for Antarctic research from the Navy's budget to NSF's. The action contradicts the 1990 agreement preventing any funds moving between defense and civilian budgets. Thus, as the committee's "white paper" points out, NSF's effective budget boost is 13.2%, which, if approved by Congress, would keep the agency on track to double what it got in 1987 by fiscal year 1994.

Funds for individual scientists would go up 17% in the Administration's plan, though much of this increase is destined for researchers in the FCCSET programs—advanced materials and processing (up $318 million, or 20% more), biotechnology ($205 million, or 18%), computing and communications ($252 million, or 20%) and global change research ($152 million, or 50%). While the proposed increase for education and human resources would raise the budget by only 3.1%, to a total of $479.5 million, this program has more than tripled between fiscal 1989 and fiscal 1992. In 1993, NSF proposes to consolidate its rapid growth and focus its programs more carefully. Support for major reforms of precollege education, including the new Statewide Systemic Initiative, which now involves ten states contributing matching funds, would increase by $12 million next year, up 27%.

To support research infrastructure at universities, NSF proposes an increase of $50 million for national facilities for astronomy, physics and materials science. But missing are any funds for the Academic Research Modernization Program, which appeared in the agency's budget for the past three years. The Administration has left out the program on the grounds that Congress now earmarks nearly $1 billion for pork-barrel buildings and programs, many of these at university campuses (see story below).

NASA. The theme of next year's space budget seems to be "steady as she goes." The Administration's request for $14.99 billion represents a nominal rise of only 4.5%, which is much less proposed growth than in any of the past five years. What's more, as the House science committee observes, NASA's budget is not projected to increase much in the next five years. Space station Freedom is the big gainer, and the Earth Observing System and its data acquisition and analysis program would go up by about 33%, with an increase of $120 million over the current year. To pay for these cuts, sacrifices would be required. The agency would abandon all hope of building new rocket motors for the space shuttle—a construction project located in the home district of Representative Jamie Whitten, the influential and aging Mississippi Democrat who is chairman of the House Appropriations Committee. Before he left NASA, Admiral Truly said improved rocket engines weren't needed because those developed since the Challenger explosion have worked unfailingly. Whitten is almost certain to see the situation differently.

Department of Defense. Of the funds requested for R&D, $4.3 billion would be allocated for the technology base, while $36.3 billion out of the total request of $291 billion would be spent in support of specific procurement programs. These funding levels represent increases above fiscal 1992 of only 2% for the technology base and 1% for development. The tech base contains $1.2 billion for basic research, an increase of 3%, and $3.06 billion for applied research, a rise of 2% over the current year's account. SDI is given another large bonus, with a request for $5.4 billion. To keep the overall defense budget from increasing, the Administration has announced cancellations in several once-massively-funded programs, including the Seawolf submarines and small ICBMs, as well as cutbacks in the Army's next generation tank and Comanche light helicopter.

Science often is a pawn in the zero-sum game the Federal government finds itself in. This year, in addition to the plethora of problems and the caps fixed on the discretionary parts of the budget, the large number of resignations and retirements in the House is bound to affect legislation. Insiders at Congress and OMB admit that the rites of passage for the 13 appropriations bills this fall are troublesome. Only one bill—namely the Energy and Water Development Act—is likely to be passed before fiscal 1993 begins on 1 October. None of the rest are likely to be completed before the election, and it is not at all certain that agreement on the other 12 will be reached before the 103rd Congress assembles next January. In such chaotic circumstances, the government will continue operating through a series of "continuing resolutions" passed by Congress.

—IRWIN GOODWIN

TWO WHITE HOUSE PANELS TO EXAMINE EMBATTLED RESEARCH UNIVERSITIES

The President's Council of Advisers on Science and Technology and the Federal Coordinating Council for Science, Engineering and Technology have begun independent examinations of the nation's research universities, whose financial accounts and scientific reputations are under siege. In announcing the two studies at a meeting of PCAST on 2 April, D. Allan Bromley, President Bush's chief adviser for science and technology, observed that the health of some of the most prestigious universities "has changed dramatically" since the last diagnosis in 1986 (PHYSICS TODAY, March 1986, page 65). That analysis was done under the direction of David Packard, chairman of Hewlett-Packard Co, and Bromley, then a Yale physics professor, who served as vice chairman of the study group. The group's report was issued as a "white paper" by the White House Science Council, the predecessor to PCAST.

The Packard–Bromley report, bearing the optimistic title of "A Renewed Partnership," urged the Federal government to make "substantially greater investments in our centers of learning in the 1980s and 1990s than in the 1960s and 1970s." In the earlier decades, various occupants of the White House, intent on squaring the account for campus dissent to the Vietnam War, cut back or cut out research programs and laboratory projects. Estimating that America's colleges and universities needed about $10 billion over a ten-year period for science buildings and research laboratories, the report called on the Federal government to put up half the total sum and for states, localities, universities and private sources to contribute the rest.

