit; there simply were too many immediate problems that the White House asked the staff to analyze. The result was that OMB tended to use OST advice on a handful of important issues each year. Carey said that he and others had pressed within OMB for an increase in the OST's staff, "but it never came off."

Breeder and shuttle—The two largest civilian R and D programs now being funded by the federal government—the nuclear fast-breeder reactor and the space shuttle—provide examples of major White House decisions in which OST played a large role.

In his 1971 energy message to Congress, President Nixon raised to top priority the $3.4-billion breeder-reactor program. Just two years earlier, a major debate had taken place within the budget bureau on whether to cut back drastically or drop the program. Recalled David Freeman: "It was a crucial time. You had a new Administration and a new budget director looking for places to save money. The policy-planning staff of the budget bureau came forward with a number of arguments, including challenges to the safety of the project, to its cost/benefit ratio, the contention that the country didn't need it, in the energy mix and that we ought to rely on the private market to develop it.

"The OST staff countered with arguments that the breeder was feasible, that its cost/benefit ratio was indeed quite good and that the project was so large that private industry couldn't carry it alone."

Freeman said he is not "sure how the issue would have come out had we not been there, but I think we did have an impact."

President Nixon's January 1972 decision to go forward with NASA's $5.1 billion space-shuttle development program was also preceded by a heated and complex debate.

Raymond L. Bisplinghoff

Navy Capt. Russell D. Drew, who had been OST's space expert since 1967, became a key figure during negotiations late in 1971 on the proper nature and cost of the shuttle system. At the time, NASA was pressing for a sophisticated design costing more than $14 billion. Factions in OMB wanted to drop the project entirely. Drew had followed the shuttle issue closely since NASA first proposed it and, said a White House aide, "he became the real honest broker among contending factions."

Getting information—Freeman said the OMB liaison also was quite important in giving the OST influence within the federal bureaucracy, facilitating its efforts to secure information on R and D efforts from mission agencies.

"Working as a White House staff member is always a game of poker," he said. "You develop a network of contacts in various agencies but their cooperation is heavily dependent on how they perceive your power. It was important when we called that the agencies never really knew exactly how much clout we had. They didn't know how badly we could hurt them, and also there was always the possibility we could help them, particularly with the OMB."

Director's sessions—Individual consultations between OST and OMB staff members probably constituted the most important part of the White House science structure's role in federal-budget policy making.

But in addition, the science adviser occupied an unusual position in the budget process: he was the single outside participant allowed in the final round of budget negotiations (the director's review) in November and December. (This practice grew up in the 1960s and continued, without statutory base, until OST was abolished. In only one year, the first of the Nixon Administration, did the science adviser not participate in these sessions.)

"This was an important privilege for the science adviser, and one that no Cabinet officer had," said William Carey. "Particularly with the fragmented federal structure for science and technology it was important that he be there when the final decisions were made."

Problems for OMB: Some present and former government officials who have worked on federal R and D budget policy believe that OMB will not be able to perform as capably in the area as it did with the OST's assistance.

Among them is Lewis M. Branscomb, who was director of the Commerce Department's National Bureau of Standards from 1969 to 1972 and now is vice president and chief scientist at International Business Machines Corp. Said Branscomb: "The capability most conspicuously lost by the reorganization was that of getting a judgment—from a group not tied to competing agencies and programs—about the technical and management possibilities and traps in federal R and D programs. The typical OMB examiner, while usually competent and diligent, is now much more likely to be taken in by slick operators and highly varnished budget presentations."

An OST staff member who worked under David said: "The real problems are going to emerge in dealing with new programs. OMB examiners and the higher ups are quite good at educating themselves over the years on the issues related to older programs, but they have neither the scientific expertise themselves nor, and this is more important, do they have the knowledge that would allow them to tap the right men in various agencies to give them the straight story on new programs."

Freeman expressed doubt that the NSF could assume the role the OST had played in the budget process. He said: "There is a real sense of unity that develops among White House staff members. The two-block separation will be a formidable barrier for NSF, because they'll be thought of as outsiders and not the President's own men." □

White House Report/Air carriers, Congress divided over Nixon's choice for CAB

by Dom Bonafede

How does a nationally unknown small-town Democratic judge from Ada, Okla., get to be named to a major federal regulatory agency by a Republican Administration?

The question, which goes to the heart of the nomination process as practiced at the highest governmental level, was raised March 12 with the announcement that President Nixon was picking Lee R. West to be a member of the Civil Aeronautics Board (CAB).

If confirmed by the Senate, West, 43, would succeed Robert T. Murphy, a consumer-oriented advocate of open competition who has been a CAB member for 12 years. Murphy, whose term expired at the end of 1972, actively sought a third six-year term. He had support from airline unions, some industry executives and Democratic and Republican leaders of the Senate Commerce Committee.

Murphy will continue to serve until the Senate confirms his successor or until it adjourns. If it adjourns without confirming West—and this is a distinct possibility—he could take Murphy's seat as an acting board member.

Routine: Normally, the selection and approval of regulatory commissioners are pro forma proceedings, attracting little notice.

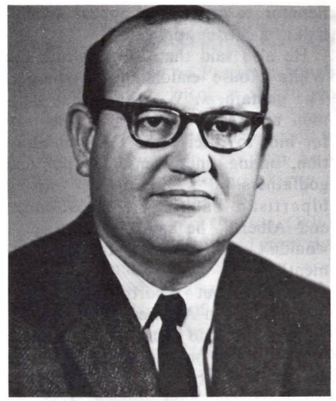
The West nomination, however, has generated intense backstage maneuvering by competing political and corporate interests.

At stake is the philosophical makeup of the CAB and its impact on future decisions regarding lucrative air-carrier routes. This threatens to make the West nomination a controversial issue and leave his confirmation hanging in balance.

Interviews with Members of Congress, CAB officials and airline executives foreshadow a public dispute, particularly regarding the role played by American Airlines Inc. in the affair.

Merger denied: According to several participants, a concerted move to get rid of Murphy began last July after the CAB rejected a proposed merger of American and Western Airlines Inc. The board's decision ended a bitterly waged struggle between the two airlines and several rival carriers which opposed the merger. *(For a comprehensive account of the background of the proposed merger, see Vol. 4, No. 14, p. 546, and No. 15, p. 606.)*

Traditionally an opponent of mergers between giant airlines, Murphy



Lee R. West

sided with the majority in the board's 4-1 vote.

"American was terribly upset over losing the merger," said David A. Sweeney, legislative specialist for the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America. The Teamsters, who represent workers at several airlines, fought the merger and favored the reappointment of Murphy.

American, said one of the airline's executives, "makes no bones about its differences with Murphy." According to a staff member of the Senate Commerce Committee, George A. Spater, who is American Airlines' board chairman, "made it known he wanted Murphy out."

American's position: Cyrus S. Collins, American's vice president for public affairs, said that several airlines, including American, were concerned over what they considered Murphy's failure to sympathize with current problems facing major carriers. Collins, however, denied that American conspired with the Nixon White House and was behind West's nomination.

"We don't know West and we never proposed his nomination," he said. "Our concern was that they find someone who realizes that the industry has problems and needs new solutions. We want high competence and objectivity and we'll take our chances with the board."

As Collins indicated, American's principal objective was to replace Murphy with a nominee more concerned with the carriers' welfare.

Fair return: Commenting on American's unhappiness with Murphy, an official of the airline who did not want to be quoted by name said, "It's no secret we'd like someone more aware of our problems. In 1960, the CAB said 10.5 per cent was a fair return on our investment; now 12.0 per cent is thought to be fair. Yet, in recent years, it has been under 5.0 per cent.

"The industry is worried about overcapacity; traffic hasn't grown in pace with most of the route awards. Given the larger airplanes, it's hard to justify competition without changing standards. The question is whether we need the competition.

"Excessive competition can be troublesome to us. Load factors are low. There are labor problems; we are forced into making union agreements that are inflationary. In addition, we have environmental and noise problems."

Murphy, he said, "has always been for competition, lower fares and more routes; he has consistently favored the little fellow."

Oklahoma constitutent: While American executives stoutly deny any direct connection with West's nomination, the fact remains that the airline is a corporate constituent of Sen. Henry Bellmon, R-Okla., who along with House Speaker Carl Albert, D-Okla., proposed West's name to the White House.

American employs about 7,000 workers at its maintenance depot in Tulsa.

Also, West lives in Albert's 3rd congressional district and has known the Speaker since he went to Congress in 1947.

Bellmon: Over the course of his political career, Bellmon has crossed paths with both American and West.

As Oklahoma's first Republican Governor (1963-67), he appointed West a state district judge in 1965. The two became close friends, sharing a love for outdoor field sports and a political affinity, even though they belong to different parties.

During a recent interview, Bellmon said, "I didn't know him at the time I appointed him to the bench, but he was recommended by the bar association. I got to be friends with him and admire him very much."

Explaining his appointment of a Democrat, Bellmon said: "Our state has a split political personality; it's heavily Democratic but the people vote independent. West's county (Pontotoc) had few eligible Republicans and he was head and shoulders

above the rest."

Political ban: As West himself said in an interview, state law and the canons of ethics prohibit him from actively participating in political campaigns.

