ductive overlap among laboratories and missed opportunities for synergism."

'Fresh look.' In its "fresh look" at the national labs, the panel makes some final observations: "The US can no longer afford the luxury of isolating its government laboratories from university and industry laboratories.... The national interest demands that the Federal laboratories collaborate with universities and industry to ensure continued advances in scientific knowledge and its translation into useful technology." The White House panel argues that current Federal procurement practices discourage the agencies and labs from contracting with universities and industry, and that the agencies have assigned R&D work to labs that would be more appropriately performed elsewhere. "This problem is most severe with the DOE and DOD and least with the NIH," the report claims.

The report is silent about particular labs, though it names a few when it wants to emphasize a general point. It notes, for instance, in speaking about the value of some rivalry among labs, that "competition between Lawrence Livermore and Los Alamos in nuclear weapons development seemed to be an important factor in the high quality of work in both laboratories." In advocating reforms in personnel management, the report cites an experimental pay and promotion system in effect at the Naval Weapons Center in China Lake, California, and the Naval Oceans Systems Center in San Diego.

At the press conference, Packard delivered some snapshot assessments of various Federal labs: DOE's Stanford Linear Accelerator Center and Fermilab were praised as examples of single mission labs with "real good performance records." Los Alamos and Livermore, both operated by the University of California, and Sandia, run by AT&T, were doing well in weapons work but DOE ought to cut back other R&D at the labs, particularly in alternative energy studies. Lawrence Berkeley, Argonne and Brookhaven, all once preeminent in accelerator work, and now diversified into many other fields, urgently needed "streamlining" and their missions redefined by DOE. For its part, NIH faces a worsening shortage of talented clinical researchers, even though it offers up to $10 000 more in differential pay for those with MD degrees. Livermore and JPL were hailed for their "close encounters" with the university faculties at, respectively, the University of California and Caltech.

After the press conference, Keyworth was asked what message the Packard panel report carried for Brookhaven, which is about to lose a partially built Colliding Beam Accelerator (see page 17). Brookhaven is clearly in search of an important new mission, possibly, said Keyworth, materials research in which it could use its new synchrotron-radiation facility, "one of the best in the world."

Although the report offers no revolutionary changes for the Federal labs, it carries the weight of the White House with a package of reforms. The last time such a reformation was proposed was in 1962 when President Kennedy asked a group of Cabinet-level officials to examine the problems confronted by Federal labs arising from the rapid growth of R&D programs. Under the chairmanship of David E. Bell, director of the Bureau of the Budget, the panel concluded that Federally financed R&D, which had soared from $100 million per year in the late 1930s to more than $10 billion in FY 1962, required a partnership between public and private research institutions as "the best way to enlist the nation's resources and achieve the most rapid progress." It urged that government labs be assigned "significant and challenging work," that laboratory directors be given "more authority to command resources and make administrative decisions" without unnecessary echelons of review and supervision by agencies and that salaries be raised to attract and retain first-class scientists, engineers and administrators. In these respects, the Bell report was not much different from the recommendations offered in the Packard report. In an interview later, Packard vowed to carry the message of his report up Capitol Hill personally. "The stakes involved are too important to allow these recommendations to go unfulfilled, as happened with the Bell report," he said.

Besides Packard, the White House panel consisted of five physicists—John Bardeen from the University of Illinois at Urbana, D. Allan Bromley of Yale, Arthur K. Kerman of MIT, Edward Teller from the Hoover Institution on War, Revolution and Peace at Stanford, and Albert D. Wheelon of Hughes Aircraft Co.—and Donald S. Fredericksson, former NIH director and now vice president of the Howard Hughes Medical Institute. —IG

Argonne surrenders accelerator to SURA

The heated rivalry between Argonne National Laboratory and a consortium of 23 southeastern universities over the construction and operation of a continuous-beam electron accelerator (PHYSICS TODAY, July, page 57) ended on 19 July when Argonne withdrew its political forces fighting for the proposed machine in Washington.

