Science Education: An Ambling Retreat

With decreasing funds and a shrinking academic job market, science education faces shifting emphasis and slow retrenchment

by John H. Douglas

Academics do not march to the beat of any drummer. They amble along, tuned to the distant murmur of new melodies and old refrains.

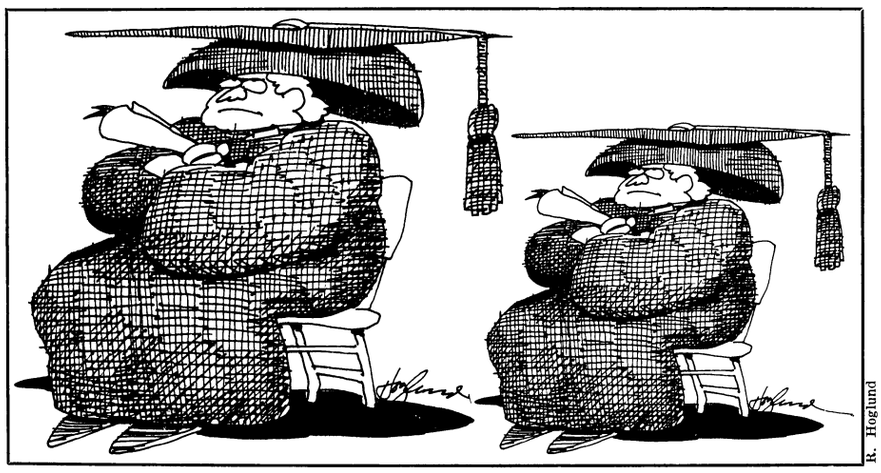
—Harold Enarson
President, Ohio State University

The "new melody" for science educators is the unmistakable call of retreat. The proposed National Science Foundation budget for science education for fiscal year 1976 is $68.8 million, down seven percent from last year and only a little over half the actual dollar expenditures of a decade earlier. During the same time, funds for science education have dropped from 27 percent of the total NSF budget to less than 9 percent; and compared to the proposed $8.6 billion of comparable Federal support to all educational programs, science education has shrunk to a dismal 0.8 percent of the total educational effort.

The biggest decrease comes in the NSF's much heralded "science literacy" program (SN: 3/2/74, p. 137) which faces a proposed 25 percent cut, followed by declining support for "careers in science," down 9 percent. While this raises serious questions about whether enough scientists and engineers will be trained to meet the country's needs 5 or 10 years hence, and whether producing a scientifically literate citizenry has lost its place of importance in Administration planning, the greatest immediate impact will fall on the science teaching profession. Already worried about the shrinking job market that will inevitably follow passage of the "war babies" through the educational system, science teachers must now face the declining financial support in areas where the Federal Government has previously encouraged development.

Career interests in technical subjects have been dropping among freshmen for some years. The proportion wanting to become engineers fell from 8.9 percent in 1966 to 4.7 percent last fall and freshmen interested in research science careers fell from 3.5 percent to 2.1. The bright spot in this picture is that freshman engineering enrollment finally began turning up last fall; but even with the upturn a short supply of graduate engineers is expected for the next 10 years. The Bureau of Labor Statistics (BLS) estimates that some 54,000 new engineering baccalaureates will be needed each year to fill the profession's needs for the next decade, and that the actual supply will fall about 10 percent short. In part students have been responding to what BLS labor economist Daniel Hecker calls the "cobweb theory": getting hung up on the current job market rather than the one that will greet them upon graduation. Thus, when unemployment among engineers reached its peak in 1971, the resulting decline of students enrolling in engineering courses predetermined the shortfall in qualified job applicants now appearing. Even in terms of the then-existing job market, however, Hecker says students overreacted—unemployment for engineers never exceeded 2.9 percent and a large number of these did not actually hold engineering degrees, but were technicians who had been specially trained to handle specific tasks.

The statistics for various scientific disciplines vary remarkably. Despite the number of students signing up as chemistry majors in hopes of getting into medical school, the BLS predicts an 11 percent annual shortfall of graduates, relative to jobs available, over the next decade. In physics, on the other hand, a 10 to 15 percent surplus is expected to continue. Meanwhile, special needs keep surfacing. The NSF has predicted that the need for scientists and engineers in energy-related fields may double between 1970 and 1985, and the agency has responded with graduate student fellowships and traineeships in these fields.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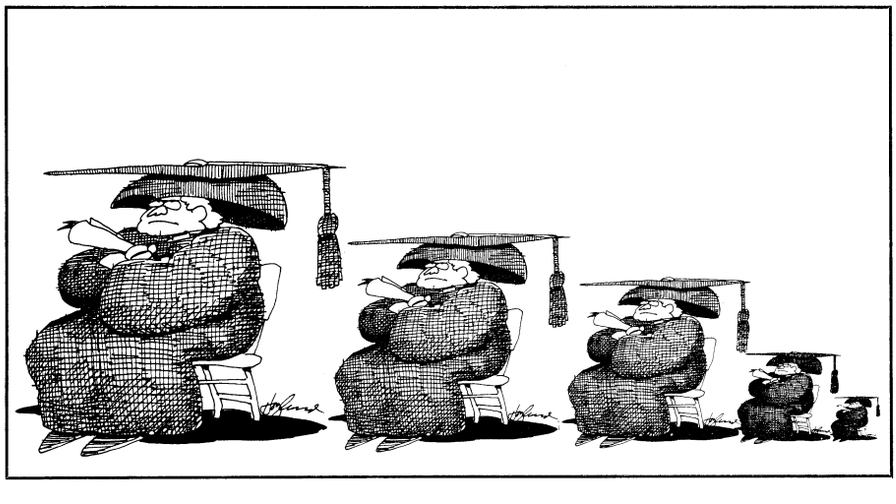
At issue is a long-standing debate over whether NSF funds should be used only to create such new programs or to help sustain programs they have already helped start. In recent hearings on the science education budget, the chairman of the House Subcommittee on Science, Research, and Development, James Symington (D-Mo.),