Nonetheless, he said that he has "supported a couple of candidates." Among them were Bellmon in his 1968 senatorial campaign. Also, as reported by Skip Healey, an official of the Oklahoma State Republican Committee, West was "receptive to Nixon's candidacy" in the 1972 national election.

An aide to Albert in Oklahoma observed, "I don't know about his (West's) political activities, but he has to be in some to hold the position he does."

Sponsor: Bellmon freely admits that he sponsored West for the CAB job and plugged his nomination at the White House.

"The initiation came from here," Bellmon said. "Carl Albert was high on him. And I sent him down to the White House. . . . The truth is American is disenchanted with Murphy. American is a corporate constituent of mine. But it had nothing to do with West's nomination."

Merger testimony: Bellmon's sponsorship of West for the CAB is not the first time that his activities have coincided with the interests of American.

On Feb. 16, 1972, Bellmon testified before the CAB in favor of the proposed merger between American and Western. He argued that one result of the merger would be improved air service to Oklahoma, which was then served by American but not Western.

Bellmon added that he had less provincial reasons for supporting the merger. "It is my firm conviction that this country supports too many airlines, resulting in duplication of services," he said.

"This duplication of service adds to the cost of airline operations, it adds to the over-all cost of air travel and ultimately it falls upon the traveling public in the form of higher rates," Bellmon said. "Monopolies certainly are not the answer to this problem. Competition must be preserved and strengthened. But in many cases where several airlines are serving the same cities or routes, fewer carriers could provide the same service far more efficiently with greater economy of operation and greater savings to the traveling public."

In the view of an attorney for a competing airline, "It's unusual for a Senator to personally appear on behalf of a carrier applicant."

He also said that Albert wrote the White House endorsing the merger.

The godfathers: West said that Bellmon and Albert had paved the way for him to receive the CAB nomination, acting, in a sense, as political godfathers. "I received strong bipartisan backing from Bellmon and Albert," he said. "Otherwise, I wouldn't have received the appointment."

Asked about reports linking him with American Airlines, West replied, "Gosh, I have no idea where that came from. I think on one occasion I may have met George S. Warde (American Airlines president), but I wouldn't know him if I saw him. I never had any dealings with American or heard a case in which they were involved."

Henry Bellmon

Impressions: Whatever its merit, the general impression within the airline industry is that American Airlines is responsible one way or another for the West nomination.

"If I had to guess what happened," said an attorney for a rival airline, "American was the activist on behalf of West, with Bellmon the front man and Albert the power behind the deal."

He said, "Murphy is an advocate of competition, he's against big mergers, he recognizes the labor interests and he's a proponent of smaller carriers. All this tends to be disruptive in creating the Penn Centrals of the airline industry."

Crucible: Above all, the West nomination shows how a nomination is hammered from a crucible of personal relationships, political ideology, corporate influence, congressional pressure and geographical representation.

Each of these elements played a role in plucking West from the anonymity of Oklahoma's Pontotoc County and bringing him to the attention of the White House.

Chronology

The chronology of the nomination began last fall when Bellmon and Albert, aware that Murphy's term was scheduled to end Dec. 31, 1972, conducted a campaign to replace him with West. Recalled an aide to Albert:

"Albert and West have known each other for a long time, but Bellmon submitted West's name. Nixon doesn't go to the Democrats for nominees.

"We had nothing against Murphy, but it was our understanding he wasn't going to be reappointed. It was a matter of endorsing a constituent whom Mr. Albert has known practically all his life."

Bellmon recommended West in discussions with Frederic V. Malek, then White House personnel chief and now deputy director of the Office of Management and Budget (OMB), and Peter M. Flanigan, currently executive director of the Council on International Economic Policy who, as an assistant to the President, acted as liaison with big business and as White House contact for the regulatory agencies.

"Flanigan," said Bellmon, "has been a good friend of mine down there (the White House)."

Bellmon also talked with Jerry H. Jones, then an aide to Malek, who has since replaced him.

In November, CAB Chairman Secor D. Browne told the White House that he was thinking of leaving the board. Thus, the prospect of two vacancies on the five-man board lent new urgency to the campaign to replace Murphy.

Comes to Washington: Summoned to Washington, West met with Frank C. Herringer, then an aide to Malek who has since been appointed administrator of the Urban Mass Transportation Administration. West reported he also "had communications" with John W. Dean III, counsel to the President, and Joseph J. Adams, a member of Dean's staff.

Under arrangements made by Bellmon, West met with Sen. Norris Cotton, R-N.H., ranking minority member of the Senate Commerce Committee, who is leading the fight for Murphy's reappointment. West also visited with Browne at the suggestion of Malek's office.

Recalling the incident, Browne said, "West came by one afternoon. He'd been sent by the personnel people at the White House. I described what a CAB member does, the pay, the duties and so on . . . he knew what the board was but didn't know how many staff people there were or the number of secretaries he'd have. He then thanked me and went away."

Hands off: Browne emphasized that he was in no way involved in the battle to replace Murphy with West.

"I stayed away from the whole thing," he said. "I very carefully kept out of it."

This meticulousness by Browne in staying clear of the controversy underlies its political sensitivity.

Running the gamut: Remarking on his experience in Washington, West said, "There were so many people I talked to that I can't remember them all. This was during the time they were switching around; I'd talk to somebody, they'd leave and somebody else would call."

The committee: Publicly supporting Murphy in the CAB dispute are the Democratic and Republican leaders of the Senate Commerce Committee, whose jurisdiction includes the holding of confirmation hearings on CAB nominations.

In a letter to President Nixon dated Aug. 3, 1972, three members of the committee—Chairman Warren G. Magnuson, D-Wash., John O. Pastore, D-R.I., and Cotton—urged the retention of Murphy.

They said they "strongly but respectfully" recommended his renomination. They contended that he had served the board "faithfully" and that they could vouchsafe his "ability, character and integrity."

Four days later, Magnuson received a reply from Tom C. Korologos, deputy assistant to the President and White House lobbyist for the Senate side.

Korologos wrote Magnuson, "You may be assured that your recommendation will be placed in the appropriate hands so that Mr. Murphy will receive most careful consideration for reappointment to this post in December."

Regional flavor: Both Cotton and Pastore admittedly are somewhat influenced by regional considerations. With Browne gone and Murphy on the brink of leaving, New England would lose two members from the board at a time when air service to the area is being threatened with cutbacks.

Browne comes from Massachusetts and Murphy from Rhode Island.

Sponsored by Pastore, Murphy formerly served as chief counsel to the Senate Commerce Subcommittee on Aviation.

(In an ironic turn of events, Pastore and former-Sen. (1951-69) A. S. Mike Monroney, D-Okla., were among the chief architects of the Federal Aviation Act of 1958. Monroney lost his Senate seat to Bellmon in 1968.)

Delta case: The concern of Cotton and Pastore over the CAB matter is particularly acute at this time. Pending before the CAB is a proposal by Delta Air Lines Inc. to eliminate 18 of the 26 New England cities served by Delta and Northeast Airlines Inc. following a merger between the two carriers. The merger was approved 3-2 by the CAB on April 24, 1972, with Murphy voting with the minority because of his opposition to the proposed reduction in service.

Cotton: Shortly after the West nomination, Cotton told *National Journal:*

"Of course, I was disappointed. Bob Murphy has been a good friend to my state and northern New England in trying to get us air service. He was the only one to show concern.

"After he voted against the Delta-Northeast merger, I thanked him and pledged to do what I could to get him reappointed. I eventually took it up with the White House, through my own personal friend, Peter Flanigan. He noted my request and said he hoped something could be done.

"A couple of months later, he called and said it was going to someone else. He was very frank and said he was sorry and hoped it wouldn't hurt our relationship. I told him I was sorry but that they could expect opposition from our committee."

Cotton said that "ultimately" hearings may be held on the West nomination, but held out little hope that they would be held in the foreseeable future.

"They may be somewhat delayed," he said in a wry tone. "I don't think the chairman would hold hearings without Pastore or myself present. Right now, we are very busy. I don't know when we will find time for them."

Cannon: Another committee member, Sen. Howard W. Cannon, D-Nev., also implied that the committee should take its time on the West nomination.

An aide to Cannon said he wants "to examine West's qualifications to be a CAB member" and review his record as a judge.

Labor front: Endorsements for Murphy, meanwhile, came from at least two labor organizations.

The Teamsters sent a letter to President Nixon requesting that Murphy be renominated. And the AFL-CIO Transport Workers' Union of America, Local 514, which includes 5,000 American Airlines workers in Tulsa, sent a telegram backing Murphy to Bellmon and several Commerce Committee members. □

" . . . don't know where West starts"

Commenting on President Nixon's selection of Oklahoma judge Lee R. West to succeed Robert T. Murphy as a member of the Civil Aeronautics Board (CAB), an assistant to Sen. Norris Cotton, R-N.H., said, "Murphy is a known quantity but we don't know where West stands." Opponents of West's nomination fear that he will become an advocate of industry. According to one airline attorney, "Without Murphy in there, a lot of the carriers will misbehave."

The record: Born in Clayton, Okla., 43 years ago, West grew up in Antlers, Okla., and was graduated from the University of Oklahoma with a degree in government in 1952. After serving in the Marine Corps for two years, during which he attained the rank of captain, West received a law degree from the University of Oklahoma in 1956. As a recipient of a Ford Foundation Fellowship, he did postgraduate work at Harvard Law School.

