

# A Report Card for American Education

by SHIRLEY HUFSTEDLER

I have recently completed my first year of service as Secretary of Education — and also my last — and so it seems appropriate to offer my version of a report card on the state of American education as it relates to science, mathematics, and engineering. I also want to make a few suggestions about some trends I think can be of importance in the next decade. Like all gazers into crystal balls, I am not passing out warranties along with my predictions, but I don't have any hesitancy about proposing some courses of positive action by the nation's great universities and by the private sector because there must be action from both if we are to avoid unpleasant consequences from some of the trends that I foresee.

I'll begin with some good news. Contrary to popular belief, American public education in the elementary schools is in very healthy condition. Today's elementary schools are better by far than those of 30 years ago, or even 20 years ago. That is likely to be lost sight of in a place like Los Angeles, which is going through the turmoil of an integration order. It is also likely to be lost sight of in many other major urban centers in which all kinds of problems are evident in education — as they are in every other sector of the society in the large cities.

The report card with respect to those elementary schools is high, even though schools are being asked to perform today a simply extraordinary number of nontraditional tasks as well as to serve a much more diverse and less affluent population than ever before. During my tenure as Secretary of Education, I was in classrooms all over the United States, and I made it my business — because that was my business — to learn what was happening in classrooms that I could not visit personally. Seeing is believing, and accordingly I have become a believer. Our elementary schools are not as good as they can be or as they ought to be, and therefore I cannot give them the highest possible mark. But they certainly deserve a solid B+.

The contrary view is shaped not only by the American addiction to bad news as a daily portion of one's news diet but by the needs of the media for dramatic stories. Neither bad news nor drama has been lacking in American education, especially in the large cities. Prevailing negative attitudes about schools have also been shaped by the fact that today only 28 percent of our population has children in school, and the proportion of students from upper- and middle-income families has declined dramatically. As a result, fewer and fewer of those families ever visit the public schools, and that accounts in large part for their estrangement from what is really happening there.

Educational success is not limited to elementary schools; I have also seen some outstanding secondary schools, even under the most difficult environments. But that, alas, about ends the good news story about the state of American education. The nation's junior and senior high schools as a whole are experiencing very severe difficulties, not only in the inner cities where you might expect

it, but in many other areas as well. While there are some very bright spots in the report for secondary education, not many of them are in the areas of science and mathematics. In October the National Science Foundation and the Department of Education sent to the President a report on the state of science, mathematics, and engineering education in the United States. It is a very detailed report, and the conclusion was that we have good reason to be alarmed — not simply about the state of education at this instant but about the kinds of nationwide trends that threaten scientific and technological decline within a generation.

The position of power and leadership in the world, as well as the amazing prosperity that the United States has enjoyed in this century, has many foundations, but no one could deny the significant role that has been played by the scientific and technological supremacy of this country. I am not suggesting that we are in imminent danger of losing that advantage. American science remains the envy of the world, and no other nation will soon match the brilliant constellation of research universities in the United States. Ultimately, however, those universities and our entire structure of scientific research and high-technology industry are based on the quality of education provided in the elementary and secondary schools.

We have failed to maintain the momentum in science and mathematics that we gained in the post-Sputnik era. I don't need to remind anyone of the galvanic effect of the space race upon science and technology throughout American society, particularly in the schools. Alas, it is sad but true that when the nation's priorities shifted from extensive space exploration and the development of the aerospace industry, support for science and mathematics education in the schools began to erode.

The number of science courses offered and required has dropped all over the nation. This decline in our standards and efforts has occurred at a time when our international rivals for technological supremacy have raised their standards and redoubled their efforts. While fewer and fewer American students are being exposed to rigorous scientific and mathematical curricula, more and more students in Germany and Japan and the Soviet Union are pursuing very difficult and sophisticated courses of study. Every year more than 3 million students graduate from Soviet high schools with two full years of calculus under their astrakhans. By contrast, barely 100,000 American high school graduates have taken even one year of calculus. American performance improves during the early years of college, but it is not improving fast enough to keep us abreast of our counterpart students abroad.

