ing'' the technology in a primitive stage.

This cautious approach drew fire from the Solar Lobby, which likened Carter's plan to something that might have been produced by Presidents Nixon or Ford. Gus Speth, a former member of the private environmental group called the Natural Resources Defense Council, now a member of the President's Council on Environmental Quality, said he was disappointed by this criticism. One of solar energy's promoters in the Administration, Speth argues that Carter's plan adopts what was known as option 2—the ''maximum practical'' plan for accelerated growth—in the domestic policy review memorandum (*Science*, 19 January 1979). Speth said, ''This represents a $3 billion commitment through 1985 over and above the R & D baseline budget we've had from the Office of Management and Budget.'' He called it a ''major leap forward,'' an ambitious program near ''the upper limit of what we can achieve.''

Some of the important pieces of the program, aside from the bank, are as follows:

- The largest item ($1.5 billion) is a proposed tax credit of 20 percent, or up to $2000 per house, for construction of new homes using approved ''passive solar'' designs. This, like other credits, depends on passage of the new oil tax.
- An increase from 10 to 25 percent in the investment tax credit for industries and farms building solar ''process heat.''
- A new 15 percent tax credit for the purchase and installation of one wood-burning stove in each principal residence.
- A permanent exemption for gasohol from the 4-cents-a-gallon federal gasoline tax.
- A change in Environmental Protection Agency (EPA) regulations to allow industries to ''bank'' their investments in solar energy in the EPA's pollution books as a credit to offset debits created by future pollution they may produce.
- An exemption from DOE regulations requiring industries to switch from oil or natural gas to coal. This will be given as a permanent exemption to any company that constructs a boiler deriving at least 20 percent of its annual energy from a solar source.
- Many administrative changes designed to bring new solar technologies to the attention of high-level bureaucrats, private investors, loan officers, and consumers.—ELIOT MARSHALL

AAAS IV Is Curtain Raiser on Innovation

Discussion at policy colloquium moves toward broad assessment of the interrelationships between R & D and the economy

Innovation is a hot topic in the Washington science policy circuit these days and at the fourth AAAS R & D Policy Colloquium on 19 and 20 June innovation was a recurring theme.

Planners of AAAS IV, as it is dubbed, hoped they had timed the meeting to make possible discussion of the results of a major interagency study on ways for the federal government to encourage innovation in industry. The report has been completed, but the White House has yet to finish winnowing out the recommendations it will back.

Jordan Baruch, the Commerce Department assistant secretary in charge of the project, who spoke at the meeting, was limited to dealing mainly with the methodology used in the study. In general, the focus was on innovation in the individual firm in industry and on the variables the federal government can do something about. Of possible models for the study, said Baruch, an ''investment model'' was chosen, and the object was to identify what influences decision makers to make the investments that lead to innovation.

The study indicated, for example, that an important consideration for the firm is the ''stream of payments'' that can be expected from innovation. The government has the power to influence this stream of subsidies, procurement policy, patents, and tax policy.

Baruch said that ''What we're seeing in the rest of the world is government making a conscious effort to join with industry to enhance the economy for society.'' In the United States, changes in policy involve the interests of unions and other groups and the adjustment of existing laws, and the question is what is ''appropriate.''

Word on the subject of innovation also came from Senator Adlai E. Stevenson (D-Ill.), sponsor of a proposal to enact the National Technology Innovation Act (S-1250), on which hearings were held in late June. The bill's purpose is to ''enhance technological innovation for the improvement of economic, environmental, and social well-being of the United States.'' Main features would be creation of an Office of Industrial Technology in the Commerce Department and establishment of ''centers for industrial technology'' around the country. The centers would be affiliated with universities and other nonprofit organizations and would promote innovation by building the base for ''generic'' (nonproprietary) research, fostering cooperation by individuals from industry and universities on technology innovation projects, and improving training and information programs in the field. The bill authorizes $40 million for the first year.

Stevenson, chairman of the Senate subcommittee on science, technology, and space, has announced that he will not seek reelection in 1980. He is generally regarded by scientists as a senator who understands. Stevenson has not discussed his reasons for leaving the Senate in any detail and, in a question period, was asked why he was not running.

On his service in the Senate, Stevenson said that ''10 years are enough, 16 years, too much.'' He had reviewed a panorama of problems involving science and technology and said what is needed is ''new ideas.'' Outside the Senate he hopes to have ''time to think, speak, and try to influence events.'' He gave the strong impression that he was not abandoning public life.

The R & D colloquium, which has become a regular AAAS rite of late spring, is based on the yearly analysis of the federal R & D budget by Willis H. Shapley and Don I. Phillips.* Attendance has grown steadily, rising from 261 last year to 387 this year. As a sign of the times and the growing sophistication of the ex-

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ercise, the trend of the meetings continued toward a broader assessment of the interrelationship between R & D and the economy.