In a letter to Senator Charles H. Percy (D-Ill.), who is chairman of the Senate Subcommittee on Energy, Nuclear Proliferation and Government Processes, Argonne's director, Walter E. Massey, wrote that he had decided not to press the lab's case with the Department of Energy to avoid a stalemate that could result in postponement or cancellation of the facility. "Such a stalemate," Massey stated, "could hurt all of American science.... At a time when the United States is striving to maintain its leadership in key areas of science and technology in the face of intense foreign competition, it would be unfortunate to delay or cancel such an important project. Rather than risk the loss or delay of the project, we think it best to end the effort to reverse the original recommendation to the DOE."

Argonne launched the attack last April after the DOE–NSF Nuclear Science Advisory Committee chose a design for an accelerator in the energy range of 0.5–4 GeV submitted by the Southeast Universities Research Association from among five proposals. The Argonne proposal, a novel variation of the race-track microtron with beam energies extended to a maximum of 4 GeV, was considered by NSAC to have more uncertainties than the SURA design. Because NSAC found that both designs "could very well form the basis for an extremely powerful national facility," Argonne's board of governors and its contractor, the University of Chicago, urged Massey to contest the NSAC decision. Percy and a delegation of Illinois Congressmen, flanked by governors and university officials from other Midwest states, argued for Argonne. Meanwhile, Senator John Warner (R-Va.) was allied with members of Congress from eight southeastern states in the battle for the accelerator. "Warner and Percy were prepared to carry the battle to the President if necessary, if the scientists wanted that," said a Congressional aide.

For his part, George A. Keyworth, President Reagan's science adviser, warned Massey that Argonne was imprudent in disregarding the recommendation of the peer review conducted by NSAC, and the lab's insistence would jeopardize the construction of the accelerator. In June, Keyworth wrote to Herbert H. Bateman (R-Va.) deploring a planned amendment to the budget bill by Representative Sidney Yates (D-Ill.) to block the project altogether. Yates's amendment, Keyworth declared, would undercut the "framework upon which American scientific

preeminence" is built and place "local self-interest above national objectives." DOE officials, including Alvin W. Trivelpiece, director of the Office of Energy Research, also advised Massey to call off his political forces or the project could be cancelled entirely.

"As long as our case looked good on scientific, technical and economic grounds," Massey says, "I was convinced we should pursue it vigorously, but as the political opposition increased, it looked more and more as if the project could be destroyed. Nobody actually asked us to withdraw, and no threats or promises were made. It was never our intention to be spoilers."

On 20 July, Hodel announced through a news release that SURA's proposal had been selected by DOE for consideration in the FY 1985 budget request to Congress next January. Hodel said he was "convinced that the technical panel did a fair and thorough job of reviewing the proposals and, in cases such as this, technical excellence must be the principal criterion for selection."

That day Percy and Representative John Erlenborn (R-Ill.) sent a consoling letter to Massey, sharing his disappointment over Argonne's decision and relating a recent conversation with Hodel. "We explored," they wrote, "what we consider to be underfunding of Argonne and a need to locate new projects at the laboratory that equal or exceed the benefits to you and the region that were represented by the accelerator. . . . Secretary Hodel has told us that he carefully studied the needs of Argonne and concurred that much had to be done and should be done to strengthen Argonne and provide greater stability to its ongoing and future programs." —IG

NSF helps advance computer research

From 1959 to 1972 the National Science Foundation spent $72 million in support of computer-research facilities at 184 universities. This was seed money to plant computers on campuses for science and engineering "number crunching" and to stimulate growth in computer studies. The program was marked by some success—sprouting new architectures, including the Rice Research Computer and the Illiac series, as well as new programming languages, such as BASIC, developed by John G. Kemeny at Dartmouth, and new concepts of time sharing, initiated at MIT. Still, by 1977, NSF counted only 50 university departments in computer science and found to its dismay that most centers were not being used for computer research at all but for serving administrative paperwork and classroom projects. What's more, universities were neither buying advanced computers nor upgrading old ones. An NSF study under the chairmanship of Gerald Feldman of the University of Rochester pointed in 1979 to a crisis in academic computer research, with the number of PhDs leveling off at a time when demands for faculty and graduate students were increasing.