While practing law in Ada, Okla., (1970 pop. 14,859), West lectured at the University of Oklahoma. In 1965, Gov. Henry Bellmon, R, now a U.S. Senator, appointed West, a Democrat, as a judge of the 22nd judicial district of Oklahoma. He has been assigned as a special justice of the Oklahoma Supreme Court.

New Federalism Report/U.S. officials take to road to urge support for Nixon programs

by Joel Havemann

Top regional administrators of federal programs for states and cities are in the middle of a rare exercise for such high-ranking officials—visiting the local officials with whom they are supposed to work.

The ostensible purpose of the federal road show is to try to clear up some of the confusion that has accompanied President Nixon's fiscal 1974 budget. In the budget, special revenue sharing takes the place of scores of categorical grants of federal assistance for states and cities, and it is hoped that the traveling administrators will help ease the fears of state and local officials about the transition to the new approach.

There is a political purpose as well. The federal administrators have been defending the budget against charges that it has gutted some of the most effective federal social programs. And they have been urging support for special revenue sharing, which faces great obstacles in the Democratic-controlled Congress.

The traveling federal officials are the members of the 10 Federal Regional Councils, which Mr. Nixon established in 1969 to coordinate federal assistance to state and local governments. On each council is the regional head of seven federal agencies—HUD, HEW, Labor, Transportation, Office of Economic Opportunity, Environmental Protection Agency and Law Enforcement Assistance Administration.

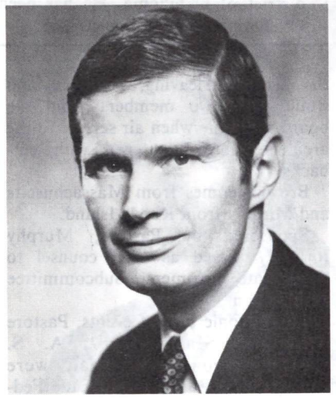
Frederic V. Malek, deputy director of the Office of Management and Budget, ordered the regional officials to take to the road in a memo dated Feb. 27. The chairmen of the regional councils gathered in Washington on March 9 to get briefings on the 1974 budget from OMB.

Mr. Nixon himself met with the chairmen for about 20 minutes to emphasize their vital role in his plan for a decentralized federal bureaucracy, part of his over-all scheme to realize the "New Federalism." He told them that his 1974 budget was designed to keep spending under control and to prevent a tax increase, while at the same time moving control of many federal programs from Washington to the states and cities. *(For an earlier report on program decentralization and the Federal Regional Councils, see Vol. 4, No. 51, p. 1932.)*

Each regional council has scheduled from five to 11 meetings with state and local officials, with the last meeting planned for April 11.

So far, according to OMB officials who oversee the work of the councils, the federal road show has met considerable public opposition on the part of Democratic Governors and mayors to Mr. Nixon's 1974 budget. But these OMB officials believe the Administration's message may be getting through even to opponents.

William R. Feezle, the OMB representative for the regional council in Region V (Chicago), said the Democrats' public outrage is a political necessity. Privately, Feezle said, many Governors and mayors are concerned with getting as much federal money as they can with as much control over



Frederic V. Malek

it as possible, and they are beginning to believe that special revenue sharing may be the best technique.

Before the current series of meetings, only a few of the regional councils, notably those in Chicago and Seattle, had met regularly with local mayors and Governors. But in their work plans for the 1974 fiscal year, all 10 of the councils have shown that they intend to continue to get together with local officials.

In addition, OMB administrators are discussing the possibility of adding Agriculture and Interior to the departments represented on the councils.

St. Paul meeting

A *National Journal* reporter was in St. Paul on March 19 for a meeting between regional council members for Region V and about 75 representatives of state and city governments in Minnesota and Wisconsin.

In general, officials of the states and big cities, who have heard much of the same information before, said they were just as confused after the meeting as before. They were especially worried about what would happen to the many federal programs scheduled for extinction in the 1974 budget if the Nixon Administration fails to get congressional approval of special revenue sharing and does not agree to continue the old programs.

On the other hand, mayors from smaller towns, many of whom never had met with such high-ranking federal officials, found the meeting useful, primarily for the contacts they made.

Introduction: "We're here to brief you on the President's 1974 budget," said Regional Council Chairman Norman A. Erbe, former Republican Governor (1961-63) of Iowa, by way of introduction. But it quickly became clear that Erbe, who also is the regional representative of the Transportation Department, wanted to persuade as well as to inform.

"The 1974 budget is the President's primary management tool to slow inflation, avoid tax increases and revamp the federal grant system," he told the state and local officials. "The main characteristic of the President's policies and programs since he took office has been a dramatic shift of outlays from defense to human-resources programs."

Erbe said some federal grant programs eliminated from the 1974 budget have not worked, and others can be controlled more effectively by local officials than the federal government. If the President's special revenue-sharing proposals are enacted, he said, total federal outlays for human resources will go up by 8 per cent in 1974.

"The issue is not that expenditures were reduced," he said. "It is that they were not allowed to run wild."

Rebuttal: The Democratic administrations of Minnesota and Wisconsin had made sure that four state and local officials also had a chance to make some introductory remarks. It was as if they were talking about a different budget.

Gerald W. Christenson, Minnesota state planning director, said the Nixon Administration was using "phony figures" to defend its budget. Of the $10-billion increase that the Administration is claiming for its human-resources budget, Christenson said, some $9 billion is earmarked for social security benefits, which do the states and cities no good. At the same time, he added, the defense budget is going up $5 billion, and another $2.3-billion budget increase is simply to pay interest on the national debt.

"When we look at all those figures and put them together," he said, "we find there really isn't an increase in the 1974 budget for social and environmental programs."

Christenson estimated that the President's 1974 budget could cost Minnesota $200 million if special revenue sharing or other measures do not make up for the cuts.

(For an analysis of the fiscal 1974 budget's impact on grant-in-aid programs, see Vol. 5, No. 7, p. 215.)

The Nixon Administration has sent only two of its special revenue-sharing programs—education and law enforcement—to Congress, and the former proposal's chances of passage are dim. State and local officials have not even seen the revenue-sharing proposals for manpower and urban community development. Christenson said the resulting uncertainty has made planning impossible.

"Our legislature goes home May 21," he said. "How are they to make wise decisions?"

Christenson said the concept of special revenue sharing, which would reduce the number of strings attached to scores of categorical programs of federal aid, was attractive.

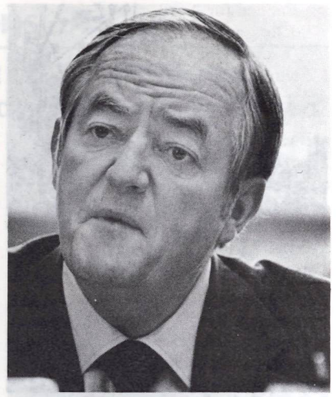
"It would be a good idea to bring more of the decision-making power to the local level," he said. "But at the same time it's important to provide adequate resources."

Other opening speakers stressed the theme of uncertainty. Edward Johnson, executive director of the League of Wisconsin Municipalities, said Mr. Nixon's impoundment of 1973 funds earmarked for social programs added to this problem.

"We wonder what will happen if Congress does not enact the President's special revenue-sharing proposals," Johnson said. "Will it be the same old ball game of categorical aid?"

Questions: The opening remarks were followed by presentations by each of the seven agency heads. All seven tried to explain what the 1974 budget would mean to the states and cities, and some of then tried to defend the program cuts in the budget.

The federal administrators had a hard time with many of the questions asked by the state and local officials.



Hubert H. Humphrey

Richard E. Friedman, regional HEW director, was asked what would happen to federally funded drug rehabilitation centers that are scheduled for no money as of July 1. "I don't think I have a satisfactory answer for you," Friedman said.

A member of the audience wanted to know if there was any news about impoundments. "I wish I could provide you some news, but I can't," Erbe replied.

Hector Santa-Anna, acting regional OEO director, was asked what would happen to OEO programs when the office is abolished after June 30. Santa-Anna, who noted that he also is wondering where he is going to work, said most of the programs would be picked up by other agencies or could be financed by special revenue sharing.

George J. Vavoulis, regional administrator for HUD, was asked when the community development revenue-sharing bill would go to Congress. "I don't know," Vavoulis said. "The political game in Washington these days is pretty strong."

Politics: Of all the seven speakers, only Vavoulis confronted the issue that was on everyone's mind—politics. He prefaced his remarks by noting he was in the state represented by Sens. Walter F. Mondale and Hubert H. Humphrey, two Democrats who on the same day were holding hearings in Minneapolis to condemn the President's 1974 budget.

"This is politics in America," Vavoulis said. "President Nixon had a mandate in his election. Whether you like it or not, he won a smashing victory. I'm not saying your position is wrong and our position is right. I'm saying you've got to live with it."

Vavoulis did not promise that state and local officials would be consulted when the Nixon Administration made decisions about what to do with social programs. He promised only that the Administration would do "everything within our command to tell you what has to be done."

Other federal administrators spoke only privately about politics. For example, Erbe said political motives probably were behind the fact that the White House has not let it be known what it would do if special revenue sharing fails in Congress. This way the pressure on Congress to approve special revenue sharing is greater.

Reaction: State officials and representatives of leagues of cities, who are relatively sophisticated in their understanding of federal-state-local relations, came away unimpressed.

