with financing at 6.2% interest, and to lease it to NCAR, charging all interest and financing costs to the leasing contract. He estimated that this financing saved them about $2 million. CSU used a similar approach to acquire Cyber 205 computers for its own use, at a cost of approximately $12 million.

Donald Shapero (Office of Physical Sciences at NRC) told us that the NRC executive committee is now working with the AAU to set up three regional workshops to be held this fall. The workshops will inform the university research community about some of the financial planning options and will continue the dialogs, begun in these caucuses, between corporate, academic and government research planners.

Additional recommendations by NRC include increasing the use of block grants and centralizing large equipment. Block grants were viewed by the group as an effective mechanism for facilitating the long-range planning of equipment purchases. While there was a general consensus recommending increasing their use by universities, some people expressed concern that block grants had sometimes been used to support less successful researchers who would otherwise not have been given funds; on the other hand, block grants do provide the flexibility needed to initiate research in new areas. The lack of such flexibility induces excessive conservatism and encourages the tendency to support areas of research that have been supported in the past.

Sharing centralized research facilities is attractive financially. The cost of acquiring and maintaining the instrumentation is split among users, and travel to the facility is usually much cheaper than duplicating the equipment on campus. Fowler told us of his concern about going too far with centralizing facilities. He noted that in elementary-particle physics, in particular, groups of university researchers queue up for time on research equipment at national laboratories; this has been accompanied by reductions in funding for scientific instrumentation for on-campus equipment. Fowler said, "I strongly feel that we cannot let on-campus physics research be banished from scientific research in this country. I believe in the system we have, where there is a truly remarkable balance between experimental research conducted in universities, in corporate labs and in government labs." Others express the concern that going too far with centralization would pose additional problems for training scientists. Students are traditionally given low priorities on queues; many feel that graduate students also need interaction with each other in order to learn, and this would be largely unavailable at centralized facilities. —JC

SELBY

No Federal aid for precollege science

A new Sputnik is challenging scientific industry and education in the US. There is a shortage of engineers and technicians so severe and a decline in pre-college math and science education so ominous that President Ronald Reagan recently described the problem as "serious enough to compromise America's future ability to develop and advance our traditional industrial base...." The statement came in a message he sent to a National Convocation on Precollege Education in Mathematics and Science at the National Academy of Sciences in May.

In 1958, the year after the Soviet satellite was launched, the Eisenhower administration responded to inadequacy in science and math education by pushing Congress to pass the National Defense Education Act and to appropriate extensive funds for education to the National Science Foundation. The present administration eschews any parallel effort. Reagan has cut the dwindling NSF budget for education from $80 million to $15 million, none of which will go to precollege programs (see PHYSICS TODAY, May, page 77). His explanation was: "This administration has deliberately suspended what had become a proliferation of small Federal programs which—taken together—showed themselves to be ineffective in stemming the slide in science and math performance that has been evident for at least a decade."

Reagan and Secretary of Education Terrel H. Bell, who spoke at the convocation, maintained instead that effort must come from US industry and from local governments—the "grass roots"—because the US citizenry is dissatisfied with big government. After persistent questioning, Frank Press, NAS president and convocation host, said that that solution is "unrealistic" because the amounts industry can be expected to contribute fall far short of the billions needed.

Shortages. Paul DeHart Hurd (Stanford University) amplified on the continuing decline in the quantity and quality of science and math education over the last decade:

▶ Elementary-school children receive, on the average, one hour of science and four of arithmetic out of 25 weekly instructional hours.

▶ Only 34% of high-school graduates complete three years of math; only 8% finish a course in calculus. (In fact, only 31% of high schools offer calculus.) No more than 19% and possibly as few as 10% of high-school graduates take physics.

▶ Between 1963 and 1980, mean SAT scores in math declined from 502 to 466. Meanwhile, the portion of those tested receiving math scores lower than 300 rose 38%.

▶ During the 1970s the number of high-school math teachers being trained declined 77%.

▶ One-half of the nation's high-school math teachers hired in 1981–82 are "unqualified" and are teaching, with emergency certificates, subjects they were not trained to teach. Even so, 22% of math teaching jobs are unfilled.

By 1980, as higher salaries in industry were continuing to attract potential teachers, 30 states, Hurd told us, reported shortages of math teachers, and 16 reported serious shortages. By 1981, out of 45 reporting states, 41 indicated shortages of teachers in math and in physics, he said.

According to Robert P. Henderson (chairman of ITEK), each year industry is short an additional 17 000 engineers. He anticipates a shortage of hundreds of thousands by the end of the century.

Economist Edward F. Denison of the Brookings Institution emphasized the serious implications of the President's message. He finds the economy in trouble particularly because of the poor prospects it shows for long-term growth. He contrasted the past few years with the period of notable growth that occurred from 1948 to 1973. In the earlier period, he said, increases in education contributed importantly to prosperity.

The reasons. While other speakers laid the blame for the present decline on diminishing Federal funding during the last 20 years, Bell and Press attributed the problem, in Press's words, to the "Vietnam War and the supposed animus toward science that it raised" and to "requirements for bilingual education, for vocational education, for special education for the handicapped and the underprivileged." Bell added that "quality, excellence, and effi-

ciency" were sacrificed to "quantity, mediocrity and general muddling" by the social legislation of the 1960s and 1970s.