To deal with the problem, NSF set up its Coordinated Experimental Research Program with the intention of improving experimental projects, expanding existing computer centers, supporting large-scale multi-investigator studies and developing a nationwide computer network to serve industry, government and universities. Using the facilities of ARPANET, PhoneNet, Telenet and Timenet, the NSF network now services 120 clients, including IBM, Hewlett-Packard, Rand, Atari, Digital Equipment and Wang Labs, as well as MIT, Stanford, Cornell and Yale, among others. It also has made 14 five-year awards totaling $50 million to universities since the CER program began in 1980.

NSF's first grant went to the University of Washington for its Eden Project, which seeks to develop a distributed system of powerful work stations and mini-computers. In 1981, awards were made to Cornell, Yale, the University of Illinois and the University of Wisconsin at Madison. Last year's grants went to Brown, Rice, UCLA, the University of Texas at Austin and the University of Utah. In July, NSF announced the latest grants: The University of Maryland received $4.5 million over the next five years to develop new procedures in image processing, numerical computation and knowledge-based systems, using a special, highly parallel multiprocessor machine developed at the university; the University of Pennsylvania got $3.8 million for work on artificial intelligence and robotics; the University of North Carolina was awarded $3 million and Duke $1.7 million to create a joint center for Very Large Scale Integrated circuit research for use particularly in computer-aided design and computer-aided manufacturing systems.

Along with this program, NSF is participating with the Defense Advanced Research Projects Agency, NASA and the Department of Energy in a searching review of the entire computer field—from the needs of scientific researchers to the general problem of high-performance supercomputers. These agencies were directed by the White House Office of Science and Technology Policy last year to come up with government initiatives, limited, of course, by the current Administration's philosophic preference for relying on the commercial market.

NSF had a head start in its study through an examination of many of the problems by a panel headed by Peter D. Lax of New York University, which issued a report last January on "Large Scale Computing in Science and Engineering." While the US currently is "the leader in supercomputer technology and in the use of supercomputers in science and engineering," the Lax panel warned of "alarming" evidence that "US dominance of the supercomputer market may soon be a thing of the past." The fastest and most powerful computers are now made by two US firms—Cray Research and Control Data Corp, both in Minneapolis. Currently Britain, West Germany, France and Japan are starting "aggressive" programs to develop supercomputers, the panel observed. Japan's "Fifth Generation Project," clearly the most ambitious, calls for a "a revolutionary approach to computer design based on artificial intelligence" and development by 1989 of a machine 1000 times faster than existing ones," said the Lax report. "There is no comparable technical program in the US."

A working group within NSF has prepared a report that sets forth various ways of carrying out the recommendations of the Lax panel, especially as it relates to access by scientists and engineers to local computer facilities, national networks and supercomputers. The draft of that report was approved by the executive committee of the National Science Board on 22 July and sent on 26 July to the interagency Federal Coordinating Council for Science, Engineering and Technology, charged by OSTP with producing a government-wide policy on supercomputers, to be presented to Congress as a program in the hundred million dollars range for the FY 1985 budget. —IG

A quick and dirty look at high-school science

Stating his position on US education before the Democratic National Committee meeting in Detroit on 14 July, Senator John Glenn (D-Ohio) observed that 34 states require high-school students to take only one mathematics or science course to graduate. "In most of those states that requirement can be fulfilled by taking a course in hygiene or physiology," said Glenn. "In other words, if you know when to take a bath, once a week or so, and wash your hands a couple of times a day, you qualify in science." □