"We haven't gotten much that is useful," said Christenson, "but I think that's because they (the federal administrators) haven't been given anything to tell us."

Philip Cohen, president of the League of Minnesota Municipalities, said he had heard the same message from federal officials before: He said he was as confused as ever about what would happen if the Nixon Administration and Congress cannot get together on what to do with grants to states and cities.

Don G. Holl, chief of federal-state relations for Wisconsin, said he found that the meeting was largely to provide a forum for the Nixon Administration.

But officials of smaller towns, who have not had much contact with federal administrators, were more appreciative. Donald R. Foss, the mayor of Altoona, Wis. (population 2,900), said this was the first time he had seen the top federal administrators from the regional office in Chicago.

"In the past I've been disgusted," Foss said. "I've always gotten awful run-arounds from the federal people. This is the first time in four years that they'd give you a straight answer."

The mayor said he has been trying for years to get federal aid to build a new reservoir and more housing for the elderly. He found out at the meeting that the Nixon Administration has frozen aid for these two kinds of projects.

"We didn't get any money," he said. "But at least we got some answers." □

Trade Report/Administration asks for trade sanctions against balance of payments offenders

by Richard S. Frank

The Nixon Administration will back its international monetary reform proposals with legislation imposing U.S. trade sanctions against countries unwilling to reduce their chronic balance-of-payments surpluses.

The U.S. monetary plan calls for international sanctions against such countries. The trade legislation being prepared for submission to Congress in April will ask for Presidential authority to impose higher tariffs and other trade restrictions as unilateral U.S. sanctions.

This authority would be invoked selectively against individual countries, in contrast with separate authority that also will be sought to raise or lower import restrictions across-the-board to meet persistent U.S. payments deficits or surpluses.

Thus the former could be imposed on imports from countries such as Japan and West Germany, which have been running substantial surpluses in their basic balance of payments; the latter could be imposed on all imports at a time, such as the present, when the United States is running a payments deficit of $9.2 billion.

Report: The U.S. proposal is outlined in the first report of the Council on International Economic Policy (CIEP) submitted with the President's international economic report to Congress on March 22.

The report includes the first public description of the principal elements of the Administration's trade legislation, although most provisions have been aired informally without much detail in recent weeks.

Included are proposals to:

- permit the President to raise or lower tariffs, virtually without limit;
- encourage the United States to negotiate for the removal of non-tariff barriers to trade;
- make it easier for the President to raise tariffs or impose quotas temporarily to protect U.S. industry from import competition;
- provide some form of improved assistance for employees put out of work or threatened with job loss because of imports;
- extend equal treatment to imports from the Soviet Union and other Eastern European countries.

The CIEP report also makes it clear that the Administration will oppose any attempts to change the tax treatment of the overseas earnings of U.S. companies. *(For background on trade legislation and monetary reform, see Vol. 5, No. 2, p. 44, and No. 10, p. 352.)*

Loading cotton for export

Sanctions: The formal U.S. proposal calls for more rapid adjustment in the balance of payments accounts of each country so that chronic surpluses or deficits could be eliminated and something close to international equilibrium attained.

As part of that proposal, the United States outlined a series of international sanctions that could be imposed against a country refusing to trim its surplus, including a universal surcharge on its imports.

The Administration trade bill will, under existing plans, ask that the President be authorized to impose such a surcharge.

Tariffs: The trade legislation will include a bold bid for Presidential tariff authority exceeding any previous such congressional grant.

If granted, the President would be able to cut tariffs back to zero. Even if he never used the full authority, it would give him and his trade negotiators "maximum negotiating flexibility," according to the CIEP report.

The President also would be able to raise tariffs against countries maintaining unreasonable restrictions on U.S. exports, such as the variable levies imposed by the European Economic Community against farm products.

Safeguards: The trade bill will propose easier access to relief for industries injured or threatened by imports.

Under existing law, the Tariff Commission must find that the injury results from earlier trade concessions. It has only rarely so found.

The Administration will propose an easier test, dropping the link to previous concessions and requiring a showing only that increased imports are or threaten to be the "primary cause" of injury.

Once the Tariff Commission has made such a finding, the President could (as he now can under present law) raise tariffs, impose quotas or negotiate voluntary-restraint agreements to keep out the offending imports.

Adjustment aid: Under existing law (76 Stat 872), the same test of injury and finding by the Tariff Commission authorizes aid to companies and workers—loans, tax breaks and technical aid to the former and jobless benefits and relocation and retraining aid for the latter.

But adjustment assistance has been opposed by organized labor as inadequate, and the Administration is inclined at this point not to propose any improvements in the system.

Instead, its inclination is to sponsor or endorse separate legislation that would mandate improved state unemployment benefits to all workers and provide federal standards for more secure private pension systems.

MFN: The bill will include a provision to extend most-favored-nation status (MFN) to the Soviet Union and other Eastern European nations, probably in the form of Presidential authority to grant such status "when he believes it is in the national interest to do so," according to the CIEP report.

MFN status for the Soviet Union is required to implement the U.S.-Soviet Union trade agreement of last Oct. 18.

However, a majority of the Senate and the House is sponsoring legislation that would deny MFN status to any Soviet-bloc nation that restricts emigration of its citizens.

The legislation is aimed at the Soviet law that levies an exit tax on emigrants as compensation for higher education received at state expense. It falls most heavily on Soviet Jews attempting to emigrate to Israel.

The law has at least temporarily been suspended, but doubts about Soviet intentions remain.

Taxes: The Administration is standing fast against labor demands that U.S. multinational companies lose the credits they now get against their U.S. taxes for the taxes they pay to foreign countries and their right to defer U.S. tax payments until their overseas earnings are repatriated.

Repeal of the latter had been considered and then rejected by the Administration. □

Checklist

Congressional Actions

House and Senate target economic issues; interest rates, spending ceilings, prices debated

The House Banking and Currency Committee March 26 began hearings on President Nixon's request for a one-year extension of the Economic Stabilization Act of 1970 (84 Stat 799) which expires April 30. The Act authorizes the President to control prices, wages and rents. Committee Chairman Wright Patman, D-Tex., introduced a bill (HR 6168) to freeze prices and interest rates at the March 16 level for 60 days and to roll back rents to their Jan. 11 level. Patman said that his legislation "is recognition of the obvious—that Phase 3 isn't working and that immediate action is needed to halt the spiraling increases in prices, rents and interest rates."

The Senate March 20 approved 85-2, a one-year extension of the price and wage control legislation after adopting 50-38 an amendment offered by Sen. Clifford P. Case, R-N.J., to limit rent increases on low and moderate housing to 2.5 per cent annually over increases in landlord costs for municipal services, taxes, capital improvements and increases in labor costs. Also adopted was an amendment by Sen. William D. Hathaway, D-Maine, to require companies having sales of more than $250 million a year to report publicly their costs and profits when seeking price increases of more than 1.5 per cent for a product that accounts for 5 per cent or more of sales.

In a related matter, the Joint Economic Committee in its annual report released March 26 on the President's Economic Report, expressed support for the Administration's proposed $268.7-billion spending ceiling and international economic policies, but clashed over wage and price controls with the Democratic members favoring a 60-day freeze.

Economic issues

Lumber prices: Cost of Living Council Director Dunlop March 26 told the Housing and Urban Affairs Subcommittee of the Senate Banking, Housing and Urban Affairs Committee that the council will begin hearings April 4 to consider reimposing price controls on lumber. The controls, if adopted, would be effective as of March 26, to avoid any incentive for price increases during the hearings. Dunlop said that in order to increase the nation's lumber supply the government would authorize more tree-cutting on federal lands and attempt to reduce log exports to Japan.

Lindy Boggs

William Hathaway

Politics

House: Democrat Corinne (Lindy) C. Boggs defeated Republican Robert E. Lee, a Gretna attorney, in Louisiana's March 20 special election to fill the 2nd district seat of her late husband, Rep. (1941-43, 1947-73) Hale Boggs, D-La., majority leader in the 92nd Congress. Mrs. Boggs, 57, who was sworn in March 27, is the first woman elected to Congress from Louisiana and her victory brings the total number of women in the House to 15 (13 are Democrats). Total Democrats in the House are now 242 and 192 Republicans, with one vacancy (Illinois, 7th district).

Republican campaign committee: Rep. Robert H. Michel, R-Ohio, March 21 was elected chairman of the Republican Congressional Campaign Committee, defeating Rep. Clarence Brown, R-Ohio. Michel succeeds Rep. Bob Wilson, R-Calif., who resigned March 15.

Party change: Rep. Paul N. McCloskey Jr., Calif., announced March 21 that he had dropped his Republican registration and re-registered as "decline to state," a category available to voters in California who do not wish a partisan affiliation. McCloskey, 45, was elected to Congress in 1967.

Environment and resources

Rural development: The Senate March 22 cleared and sent to the President a bill (HR 3298) to reinstate the rural communities grant program under the Consolidated Farm and Rural Development Act (86 Stat 657). The bill requires the President to spend $150 million authorized by Congress for rural water and waste-disposal grants in 1973. The program, terminated Jan. 10 by the President, helps small communities build water and sewer systems. The House passed the bill March 1.

John D. Ehrlichman, assistant to the President for domestic affairs, March 9 said that the bill was one of the 15 "Trojan horse" spending bills that the President would veto.