Several other speakers recommended expanding training programs for women and minorities. John B. Slaughter, who recently announced his resignation as NSF director, pointed out that during the next 20 years the recent fall in the birth rate will entail a 25% reduction in the number of young people entering the job market. To offset this shortage and to supply a growing demand for trained personnel, a greater participation of minorities and women will be needed. Sheila M. Pfafflin, a district manager of AT&T, emphasized that women and members of racial minority groups comprise a substantial majority of young people. Any effort to expand the trained labor force must include them, she said.

Disputing the view of the Reagan administration, Robert B. Sigda said that local communities cannot come up with the funds needed to reverse current trends in precollege education. An earth science teacher and the president-elect of the National Science Teachers Association, he commented, "The recent suggestions by some that all the funding for science education must come from the local level is totally unrealistic to science teachers, who, for many years, have been trying to obtain money from these sources. Anyone familiar with the problems and pressures on local school boards know that little, if any, funding will come from this source. There has been a fiction that a massive Federal support has been present over the years," Sigda told us. "The fact is, Federal support for pre-college science education has declined steadily and drastically for the past 22 years."

Gerard Piel (publisher of *Scientific American*) disagreed with the Reagan administration idea that Federal funding would interfere with local initiative. He said programs of the 1950s originated locally in universities but received Federal funds, a relation he feels ought to be repeated.

Small bright light. Collaborations between schools and industry, particularly high-technology companies, offer some encouragement. Computer-based instructional programs developed jointly by industry and schools have been applied in many cities. The PLATO system (developed with funds from NSF), for example, is being used to teach disadvantaged children in basic skills, to enrich mainstream programs in math and science and to provide training in computer literacy and high-technology vocations.

The Houston public school system has introduced measures to improve science instruction with help from large corporations: joint appointments in industry and schools for teachers, establishment of schools specializing in science and math, and incentive pay rewards for teachers instructing in subjects in which there are shortages of teachers and in inner-city regions.

Although the Reagan administration refuses money, it was willing to provide recommendations. Bell suggested 18 measures that local school boards and states might implement: paying math and science teachers more than their colleagues, increasing math and science requirements for high-school graduation and for university admission, establishing more high schools along the lines of Bronx (New York) High School of Science, encouraging corporations to pay for expanded laboratory equipment, and so on.

Another measure Reagan and Bell cited was the newly created National Science Board Commission of Precollege Education in Mathematics, Science, and Technology, under the leadership of William T. Coleman, former Secretary of Transportation, and Cecily Cannan Selby, a physicist and a chairperson of the board of advisers of the North Carolina School of Science and Technology, a residential high school. The Commission—whose 20 members also include physicist General Lew Allen Jr, Chief of Staff of the US Air Force—is to meet approximately ten times during the next year and a half to "define a national agenda for improving mathematics and science education in this country. It will develop an action plan that will include a definition of the appropriate roles of Federal, state and local governments, professional and scientific societies, and the private sector in addressing this problem. . . ." The Commission, according to Sarah Klein, president of the National Science Teachers Association, "would duplicate studies already undertaken, but largely ignored [for which] the NSF spent upwards of $3 million over the last five years." Any recommendations the Commission makes, which will not occur until late 1983, will have no chance of receiving funding until 1985, according to a recent statement by F. James Rutherford, chief education officer of the American Association for the Advancement of Science.

Where the money for needed programs will come from is "a serious question the country must address," according to Press. —DG

the physics community

Acoustical Society elects Fisher and Galloway

The membership of the Acoustical Society of America has elected Frederick H. Fisher president-elect and William J. Galloway vice-president-elect for 1982–83. They will succeed current president David T. Blackstock (University of Texas) and vice-president Alan Powell (David W. Taylor Naval Ship R&D Center) in the spring of 1983.

Fisher attended the US Naval Academy (1945–47) and graduated from the University of Washington: BS in 1949,

FISHER

PhD in physics in 1957. Since 1955 he has worked at the Marine Physical Laboratory of the Scripps Institution of Oceanography of the University of California. He was assistant, then from 1962, associate research physicist. In 1968 he became research oceanographer. Since 1975 he has also been associate director. He worked on reverse osmosis desalination of sea water as director of research at Havens Industries from 1963 to 1964 and as professor and chairman, department of physics, at the University of Rhode Island from 1970 to 1971.

Fisher has served the ASA as vice-president 1980–81, as member of its executive council 1976–79. He has worked on committees on physical acoustics and underwater acoustics and as an associate editor of the *Journal*.

Galloway earned BS (1949), MS (1950) and PhD (physics, 1953) degrees from the University of California at Los Angeles. Since 1953 he has been vice-president and principal consultant at Bolt Beranek & Newman. He has also been standards director of the ASA since 1979 and served on its noise and standards committees.

At the same time, Juergen Tonndorf (Columbia University) and Josef F. Zwislocki (Syracuse University) were elected to the ASA executive council. □