These problems of secondary education are not remote, as they might seem, from the concerns of Caltech. It is true that the quality of higher education in the United States is outstanding, rating a full A in university after university. That is particularly true at the very top levels of science education. Caltech is still an A+ institution at the pinnacle of that structure. There is at the present time no

dearth of highly qualified applicants for every available spot on the campus, but if we don't act now to shore up our secondary school system, that state of affairs is unlikely to continue either for Caltech or — perhaps even more importantly — for less distinguished institutions that nevertheless will play very significant roles in the training of scientists, mathematicians, and technologists for the rest of this century.

Because our great colleges and universities have experienced no shortage of intellectual riches even in an era of declining youth populations, there has been a temptation to be rather complacent. A number of highly respected leaders in science, math, and engineering have remained aloof from the serious problems brewing in the secondary schools, in part I think because they have not fully appreciated what is happening. Aside from sheer love of science (and who is to love science and to guard its health if not those who practice and teach it?), there are some eminently practical reasons for institutions like Caltech to become more involved than they already are in secondary education.

In the first place, we have to consider the quality of future students. Even when one takes only the top one-tenth of one percent from the pool of potential students, the quality of the freshman classes will still depend on the size of the pool and the abilities of its members. Yet today hundreds and thousands, even millions, of potentially brilliant scientists are being turned away from science at a very early age. The most critical age today is the seventh grade, where youngsters, once fired up by high-quality elementary schools, begin to see that their futures are not expanding as they should. They are not being adequately challenged; they are not being asked to persevere for rigorous academic training at a time when their natural talents might be permitted to mature.

Entire minority communities and an enormous portion of young women never even consider the possibility of careers in science. And even among white males, the number of students giving short shrift to science, math, and engineering is not encouraging. Though they have no way of knowing it, some of these youngsters belong in the Caltech freshman classes of the eighties and the nineties, and they are not going to be there. Because of that, their lives as well as the lives of Caltech and the nation will be far poorer.

Outstanding students are not the only ones who are going to be in short supply if we don't reverse this trend. Faculties and the whole array of practical researchers and engineers who sustain our scientific establishment are decreasing. Already there are spot shortages of qualified people in areas of computer science and certain other fields. Because the demand in computer science, for instance, is growing at an astonishing rate, these shortages will get worse. Even in fields that have not experienced overt shortages, intense private sector competition for talented and well-trained people often skims the most able young

men and women from the campuses before they are willing or have had an opportunity to undertake serious doctoral and postdoctoral work. The general scarcity thus undercuts the vital work of regenerating our teaching faculties at both the secondary and the postsecondary levels. Someday we may be in the ironic position of having piqued dramatically the interest of students in high school, only to find that the college-level distinguished faculty does not exist to teach them. We are already facing very serious teacher shortages at the secondary level in science and math.

Ultimately, however, the greatest risk for institutions like Caltech is that we will produce an entire generation of young people who are not only ignorant about science and math, but who are actually alienated from both. Over the course of a generation, Americans convinced themselves — incorrectly, to be sure — that science and technology could accomplish anything and everything. Disillusionment was, of course, inevitable. It should come as no surprise that there is now an almost equally incorrect strain of thought that contends that science and technology can accomplish nothing — or at least, that every gain is outweighed by costs and the dangers of its unintended consequences.

In a sense science has been both oversold and undersold. Relentless change did not bring us the nirvana that Madison Avenue told us we should have, and it had heavy and pernicious effects upon our environment. Yet the long-term solutions to so many of our problems — from cleaning up polluted air to producing an adequate food supply for our country and the world — can only be found through recourse to the very same science and the very same technology. When I say *same*, of course, I do not mean that it should not undergo improvement.