Solid waste, clean air extension: The Senate March 27 passed and sent to the White House one year extensions of the Solid Waste Disposal Act (79 Stat 997) and the Clean Air Act (77 Stat 392). Authorizations for both laws expire June 30. The bills extend authorizations through fiscal 1974 at the existing levels—$238.5 million for solid waste and $475 million for air pollution.

President Nixon's fiscal 1974 budget allots $5.7 million for solid waste and he sought $250 million for air pollution.

The House March 21 passed the two bills (HR 5446; HR 5445). *(For background, see Vol. 5, No. 8, p. 286.)*

Joan C. Szabo

Vote Charts

Senate votes 44, 45, 46, 47, 48, 49, 50

44—Economic stabilization, proprietary information (S 398): March 19, 1973. The Senate agreed, 43-35 (D 11-32; R 32-3), to amendments by Sen. John Tower, R-Tex., to delete from the bill a provision requiring reports and data submitted to the Cost of Living Council to include proprietary information.

45—Economic stabilization, bakery prices (S 398): March 19, 1973. The Senate agreed, 53-26 (D 35-8; R 18-18) to table an amendment by Sen. Tower to permit bakers to pass along to consumers increased costs of wheat and flour in the form of increased prices.

46—Economic stabilization, oil and gasoline rationing (S 398): March 19, 1973. The Senate rejected, 30-50 (D 12-32; R 18-18), an amendment by Sen. Tower to authorize the President to ration oil and gasoline.

47—Economic stabilization, productivity and cost of living escalator (S 398): March 20, 1973. The Senate rejected, 9-82 (D 9-41; R 0-41), an amendment by Sen. George McGovern, D-S.D., to deny price increases which would have resulted in a profit margin higher than realized in the 12-month period prior to August 1970, and to link wage increases to productivity and cost of living increases.

48—Economic stabilization, rent controls (S 398): March 20, 1973. The Senate agreed, 50-38 (D 40-9; R 10-29), to an amendment by Sen. Clifford P. Case, R-N.J., providing rent controls on low- and moderate-priced rental units in standard metropolitan statistical areas in which the rental vacancy rate is 5.5 per cent or less.

49—Economic stabilization, notification requirement (S 398): March 20, 1973. The Senate rejected, 41-49 (D 36-14; R 5-35), an amendment by Sen. William Proxmire, D-Wis., to require firms with annual sales of $250 million or more to notify the Cost of Living Council 30 days in advance of price increases of 1.5 per cent or more.

50—Economic stabilization, interest-rate controls (S 398): March 20, 1973. While considering an amendment by Sen. Thomas J. McIntyre, D-N.H., to require the President to stabilize interest rates at the March 16, 1973, level and to provide mandatory controls on interest rates, the Senate rejected, 43-44 (D 13-35; R 30-9), a motion to sustain a ruling by the chair that the amendment was out of order.

Democratic Senators—57
Republican Senators—43
Democratic Representatives—242
Republican Representatives—192
Vacant House seat—(Illinois 7th)

Key

Y—Voted "yea"
N—Voted "nay"
+—Announced or paired "yea"
–—Announced or paired "nay"
*—Not voting, unannounced

Vote numbers in this chart correspond to the *Congressional Record*, Daily Edition. Quorum calls are not included.

Democrats

	44	45	46	47	48	49	50
Abourezk, S. D.	N	Y	Y	Y	Y	Y	N
Allen, Ala.	Y	Y	Y	N	Y	Y	Y
Bayh, Ind.	Y	Y	N	N	Y	Y	N
Bentsen, Tex.	Y	Y	N	N	N	Y	Y
Bible, Nev.	Y	Y	N	N	Y	Y	N
Biden, Del.	N	Y	N	N	Y	Y	N
Burdick, N.D.	N	Y	N	N	Y	N	N
Byrd, Va. #	Y	Y	Y	N	N	N	Y
Byrd, W.Va.	N	Y	N	N	Y	Y	Y
Cannon, Nev.	N	Y	N	N	Y	Y	N
Chiles, Fla.	N	Y	N	N	Y	Y	N
Church, Idaho	N	Y	N	Y	Y	Y	N
Clark, Iowa	N	Y	N	N	Y	Y	Y
Cranston, Calif.	*	*	*	*	*	*	*
Eagleton, Mo.	N	Y	N	N	Y	Y	N
Eastland, Miss.	*	*	*	N	N	N	Y
Ervin, N.C.	Y	N	Y	N	N	N	Y
Fulbright, Ark.	*	*	*	*	*	*	*
Gravel, Alaska	–	+	–	N	Y	Y	N
Hart, Mich.	N	Y	N	N	N	Y	N
Hartke, Ind.	Y	Y	Y	Y	Y	Y	N
Haskell, Colo.	N	Y	N	N	Y	N	N
Hathaway, Maine	N	Y	N	N	Y	Y	N
Hollings, S.C.	*	*	*	N	Y	N	N
Huddleston, Ky.	*	Y	Y	N	Y	Y	N
Hughes, Iowa	*	*	*	*	*	–	*
Humphrey, Minn.	–	*	–	Y	Y	Y	N
Inouye, Hawaii	N	Y	N	N	Y	Y	N
Jackson, Wash.	N	Y	N	N	Y	Y	N
Johnston, La.	N	N	Y	N	N	N	N
Kennedy, Mass.	N	Y	N	Y	*	Y	N
Long, La.	N	N	Y	N	N	N	Y
Magnuson, Wash.	N	Y	N	N	Y	Y	N
Mansfield, Mont.	*	*	*	*	*	*	*
McClellan, Ark.	Y	N	Y	N	Y	N	Y
McGee, Wyo.	N	Y	N	N	Y	Y	N
McGovern, S.D.	N	Y	N	Y	Y	Y	N
McIntyre, N.H.	N	Y	N	N	Y	Y	N
Metcalfe, Mont.	N	N	N	Y	Y	N	Y
Mondale, Minn.	–	*	*	*	*	–	*
Montoya, N.M.	N	Y	Y	N	Y	Y	N
Moss, Utah	N	Y	N	Y	Y	Y	N
Muskie, Maine	*	*	*	N	Y	Y	N
Nelson, Wis.	*	*	*	Y	Y	Y	N
Nunn, Ga.	Y	Y	Y	N	Y	Y	+
Pastore, R.I.	*	*	*	*	*	*	*
Pell, R.I.	N	Y	N	N	N	Y	N
Proxmire, Wis.	N	Y	N	N	Y	Y	N
Randolph, W.Va.	N	Y	N	N	Y	N	Y
Ribicoff, Conn.	N	Y	N	N	Y	N	N
Sparkman, Ala.	Y	N	N	N	N	N	Y
Stennis, Miss.	*	*	*	*	*	*	*
Stevenson, Ill.	N	N	N	N	Y	Y	N
Symington, Mo.	N	*	N	N	Y	Y	*
Talmadge, Ga.	Y	N	Y	N	Y	Y	Y
Tunney, Calif.	N	Y	N	N	Y	Y	N
Williams, N. J.	N	Y	N	N	Y	N	N

Republicans

	44	45	46	47	48	49	50
Aiken, Vt.	Y	Y	N	N	*	N	Y
Baker, Tenn.	*	*	*	*	*	*	*
Bartlett, Okla.	Y	Y	Y	N	N	N	Y
Beall, Md.	Y	Y	N	N	N	N	Y
Bellmon, Okla.	Y	Y	Y	N	N	N	N
Bennett, Utah	Y	N	Y	N	N	N	Y
Brock, Tenn.	Y	N	Y	N	N	N	Y
Brooke, Mass.	N	Y	N	N	Y	N	N
Buckley, N.Y. #	*	*	*	*	*	*	*
Case, N.J.	N	Y	N	N	Y	Y	N
Cook, Ky.	Y	Y	Y	N	Y	N	Y
Cotton, N.H.	Y	Y	N	N	N	N	Y
Curtis, Neb.	Y	N	Y	N	N	N	Y
Dole, Kan.	Y	Y	N	N	N	N	Y
Domenici, N.M.	Y	Y	Y	N	N	N	Y
Dominick, Colo.	Y	N	N	N	N	N	Y
Fannin, Ariz.	Y	N	Y	N	N	N	Y
Fong, Hawaii	Y	N	N	N	N	N	N
Goldwater, Ariz.	*	*	*	N	*	*	*
Griffin, Mich.	Y	N	N	N	N	N	Y
Gurney, Fla.	Y	Y	Y	N	Y	N	Y
Hansen, Wyo.	Y	N	Y	N	N	N	Y
Hatfield, Ore.	*	*	–	N	N	N	Y
Helms, N.C.	Y	N	Y	N	N	N	Y
Hruska, Neb.	Y	N	Y	N	N	N	Y
Javits, N.Y.	*	*	*	N	Y	Y	N
Mathias, Md.	*	Y	N	N	Y	N	N
McClure, Idaho	Y	N	N	N	N	N	Y
Packwood, Ore.	*	*	*	N	N	Y	Y
Pearson, Kan.	Y	N	N	N	Y	Y	Y
Percy, Ill.	+	*	*	N	N	N	*
Roth, Del.	Y	Y	N	N	N	Y	N
Saxbe, Ohio	Y	N	N	N	Y	N	Y
Schweiker, Pa.	N	Y	N	N	Y	N	N
Scott, Pa.	Y	Y	Y	N	N	N	Y
Scott, Va.	Y	N	Y	N	N	N	Y
Stafford, Vt.	Y	Y	N	N	N	N	Y
Stevens, Alaska	Y	Y	Y	N	Y	N	Y
Taft, Ohio	Y	N	N	N	N	N	N
Thurmond, S.C.	Y	N	Y	N	N	N	Y
Tower, Tex.	Y	N	Y	N	N	N	Y
Weicker, Conn.	Y	Y	N	N	N	N	Y
Young, N.D.	Y	N	Y	N	N	N	Y

#—Byrd, Va., was elected as an independent; Buckley, N.Y., was elected on the Conservative Party ticket.