grilled the NSF assistant director for education, Lowell F. Paige, for deemphasizing such "sustaining" activities as fellowships and summer institutes for teachers. Lewis S. Salter, speaking on behalf of the Associated Colleges of the Midwest, expanded on this theme, saying that without past Congressional action, such programs as undergraduate research grants, science faculty fellowships and funds to buy instructional scientific equipment "might now be extinct." NSF is preoccupied with responding to developing crises, Salter says: "One looks in vain for an acknowledgment that there are certain continuing needs borne by science-teaching institutions, crucial for the maintenance of scientific quality."

Paige counters such criticisms with the observation that the basic problem goes far beyond direct support for science education and lies outside NSF's ability to counter. Acknowledging the "financial distress" of many universities, Paige suggests the need for "a massive Federal assistance program," and in the same breath says such a program is "beyond the authority" of his agency. With such limited resources, he concludes, NSF can do little more than attack certain priority needs—such as getting more women and minorities into science—and set up a few pilot projects that someone else might nurture in maturity. Though he does not specify why NSF should have received such limited resources, Salter lays the blame at the door of the Office of Management and Budget, which he says has selected various programs as "targets for annihilation."



To those concerned with maintaining an adequate supply of future scientists and better preparing the educated public to deal with increasingly complex technical issues, the plight of science education may seem especially important, but it is by no means unique. Enrollment in elementary schools has been falling since 1970. The number of secondary-school pupils is expected to peak this year, and college enrollment will level off and possibly decline in another 5 or 10 years. Most of these declines result from school-age population, but other factors also enter: The percentage of high-school graduates going on to attend college, for example, has been dropping since 1970.

The results for the teaching profession are nearly catastrophic. The New York Department of Education estimates that 80 of the state's 120 private colleges may have to close. Nearly 46 percent of beginning elementary and secondary teachers could not find teaching positions last September. At the university level, many more recent Ph.D's were granted than there were academic positions to absorb them. The problem is particularly difficult in such traditionally academic fields as philosophy, where 500 teachers have recently lost jobs and another 2,000 recent doctorates cannot find their first academic employment. According to one estimate, the proportion of Ph.D's now going into teaching has fallen to 40 percent and may drop to 20 percent.

For science teachers, at least, industry can offer alternative employment, and some science education planners are beginning to call for a shift to more practical training at the university level to help meet projected shortages. Robert A. Alberty, dean of science at MIT, emphasizes the need for science teachers to become familiar with practical problems and says such NSF programs as the one that provides industrial experience for science teachers will become increasingly important. He also says the problem of providing continuing education for scientists and engineers, so that they can keep up with recent developments or can remain flexible enough to shift fields if necessary, has not been successfully fulfilled. To help meet the challenge, MIT, for example, has begun an interdisciplinary science program at the master's degree level to help train students who will work on practical problems in government or industry requiring knowledge from several fields.

Industry, for its part, is delighted with the projected shift of emphasis. Arthur M. Bueche, vice-president for research and development of the General Electric Co., says flatly: "We must recognize that the greatest opportunities for using tomorrow's technical talent will be in industry. Having recognized this, we must be more innovative and receptive to new ideas for promoting the interchange of ideas and people among industry, universities and government." Specifically he would like to see a faculty member gain credit for academic advancement by spending a year working in industry to become "more aware of the real-world impact of both his research and his teaching." Another way to increase the available number of scientists and engineers, Bueche says, is to encourage women and minority-group members to go into these fields.

At stake, as businessmen see it, is America's position in international competition, for at present, the Soviet Union still produces twice as many engineers per year as the United States. As a result, industry has had to upgrade technicians, or take people trained in other fields, to hold engineering jobs—45 percent of the workers now holding engineering positions in the United States cannot meet professional society criteria as "engineers."

Of course, future demand for technically trained workers can only roughly be estimated. Lindsey R. Harmon, director of research for the National Research Council's Commission on Human Resources, declares himself "very leery of these long-range predictions." Projected "demand" is very different from projected "need," he says; while the latter reflects what society wants, the former results from what society is willing to pay for. Young people may also enter—or refuse to enter—scientific training because of vaguely perceived benefits or evils associated with current accomplishments. Budget priorities, Harmon concludes, should thus stem from "what we are up to as a society."

What we seem to be "up to" is the development of an increasingly complex society in which the lay person understands less and less of the technical world that surrounds him. If science education is presently failing even to prepare enough professionals to fill lucrative industrial jobs, the failure to increase general understanding and appreciation of technical matters among the public can only be guessed at. In the face of crises in the economy and energy and food supplies, declining support for either of these goals of science education can only be considered ominous. □