In the discussion of the domestic economy there was general agreement that the cost and complexity of federal regulation has become a major issue. In remarks prepared for the meeting, the President's science adviser Frank Press noted the rapid growth of "social regulation" to achieve socially desired objectives, as contrasted with longer-standing economic regulation aimed, for instance, at curbing monopolistic practices. He said that in many cases social regulation is heavily technological, and among examples he mentioned control of air and water pollution and toxic chemicals and dealing with problems of nuclear power and aircraft safety.

Press said that the costs as well as the benefits of regulation had to be taken into account and that the Administration had undertaken a number of initiatives to improve the regulatory apparatus. The key elements related to science and technology were as follows:

- Requiring by Executive Order and proposed legislation "the publication of regulatory analyses, to insure that regulators and the general public are well informed about the costs and benefits of individual regulations."
- Creation of a Regulatory Council to bring some coordination and consistency into the system. A calendar is being published to give an overall picture of what is going on.
- Establishment of a Regulatory Analysis Review Group to review 15 or 20 of the most important rules each year. The chairman of the Council of Economic Advisers chairs the group and the Office of Science and Technology Policy is involved and takes an active part when scientific and technological issues arise. The aim is to improve regulatory analysis and ensure that alternative points of view have been considered.

In general, discussion at the meeting was marked by a mild revisionist spirit. This was perhaps reflected best in the remarks of panelist Nathan Rosenberg, a Stanford economist. In the past, Americans have entertained the "conceit" that the United States should maintain an across-the-board lead in technology, said Rosenberg. Inevitably, Europe and Japan have closed the technology gap and this country, in fact, has much to learn from other industrial countries, he said.

In other respects, U.S. leadership was at least partly an illusion. In the mid-1960's there was considerable satisfaction here over the U.S. lead in R & D as expressed by the percentage of the gross national product spent on science. If military expenditures are eliminated, however, the U.S. position looked much less favorable. U.S. expenditures on R & D were not significantly greater than those of countries that are now our chief rivals. Said Rosenberg, "It was not much of a golden age."

He went on to suggest that the United States might learn from the ways others have organized their economic lives, particularly the other successful international "peddlers," West Germany and Japan. In these countries a higher percentage of R & D is financed by industry and a stronger set of incentives is provided for industry to do R & D. They do not rely so heavily on direct government funding.

That the United States has fallen on hard economic times Rosenberg sees as having little to do with R & D. Inflation has now gone on so long in this country that those making decisions affecting research are influenced by "the expectation of inflation," and that has serious implications for R & D. Another factor is the problems relating to energy caused by the "most powerful cartel in history." And, as several speakers said, the tax structure does not provide a strong set of incentives for R & D, and the very slow rate of capital formation in the United States in recent years has adversely affected R & D.

What Rosenberg sees is a "broadening agenda," in which it is necessary to take into account these problems and the society's concern about environment, health, and safety. His main point is that R & D is strongly influenced by the overall performance of the economy. He thinks that difficulties with R & D are

Development Institute Derailed

Administration plans to create an Institute for Scientific and Technological Cooperation (ISTC) to work with less developed countries met a stunning reversal when the Senate on 19 June voted to cut the section establishing the institute from the foreign aid authorization bill.

Advocates of the measure in the Administration and in Congress immediately began an effort to regroup and recoup, but the 58 to 42 vote went so heavily against the proposal that an uphill fight is foreseen.

The defeat was unexpected and is attributed to the virtually single-handed efforts of Senator Dennis DeConcini (D-Ariz.). It was not a case of the first-term Arizona senator drygulching the measure. DeConcini had given ample notice that he would introduce an amendment to drop ISTC.

DeConcini has emerged as one of a group of Western conservatives recognizable as much by regional as by party attitudes. In the debate, he concentrated on questioning whether, at a time of "rampant inflation," the taxpayer's dollars should be spent on a new venture which he insisted would perform the same functions as the present aid agency. The debate was spottily attended and DeConcini was reportedly very effective in meeting senators as they came on the Senate floor and urging them to vote against a new agency and $25 million in new money.

Less efficacious were efforts by the proposal's floor manager Senator John Glenn (D-Ohio) and other advocates to persuade their colleagues that the institute idea offers a new cooperative working relationship with less developed countries with promise to overcome past failures by the United States in using science and technology in fostering development (*Science*, 29 April).

Postmortems on the Senate defeat indicate that some blame for the defeat can be awarded both the Administration and congressional proponents of the measure. Missionary work was apparently not done widely enough in the Senate in behalf of the institute, and the basic task of making a head count in advance of the vote seems to have been botched.

The next test is when Senate and House members meet in conference to reconcile differences in versions of the bill passed by the two houses. ISTC was accepted by the House by a substantial majority, and there is a fair chance it will emerge as part of the conference bill. If it is restored, however, a floor fight in the Senate is expected and Hill observers say substantial cuts and changes are likely to be necessary if enough votes are to be switched for the measure to survive.—J.W.