Some people within American society have been slow to recognize this. There is increasing evidence that our own people are rapidly becoming divorced from any real understanding of the machines and the ideas that routinely govern enormous portions of their lives, both at home and abroad. We face the dangerous possibility of increasing isolation of the scientific community from the rest of humankind. All of those connected with Caltech know very well how many symposia over the years have been devoted to sounding warnings against the propagation of distant scientific elites who deal with problems incomprehensible to the rest of the nation. Such a state of affairs is dangerous to those who do not share in the scientific and mathematical knowledges because they are likely to find themselves permanently confined to an underclass of society. In the past, illiteracy formed the underclass; in the future, it is extremely likely that scientific and technological illiteracy will be the mark of the underclass of America.

Isolation and alienation may be even greater for the scientific and technologically literate. The rising generation will, after all, ultimately control political and economic levers of our entire society. Individually and collectively,

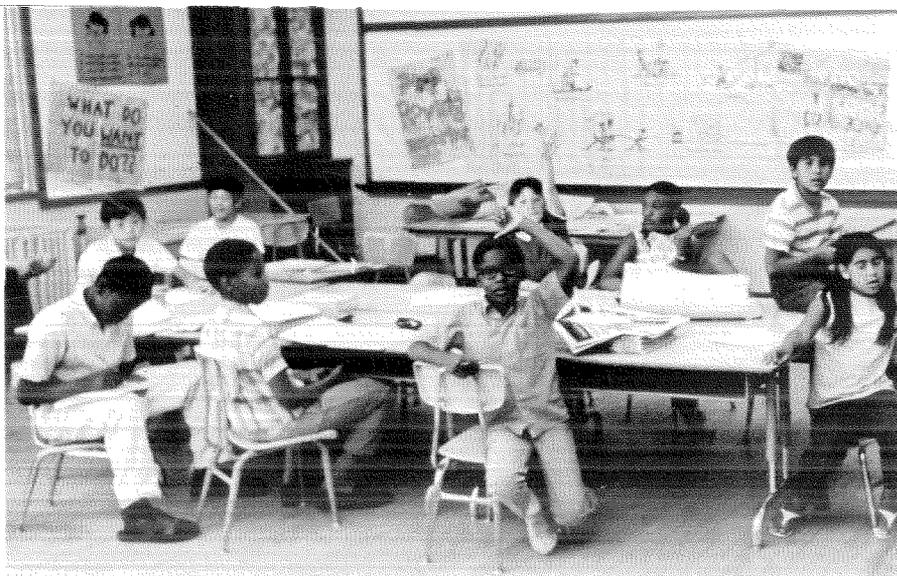
they will make decisions that will govern the fate of the whole scientific community. Even without the gifts of Cassandra, I can easily foresee the very unpleasant consequences that may arise if scientists are estranged from the great majority of our people. It is the most natural of human instincts to be suspicious, to be anxious, and to be angry about things that are outside our own understanding.

At best, we may predict that money will be shorter for science in the next few years than it has been in some of the past years. It is perfectly true that money is not everything, but in science it is also true that no money is very nearly nothing. Research support has already suffered in an era of inflation and its necessary budgetary constraints. If the politics of inflation should be wedded to the politics of alienation from science, institutions like Caltech could enter an era of permanent austerity. Experimentation, as all of us know, is not always immediately cost-efficient. It is rarely tidy, and it is virtually never straight-line. Its worth is not always intuitively obvious. Considered in that light, it is genuinely remarkable that such an activity as science has been funded so well for so long by those who are not directly participants. But if the holders of tomorrow's purse strings lack understanding of and faith in scientific inquiry, then all research will suffer, and pure research will become an endangered species.

Anti-intellectualism is never very far below the veneer of any civilization, including our own. We should not delude ourselves that Galileo's trials and the Luddite rages were merely historical oddities. At present we are seeing a growing movement toward return to some persons' notions of fundamental biblical verities in rebellion against the scientific and social uncertainties of our time. When that movement is combined with fears (whether or not legitimate) about nuclear power, as it is in our society today, an unmistakable element of active hostility toward science is created.