Senate votes 51, 52, 53, 54, 55, 56

51—Economic stabilization, interest-rate controls (S 398): March 20, 1973. The Senate agreed, 45-41 (D 10-38; R 35-3), to table an amendment by Sen. Thomas J. McIntyre, D-N.H., to require the President to stabilize interest rates at the March 16, 1973, level and to provide mandatory controls on interest rates.

52—Economic stabilization, food-price controls (S 398): March 20, 1973. The Senate rejected, 9-78 (D 6-42; R 3-36), an amendment by Sen. Abraham Ribicoff, D-Conn., to impose mandatory price controls on all raw agricultural and meat products.

53—Economic stabilization, food-price freeze (S 398): March 20, 1973. The Senate rejected, 21-66 (D 17-31; R 4-35), an amendment by Sen. Frank E. Moss, D-Utah, and Sen. Birch Bayh, D-Ind., to freeze retail food prices for 90 days following final passage of the bill.

54—Economic stabilization, proprietary information (S 398): March 20, 1973. The Senate rejected, 37-49 (D 5-42; R 32-7), a motion by Sen. John Tower, R-Tex., to table an amendment by Sen. William D. Hathaway, D-Maine, to delegate to the President the authority to issue regulations determining what is and is not proprietary information for the purposes of the economic stabilization program. The Senate then agreed to the amendment by voice vote.

55—Economic stabilization, wage-price freeze (S 398): March 20, 1973. The Senate rejected, 36-51 (D 36-12; R 0-39), an amendment by Sen. William Proxmire, D-Wis., to freeze prices, rents, wages, salaries, interest rates and dividends for six months following final passage of the bill.

56—Economic stabilization (S 398): March 20, 1973. The Senate passed, 85-2 (D 48-0; R 37-2), a bill extending the Economic Stabilization Act of 1970 (84 Stat 799) through April 30, 1974.

Democratic Senators—57
Republican Senators—43
Democratic Representatives—242
Republican Representatives—192
Vacant House seat—(Illinois 7th)

Key

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N—Voted "nay"
+—Announced or paired "yea"
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*—Not voting, unannounced

Vote numbers in this chart correspond to the *Congressional Record*, Daily Edition. Quorum calls are not included.

Democrats

	51	52	53	54	55	56
Abourezk, S. D.	N	N	Y	N	Y	Y
Allen, Ala.	Y	N	Y	Y	Y	Y
Bayh, Ind.	N	N	Y	N	Y	Y
Bentsen, Tex.	Y	N	N	N	Y	Y
Bible, Nev.	N	N	N	N	Y	Y
Biden, Del.	N	N	Y	N	Y	Y
Burdick, N.D.	N	N	N	N	Y	Y
Byrd, Va. #	Y	N	N	Y	Y	Y
Byrd, W.Va.	N	N	N	N	Y	Y
Cannon, Nev.	N	N	N	N	Y	Y
Chiles, Fla.	N	N	N	N	Y	Y
Church, Idaho	N	N	N	N	N	Y
Clark, Iowa	N	N	N	N	Y	Y
Cranston, Calif.	*	*	*	+	*	*
Eagleton, Mo.	N	N	N	N	Y	Y
Eastland, Miss.	Y	N	N	Y	Y	Y
Ervin, N.C.	Y	N	N	Y	N	Y
Fulbright, Ark.	*	*	*	*	*	*
Gravel, Alaska	N	N	N	N	N	Y
Hart, Mich.	N	Y	Y	N	N	Y
Hartke, Ind.	N	N	Y	–	Y	Y
Haskell, Colo.	Y	N	N	N	Y	Y
Hathaway, Maine	N	N	Y	N	N	Y
Hollings, S.C.	N	N	Y	N	N	Y
Huddleston, Ky.	N	N	N	N	Y	Y
Hughes, Iowa	*	*	*	*	*	*
Humphrey, Minn.	N	N	N	N	Y	Y
Inouye, Hawaii	N	N	N	N	Y	Y
Jackson, Wash.	N	N	N	N	Y	Y
Johnston, La.	Y	N	N	N	N	Y
Kennedy, Mass.	N	N	N	N	Y	Y
Long, La.	N	N	*	*	*	*
Magnuson, Wash.	N	N	N	N	Y	Y
Mansfield, Mont.	*	*	*	*	*	*
McClellan, Ark.	Y	N	N	Y	N	Y
McGee, Wyo.	N	N	Y	N	Y	Y
McGovern, S.D.	N	N	Y	N	Y	Y
McIntyre, N.H.	N	Y	Y	N	Y	Y
Metcalfe, Mont.	N	N	Y	N	Y	Y
Mondale, Minn.	*	*	*	*	*	*
Montoya, N.M.	N	N	N	N	Y	Y
Moss, Utah	N	Y	Y	N	Y	Y
Muskie, Maine	N	N	Y	N	N	Y
Nelson, Wis.	N	N	N	N	Y	Y
Nunn, Ga.	+	–	N	N	Y	Y
Pastore, R.I.	*	*	*	*	*	*
Pell, R.I.	N	Y	Y	N	N	Y
Proxmire, Wis.	N	N	N	N	Y	Y
Randolph, W.Va.	N	N	N	N	Y	Y
Ribicoff, Conn.	N	Y	Y	N	Y	Y
Sparkman, Ala.	Y	N	N	N	N	Y
Stennis, Miss.	*	*	*	*	*	*
Stevenson, Ill.	N	N	N	N	Y	Y
Symington, Mo.	*	*	*	*	*	*
Talmadge, Ga.	Y	N	N	N	Y	Y
Tunney, Calif.	N	N	N	N	N	Y
Williams, N. J.	N	Y	Y	N	Y	Y

Republicans

	51	52	53	54	55	56
Aiken, Vt.	Y	N	N	Y	N	Y
Baker, Tenn.	*	*	*	*	*	*
Bartlett, Okla.	Y	N	N	Y	N	Y
Beall, Md.	Y	N	N	Y	N	Y
Bellmon, Okla.	Y	N	N	Y	N	Y
Bennett, Utah	Y	N	N	Y	N	Y
Brock, Tenn.	Y	N	N	Y	N	Y
Brooke, Mass.	N	N	N	N	N	Y
Buckley, N.Y. #	*	*	*	*	*	–
Case, N.J.	N	Y	Y	N	N	Y
Cook, Ky.	Y	N	N	N	N	N
Cotton, N.H.	Y	N	N	Y	N	Y
Curtis, Neb.	Y	N	N	Y	N	Y
Dole, Kan.	Y	N	N	Y	N	Y
Domenici, N.M.	Y	N	N	Y	N	Y
Dominick, Colo.	Y	N	N	Y	N	Y
Fannin, Ariz.	Y	N	N	Y	N	Y
Fong, Hawaii	Y	N	N	Y	N	Y
Goldwater, Ariz.	*	*	*	*	*	*
Griffin, Mich.	Y	N	N	Y	N	Y
Gurney, Fla.	Y	N	N	Y	N	Y
Hansen, Wyo.	Y	N	N	Y	N	Y
Hatfield, Ore.	Y	N	N	N	N	N
Helms, N.C.	Y	N	N	Y	N	Y
Hruska, Neb.	Y	N	N	Y	N	Y
Javits, N.Y.	Y	Y	N	N	N	Y
Mathias, Md.	Y	N	N	N	N	Y
McClure, Idaho	Y	N	N	Y	N	Y
Packwood, Ore.	Y	N	N	Y	N	Y
Pearson, Kan.	Y	N	N	Y	N	Y
Percy, Ill.	*	*	*	*	*	*
Roth, Del.	Y	N	Y	Y	N	Y
Saxbe, Ohio	Y	N	N	Y	N	Y
Schweiker, Pa.	N	N	Y	N	N	Y
Scott, Pa.	Y	N	Y	N	N	Y
Scott, Va.	Y	N	N	Y	N	Y
Stafford, Vt.	Y	N	N	Y	N	Y
Stevens, Alaska	*	N	N	Y	N	Y
Taft, Ohio	Y	N	N	Y	N	Y
Thurmond, S.C.	Y	N	N	Y	N	Y
Tower, Tex.	Y	N	N	Y	N	Y
Weicker, Conn.	Y	Y	Y	Y	N	Y
Young, N.D.	Y	N	N	Y	N	Y

#—Byrd, Va., was elected as an independent; Buckley, N.Y., was elected on the Conservative Party ticket.