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largely "self-correcting" if something can be done about general economic problems.

Rosenberg said America's greatest success in the past was based on commercialization of new products. Many of the incentives to do well in this sphere have been allowed to erode. What is important for economic progress is to exploit and diffuse correct technologies, not simply to invent new ones. And it is necessary, for example, to maintain engineering and design skills in industry, to have highly motivated businessmen able to make shrewd business judgments, and to have ready access to capital. "Science is not unimportant," said Rosenberg, "but it's a single ingredient in a large complex of factors."

If the analysis from inside was astringent, the comments of two congressmen who came as after-dinner speakers had even harsher elements. The speakers were Representative George E. Brown, Jr. (D-Cal.), chairman of the House Science and Technology Committee's subcommittee on science, research, and technology, and Representative Clarence J. Brown (R-Ohio), who sits on two House energy subcommittees.

The message from both Browns was essentially the same. There are signs that the public's confidence in science is flagging and this will affect congressional support. People expect that expenditures on R & D will bring a recognizable result in avoiding or solving serious problems. Both congressmen support a strong R & D effort, but point out that at a time of heavy pressure on government spending, R & D comes under keen scrutiny. The gentleman from Ohio made the point most forcefully when he said, "we cannot afford to do without more R & D. Inevitably, much of it will be supported by the taxpayer's money. Consequently, the R & D will have to be done on topics the public can relate to. If the taxpayer is paying for R & D in a time of general austerity, he is going to want to get something out of it."—JOHN WALSH

No Cure in Sight for Loss of M.D. Researchers

The ranks of medical researchers have thinned in the past decade, and just what to do about it baffles even the experts

Chicago. Medical researchers are feeling unloved these days, and some of them recently got together at the Center for Policy Study at the University of Chicago to compare notes and air complaints. One problem they perceived was a drop in prestige, another was a fall in funding, a third was a loss of students. Not all the news was bad, however. A government administrator and others told the researchers to take heart—things may not be half as bad as they seemed.

That advice seemed to fall on deaf ears, however; a series of gloomy statistics had set up the audience for the worst. According to the American Medical Association, for instance, the number of physicians who reported research as a primary activity has dropped from 15,441 in 1968 to 7,944 in 1975. Just what this means for biomedical research is not clear, however, as the number of Ph.D.'s in the area has skyrocketed. The M.D.'s say that it takes physicians to translate the decade-long explosion of biomedical facts into therapies and cures, and that they are falling dangerously far behind. In 1967, for instance, the number of physicians who were listed as principal investigators on National Institutes of Health (NIH) grants was 59 percent. By 1976 that figure had dropped to 29 percent. More than anything else, this one fact, repeated over and over in the course of papers and presentations, hung over the conference like a dark cloud.

Debate among the 50 or so participants over what to do about it was sharp, some calling for increased lobbying and more federal dollars, others for squeezing more work out of existing funds. Not everyone was worried by the stark figures, however.

"It's just not that bad," said G. Donald Whedon, the director of the National Institute of Arthritis, Metabolism, and Digestive Diseases (NIAMDD), at the 5 to 7 June Conference on Clinical Research: Elements for a Prognosis. He said, for instance, that the number of M.D.'s doing research at NIH is shrinking only relative to the increasing number of Ph.D.'s. In *absolute* terms, the M.D.'s are holding their own. Another complaint that Whedon criticized was that a growing share of the NIH budget was earmarked for targeted research. At NIAMDD, a consultant for the conference found that targeted research had risen from 6 percent of the total human research in 1975 to 19 percent in 1978, and the rise was accompanied by a drop in clinical research on fundamental topics.

It seemed like an open and shut case—until Whedon stepped up. "In *absolute* figures, not percentages, clinical research in fundamental areas is *not* shrinking," he snapped. "Wherever I go, people talk about the bleak funding picture. But, in fact, funds are increasing, the number of investigators are increasing. . . . The doom and gloom which is being preached everywhere is no help in getting young people interested. They are getting grants. And they ought to be encouraged."

Upbeat efforts of this sort were rather rare, however, and the conference for the most part centered on depressing facts. One was supplied by William DeCesare, director of the General Clinical Research Center Program at NIH. His program, designed to support studies on normal subjects and patients, has slipped from 91 centers across the country in 1968 to 74 in 1979. This drop occurred while the number of U.S. medical schools was increasing from 100 to 125; thus many of the medical schools now have no facility for clinical studies.

For the collective ills of the clinical research community, real or imagined, Jeremiah Stamler of the Northwestern University Medical School had but one cure. More money. "We all have to put in our oars and pull together," he railed. "Fighting over the shrinking pie will get us nowhere. What we need is the billion dollars that the Defense Department lost last year in cost overruns and bungled budgeting." Not everyone was convinced by the plea. "I wish it were so simple as to shift a billion," said Scott Swisher of Michigan State University. "But I think it would not solve our problems but only increase them. What we

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