The report argued as a major premise that the ups and downs in Federal funding have not enabled the nation's colleges and universities to meet the increasing demands for new talent and new knowledge. It also complained that academic operations were hopelessly snarled in bureaucratic red tape, preventing both the academic institutions and their research investigators from making the

Packard: Seeking remedies once more.

best use of resources.

Since then, scientific scandals and financial follies have raised doubts about the integrity and accountability of some major universities and several leading researchers. At a George Washington University symposium last year, Bromley lamented that disputes over instances of scientific misconduct and over payments of indirect costs "have shaken the public's long-standing confidence" in US academic research (PHYSICS TODAY, June 1991, page 93). Right or wrong, the public's perception is that university researchers often consider government grants as entitlements but sometimes hold themselves exempt from ethical standards.

In the past year, Bromley has faulted university leaders who coaxed or cajoled members of Congress to make end runs around traditional merit review procedures in order to "earmark" R&D funds, almost always without floor debate, for new facilities or programs at particular institutions. In a talk on science and technology policy at a forum of the American Association for the Advancement of Science on 16 April, Bromley declared that the 1992 budget passed by Congress contained 566 pork-barrel items, worth a combined total of $993 million—a 23% increase over 1991. Commenting on the fiscal 1992 budget, Bromley declared that 143 R&D items of pork, amounting to $347 million in all, went to colleges and universities. "It is important to note," he asserted, "that the amount of funding now being earmarked would be quite adequate to fund a competitive infrastructure program to which universities could apply for support of projects to compensate for more than a decade of deferred maintenance and modernization."

In response to this finger-wagging, the leaders of some of the nation's elite universities say their institutions are on hard times. They have few alternatives to reaching out for pork from friendly members of Congress, they argue uncomfortably, because grants for building and instruments from Federal and state sources are drying up, money from corporations and alumni, hit by the slumping economy, is falling off, and demands are increasing for all the services that universities traditionally provide.

The PCAST and FCCSET studies, each initiated in May and scheduled for completion by the end of this year, will benefit from a series of deliberations on the future of US academic research conducted by the Government–University–Industry Research Roundtable of the National Academies of Sciences and Engineering. The roundtable's report, "Fateful Choices," is optimistic about the benefits to be contributed by research universities to science and to society. Even so, the report is uneasy about the ability of university administrators and faculty to maintain the quality and productivity of the academic enterprise, in view of the accelerating pace of scientific discoveries, the changing demographics and values of young scientists, and the increasing difficulty of financially sustaining 60 or so world-class research-intensive universities.

While Packard heads the PCAST study, as he did when the White House Council conducted its review, the vice chairman this time is Harold T. Shapiro, president of Princeton University. The complementary FCCSET inquiry is being made by a panel of high-level officials who work in 17 Federal agencies. It is led by David T. Kearns, deputy secretary of education and until last year CEO of Xerox Corporation. The panel includes two key agency directors—Bernadine Healy of the National Institutes of Health and Walter Massey of the National Science Foundation. Most everyone at the research universities considers Healy and Massey important because NIH and NSF together support 80% of the basic research done in academe.

While FCCSET is concerned with examining the relationship of colleges and universities with the Federal agencies, PCAST has a much longer bill of particulars. Shapiro discussed many of these with the other members of PCAST at its meeting on 7 May. The issues include the nature and scope of the social contract between the Federal government and

Shapiro: Looking at models of the '40s.

universities conceived in the late 1940s and early 1950s by Vannevar Bush (then president of the Carnegie Institution), Emanuel Piore (then chief scientist at the Office of Naval Research) and James Killian (president of MIT at the time).

Among the questions for PCAST to answer: Is the model invented in the 1940s for government grants to university investigators still appropriate for the 1990s? Are US universities graduating too many PhDs in science and engineering? What is the likely impact on the US research enterprise of admitting large numbers of foreign students into graduate schools? Is it likely that government support of basic research will continue to be high on the national agenda as the drive for military security gives way to the goals of meeting social needs and increasing economic competitiveness? How likely is it that universities will be able to count on Federal support for costly facilities and science instruments in tough economic times? Is US industry taking advantage of advances in basic research as avidly as business interests in other lands?

PCAST plans to hold meetings with university officials, faculty and other interested parties in five cities in the next few months. The schedule calls for the first meeting to take place on 24 June at MIT in Cambridge, Massachusetts. Other meetings are tentatively set for Chicago on 24 September; Raleigh–Durham on 25 September; Austin, Texas, on 8 October and San Francisco on 9 October.

Bromley believes that the prescriptions written by PCAST and FCCSET, if taken, will give US research universities the best chance of surviving robustly into the next millennium.

—IRWIN GOODWIN ■