Executive Actions

President's veto to be challenged; U.S. moves on energy, environment, transportation issues

President Nixon March 27 vetoed the $2.6-billion Vocational Rehabilitation Act cleared by Congress March 15. Referring to the veto as part of his "over-all commitment to hold down taxes and prices," the President said he would take similar action on additional big spending bills pending in Congress. He said there are "more than a dozen" other bills before Congress which have "extravagant price tags."

The vetoed bill would have authorized $2.6 billion over three years to states for vocational rehabilitation services, $1 billion more than the President's proposal. The fiscal 1974 budget recommends $650 million for vocational rehabilitation in 1973, 1974 and 1975.

A similar bill was pocket vetoed by the President in October. In this year's veto, he said the bill would establish seven new categorical programs, "many of which overlap and duplicate existing services."

In response to the President's actions, Sen. Hubert H. Humphrey, D-Minn., said, "It is my judgment that the Senate will vote to override the President's veto," but he said "I am uncertain as to what the decision will be in the House."

House Speaker Carl Albert, D-Okla., told *National Journal* that "every effort will be made to override the President's veto of this legislation."

The Senate vote on whether to override the veto is scheduled for April 3. A House vote will be scheduled for Wednesday, April 4 or Thursday, April 5, the Speaker said.

Environment

Air pollution: The Environmental Protection Agency March 22 ordered four Southwestern electric power plants to reduce sulphur-dioxide emissions by 70 per cent by March 15, 1976.

The coal-burning electric power plants—the Four Corners plant in New Mexico, the Navajo plant in Arizona, Huntington Canyon in Utah and the San Juan power plant in New Mexico—have said sulphur-dioxide control technology is not sophisticated enough yet to ensure 70-per cent removal of the pollutant.

EPA Administrator William D. Ruckelshaus previously granted the utilities an extension of two years, until 1977, to comply with 1970 Clean Air Act standards (84 Stat 1676). Ruckelshaus reduced the extension to March 15, 1976, because "a more recent reassessment of the time required to design, fabricate and install sulphur scrubbing equipment" indicated the utilities could meet a shortened deadline.

Human resources

Education: The Supreme Court March 21 upheld state use of property-tax revenues to finance public education even though it meant that wealthy districts would have more money to spend than poorer districts. By a 5-4 vote, the Court overturned a 1971 decision by the U.S. District Court for the Western District of Texas that the state's finance program violated both the Texas state and U.S. constitutions. The case, *Rodriquez v. San Antonio Independent School District*, had challenged the property tax as an equitable method of financing public schools.

Justice Lewis F. Powell Jr.'s majority opinion said that the Constitution's equal-protection clause does not require "absolute equality or precisely equal advantages", and that overturning use of the property tax would have created "an unprecedented upheaval in public education." *(For a report on school financing, see Vol. 4, No. 52, p. 1954.)*

Labor: President Nixon announced March 21 that $424 million in federal funds would be available to cities to provide 776,000 summer jobs for youth. About $300 million of that amount, the President said, would come from the Public Employment Program of the Emergency Employment Assistance Act rather than from money appropriated for summer youth jobs.

Negative reaction to Mr. Nixon's announcement came from the National League of Cities-U.S. Conference of Mayors and from Sen. Jacob K. Javits, R-N.Y. Javits, who last month had requested funds for 1,018,000 summer jobs, said, "This is more than impoundment, this is impoundment and breach of promise."

Executive appointments

Labor: President Nixon March 19 nominated **William H. Kolberg** to be assistant Labor secretary (manpower), succeeding Malcolm R. Lovell Jr. Kolberg, 46, of Bethesda, Md., has been assistant director (program coordination) of the Office of Management and Budget since September 1970. He was associate manpower administrator for the Labor Department from 1968 until joining OMB, and in 1967 was executive director of the President's Task Force on Urban Employment Opportunities.

HEW: On March 19 the President nominated **James S. Dwight Jr.** to be administrator of HEW's Social and Rehabilitation Service. Dwight, 39, of Pasadena, Calif., has been associate director of the Office of Management and Budget since August 1972. He was chief deputy finance director (1969-72) and deputy finance director (1967-69) for the state of California. He will succeed **John D. Twiname,** who March 19 was appointed executive director (health) of the Cost of Living Council by Director John T. Dunlop to coordinate medical and health-care costs under Phase 3.

Interior: The President March 20 nominated **Laurence E. Lynn Jr.** to be assistant Interior secretary (program development and budget). Lynn, 35, of Long Beach, Calif., has been assistant HEW secretary (planning and evaluation) since June 1971. Prior to that, he was an associate professor of business economics at Stanford University Graduate School of Business. From January 1969 until joining the Stanford faculty in August 1970, he was assistant (program analysis) to the President's national security affairs adviser Henry A. Kissinger.

Mr. Nixon nominated **Kent Frizzell** March 21 to be solicitor of the Interior Department. Frizzell, 44, of Topeka, Kan., served as assistant attorney general (land and natural resources) since January 1972. From 1969 to 1971 he was Kansas attorney general.

Justice: To succeed Mr. Frizzell, the President March 21 nominated **Wallace H. Johnson Jr.** to be assistant attorney general (land and natural resources). Johnson, 33, of Cleveland, Ohio, has been special assistant to the President (legislative affairs) since February 1972. He was associate deputy attorney general (legislation) with the Justice Department from 1970-72 and minority counsel (1969-70) to the Senate Judiciary Criminal Laws and Procedures Subcommittee.

The President March 19 nominated **Donald E. Santarelli** to be administrator of the Justice Department's Law Enforcement Assistance Administration, succeeding Jerris Leonard. Santarelli, 35, of Alexandria, Va., has been associate deputy attorney general since January 1969. He served as special counsel on constitutional rights (1968) for the Senate Judiciary Committee and was associate counsel (1967) to the House Judiciary Committee.

Treasury: The President March 19 nominated **Donald C. Alexander** to be commissioner of the Treasury Department's Internal Revenue Service. Alexander, 51, of Cincinnati, Ohio, since 1966 has been a partner with the law firm of Dinsmore, Shohl, Coates and Deupree and from 1954 to 1966 was with the firm of Taft, Stettinius and Hollister, both in Cincinnati. He will succeed Johnnie M. Walters.

Transportation

Northeast railroads: Transportation Secretary Claude S. Brinegar March 26 presented Congress with the Administration's plan to save the Northeast railroads. Brinegar proposed a

Consumer Federation Forms

Consumers are planning to have a greater organized voice with regard to energy issues in the future and the increased clout may help shape future energy policies.

In an effort to make consumers' views better known to energy policy makers, the Consumer Federation of America announced on March 26 it has formed the CFA Energy Policy Task Force and has hired Lee C. White, a Washington lawyer and former chairman (1966-69) of the Federal Power Commission, to head it. White was director of Sargent Shriver's Vice-Presidential campaign.

Purpose: "Our nation has some fundamental energy-policy issues to resolve in the near future," White said at the press conference. ". . .The people of this country obviously have a great stake in how the energy issues now being debated are decided."

The task force, a coalition of 12 public groups, hopes "to offer to the public, to the Administration and to the Congress, data, recommendations and approaches to those problems which the task force believes will be constructive and take into account the interest of the consumers" who collectively have "billions of dollars" and their "style of life" at stake, he said in a statement.

The CFA board of directors voted unanimously to create the task force on Jan. 27. The coalition will operate directly as a "voice for CFA in the field of energy only," Erma Angevine, CFA executive director, said in an interview. CFA's board decided that "instead of being an also-ran in the energy field, we better be out in front," she said.

"We didn't perceive any organized efforts already doing this," White said in an interview. "It is a classic case of the people who are affected having an interest but whose voice is nowhere as meaningful and significant as it should be to advocate their view. We hope to provide a more cohesive presentation." The energy policy task force will try to make its position known through testimony at congressional hearings, meetings with Nixon Administration officials and publicity in the media and members' publications.

Operations: The coalition now has 11 members in addition to CFA, which is itself an umbrella for 197 local consumer groups.

(For a profile of CFA, see Vol. 4, No. 28, p. 1126.)

Membership—Initial members of the task force are the American Public Gas Association and American Public Power Association which represent municipally and publicly owned utility companies, Consumers Educational and Protective Association International, Cooperative League of the United States of America, Industrial Union Department AFL-CIO, National Farmers Organization, National Farmers Union, National League of Cities, National World Electric Cooperative Association, New Populist Action and the United States Conference of Mayors.

Financing comes from the members and $6,000 has been raised so far. The CFA board resolution suggested a goal of $100,000 with $50,000 to be raised immediately. White is recruiting more members and money. He said he also would call on member organizations for talent and publicity, in addition to funds.

White's role—White, 49, will work five days a month for the task force and will be paid on a retainer basis. He will continue as a partner in the firm of White, Fine and Ambrogne.

His role will be largely one of a coordinator and spokesman for the coalition, "lending his authority and background," said Mrs. Angevine. Before becoming chairman of the power commission, he was an aide to Presidents Johnson and Kennedy and worked on Capitol Hill.

Positions: The coalition has outlined its approaches to the nation's "energy problems" in 15 policy statements. They include:

- the consolidation of energy policy making and implementation into a single agency and the consolidation of regulatory efforts;
- the formation of a government-owned corporation to search for fuels on public lands;
- tighter controls over the development of publicly owned fuel reserves;
- the construction of additional oil refineries on government-designated sites;
- modifications in the tax laws to reduce incentives for petroleum companies to search for fuel abroad;
- continued 2-per cent interest rates for rural electric cooperatives that cannot afford higher rates;
- continued controls over gas wellhead prices;
- the "scrapping" of the mandatory oil-import quota system;
- consumer representation on regulatory agencies;
- a consumer counsel to act as an advocate for the consumer in government proceedings.

White said that "clearly it is not our purpose to be anti-industry, anti-Administration and anti-anybody else. These are significant issues facing the country and we propose to be as positive, as constructive and as vigorous as possible."

"I take it as a good sign that the Administration has taken so long to come up with a position on energy policy," White said. "Apparently they are taking a long, hard look at the issues."

Judy Gardner

federally chartered private corporation, with a Presidentially appointed board of directors or "incorporators," to reorganize the system, but without nationalization or federal financial assistance. The new corporation would negotiate with the six major bankrupt railroads for facilities and would design one or more rail systems, based on a "core" system selected by the Transportation Department.

In rejecting several alternatives requiring federal aid, such as operating subsidies or nationalization, Brinegar also suggested a reduced role for the Interstate Commerce Commission in reorganizing and regulating the system.

On March 24 the ICC sent Congress its plan to rescue the Northeast system through a federally funded $400-million-a-year program. The commission plan proposed a general 1-per cent tax on all surface transportation with interim funding of $150 million to $250 million a year until the long-range program could be carried out. Under the plan, the agency would have increased supervision of the system. *(For a report on a Senate Commerce Committee staff proposal, see Vol. 5, No. 8, p. 279.)*

Economic issues

Food prices: The Cost of Living Council March 22 ordered the meat-packing industry to pass through to consumers any increases or decreases in expenses on a dollar-for-dollar basis. The ruling means that packers cannot add a markup to the higher prices they pay for live or partially processed meat and must pass along savings when these prices drop. Director John T. Dunlop said the regulation will supercede "the volatile pricing authority" allowed under Phase 2. Firms employing fewer than 61 persons will be exempt.

The Labor Department March 21 reported that the consumer price index for February increased 0.8 per cent, seasonally adjusted. The figure represented the largest one-month gain since February 1951. Accounting for two-thirds of the over-all increase, retail food costs rose 2.4 per cent, the largest monthly increase since the Bureau of Labor Statistics began compiling food-price records in 1952.

Prime interest rate: Responding to pressure from the Nixon Administration, major banks decided to hold the prime lending rate temporarily to 6.5 per cent. The rate evolved from a March 22 meeting with Federal Reserve Board Chairman Arthur F. Burns and members of the Committee on Interest and Dividends (CID). After some banks raised the prime rate from 6.25 per cent to 6.75 per cent, Burns, acting as chairman of the committee, said that CID felt an increase as large as one-half percentage point was "not justified at this time" but suggested that "it may be desirable to introduce a dual prime-lending rate." One rate would apply to large corporations borrowing on the national money market and the other to small businesses which rely mainly on local sources of funds.

Linda E. Demkovich

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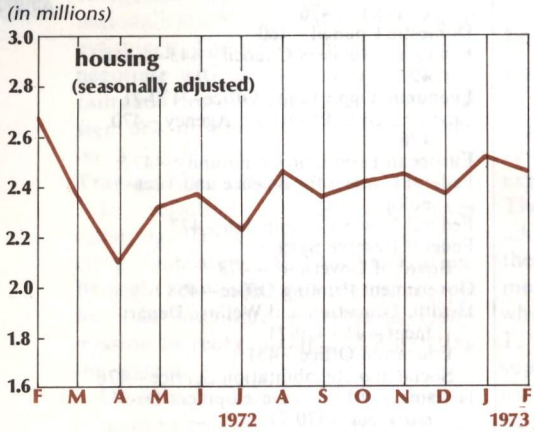
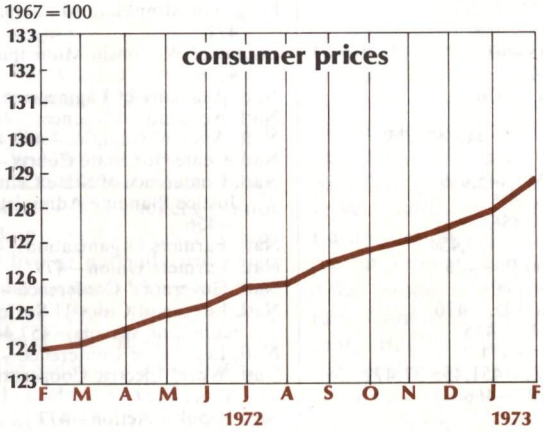
Correction

Vol. 5, No. 12, p. 424 misquoted Rep. John Brademas, D-Ind. It should read: "I am always willing to consider the thoughtful suggestions of other people. Streamlining, of course, is a good thing, but what is important is that we do not 'streamline' things to the extent of giving the Secretary of Health, Education and Welfare a blank check which would allow him to ignore the purposes of Congress in enacting the law."

National Journal

National Journal Indicators





Budget deficit

Federal budget outlays will exceed receipts for fiscal 1973 by $24.8 billion, according to a revised estimate in the President's budget submitted to Congress Jan 29. The Joint Committee on the Reduction of Federal Expenditures reported Oct. 23 that outlays will top receipts by $30.8 billion.

Consumer prices

The Consumer Price Index rose 0.7 per cent in February to 128.6 per cent of the 1967 average, the Labor Department reported March 21. *(See chart.)* The index rose 0.8 per cent after seasonal adjustment. During the six-month period ending in February, which includes five months of Phase 2 and one month of Phase 3, the index rose at an annual rate of 5.2 per cent, compared with 2.5 per cent in the six-month period ending August 1972.

Crime

Serious crime increased 1 per cent during the first nine months of 1972 as compared with a 6-per cent increase during the same period of 1971, the Federal Bureau of Investigation reported Dec. 28. Of the two categories of serious crimes, violent crimes rose 3 per cent and property crimes did not change.

Economy

The Commerce Department's composite index of leading economic indicators increased 1.2 per cent in January from the revised December index of 153.3 to 155.1 per cent of the 1967 average, the department reported Feb. 27. Six of the eight components improved—initial claims for unemployment insurance, industrial materials prices, stock prices, price-labor cost ratio, contracts and orders for plant and equipment, and new orders for durable goods. Two components declined—average workweek and building permits.

This page records the current level of 12 economic, social and business indicators. Recent data is charted at the top of the page and all items are updated regularly. (For additional background on each of the indicators, see Vol. 5, No. 2, p. 66e.)

GNP

The Gross National Product rose $30.9 billion in the fourth quarter of 1972 to $1,194.9 billion in current dollars, on a seasonally adjusted basis, according to revised figures released by the Commerce Department Feb. 20. In 1958 dollars, GNP rose $15.5 billion to $811.6 billion. GNP in 1958 dollars increased at an annual rate of 8.0 per cent in the fourth quarter, up from the 6.3-per-cent rate achieved in the third quarter of 1972.

Housing

Privately owned housing starts decreased 2.0 per cent from January to February to a seasonally adjusted rate of 2,444,000, the Commerce Department reported March 16. *(See chart.)* The department also revised upward its January rate to 2,496,000. It revised upward its December rate to 2,369,000.

International trade

The United States imported $303.8 million worth of goods more than it exported during the month of January, the Commerce Department reported Feb. 24. This is a decrease of 45.1 per cent from the revised December deficit of $441.1 million. The January totals brought the U.S. trade deficit for 1973 to $303.8 million, the department said.

Presidential confidence

In a Gallup Poll conducted Feb. 16-19, 65 per cent of those polled said that they approved of the way Richard Nixon is handling his job as President. Twenty-five per cent said that they disapproved and 10 per cent said they had no opinion. The President's highest rating was 68 per cent in January, to match that of November 1969, and his lowest rating was 48 per cent in June 1971.

Production

Industrial production during February rose 0.8 per cent from January's revised level of 119.9 per cent of the 1967 average, the Federal Reserve Board reported March 16. The February level of 120.8 is 9.8 per cent above that of a year ago, the board also said.

Unemployment

Unemployment in February was 5.1 per cent of the labor force, equal to January's revised figure of 5.1 per cent, the Labor Department reported March 9. Total employment increased 572,000 to 83,127,000 seasonally adjusted, the department also said. The Conference Board reported March 7 that its help-wanted index advanced in January to 120 per cent of the 1967 average from December's revised level of 117, seasonally adjusted.

Welfare

The number of persons receiving public assistance decreased 0.05 per cent in October from 15,182,000, the HEW Department reported Mar. 5. 15,099,000 persons received public assistance in October, an increase of 5.9 per cent above October 1971. Expenditures for public assistance increased from $1,641,617,000 in September to $1,660,850,000 in October. This increase in expenditures in October reverses a one-month decrease.

Wholesale prices

The wholesale price index increased 1.9 per cent in February from 124.5 in January to 126.9 per cent of the 1967 average, the Labor Department reported March 8. The industrial-commodities component of the index rose 1.0 per cent in January to 121.3 per cent. The department also reported that the seasonally adjusted index for all commodities rose 1.6 per cent. During the first part of Phase 3 economic controls, the index for all commodities rose 1.6 per cent. During Phase 2 economic controls the index for all commodities rose at an annual rate of 7 per cent.