We can't let ourselves become the victims of ideological mood swings; we have already seen in China what happens when emotional fervor is wedded to political zealotry. The convulsive upheavals of the Cultural Revolution locked out a whole generation of science and scientists and effectively foreclosed schools and universities from replacing them. China is only now beginning a slow and exceedingly painful recovery. Such an anti-intellectual exposure to popular rage is all but unthinkable in the United States, but it is most surely not impossible. If we do not act now to curb the growth of technological and scientific illiteracy, there may come a time when the unthinkable can indeed be thought right here.

Furthermore, the ideological perils to science are not limited either to the left or to the ill-informed. Some proposals emanating from other directions are almost as disturbing. Dr. Milton Friedman, for example, has suggested that the National Institutes of Health and the National Science Foundation should be disbanded. He believes in effect that federal support for scientific research should be



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eliminated and that future decisions and future funding should be left to private initiative, wherever and under whatever circumstances it may be found. I don't think I need to spell out how potentially disastrous such a policy could be in American science. Our pluralistic society and our mixed economy are simply not very well suited to sudden, drastic, and sometimes doctrinaire solutions.

There's always a danger in making public lists of potentially troublesome things because if the list is long enough and discouraging enough some people may react by simply throwing up their hands, and I don't believe in pessimism at all. My indications of what is troubling do not mean that I think the problems are insolvable; it does not mean that there are not a lot of good things going on that are working to resolve those issues. There are many counterforces to the centrifugal forces that have moved us apart from one another for a significant period of time.

As a matter of fact, the United States has the resources to do all the jobs that need to be done with respect to education, as long as we appreciate that we can no longer engage in tiresome turf wars with one another. We must, instead, begin to put our resources together in new, creative, cooperative ways. Those resources, then, can do positive things toward reversing these trends.

Let me just give you a few examples from the many I have. Johns Hopkins University is attacking the problem of poor scientific and mathematical education at the secondary level and doing so head on. The University is administering a unique program designed to identify junior high school students (remember, I said those are the youngsters who are most at risk today) who are gifted in math and to make sure that every one of them has an opportunity to develop his or her talents. Johns Hopkins uses the Scholastic Aptitude Test for college admissions to identify these gifted youngsters, and then puts them in touch with various public and private programs offering advanced instruction in mathematics. In just a few years, more than 1300 students in Maryland have been rescued from school curricula that were too limited and simple to challenge them or even to hold their interest. Instead of tuning out in the seventh grade, they have now taken the first steps to-

ward very exciting careers in math and science.

Johns Hopkins is also responsible for another extremely energetic and interesting program. It has adopted Dunbar High School in Baltimore. Dunbar is 84 percent black, and it has only 3 percent white students. The University has produced a program in which these young people prepare for careers in both health and science at every single level from learning entering basic skills through sophisticated technology. Johns Hopkins does this by using its own personnel to teach in the high schools and to bring youngsters into the hospital for training from the time they are in the eighth grade. The results have been remarkably good.

Our neighbor to the north, the University of California at Berkeley, is working intensively on extremely imaginative programs in the Bay Area secondary schools. Other universities are working in the field of educational television to fire the imaginations of the young and to instruct the general public. Such efforts at public education both for children and adults should be an integral part of the scientific community's approach to improving scientific curricula in the schools. I welcome programs like *Cosmos*, which is now reaching an enormous audience, to begin to turn the excitement of *Star Wars* into the reality of what is *basic to scientific information*. It is only by communicating the joy, the mystery, the excitement, and the truths of science that we can effectively counter the propaganda of some zealous anti-intellectuals and unknowledgeable radicals who are taking dead aim at the scientific base.

Another great set of resources that need to be moved in new ways for the support of education is the private business sector. I am aware of many exciting programs in which private businessmen in the United States have become involved intimately in secondary schools. They have learned an enormous amount; they have brought a great deal into those institutions; and they can make important contributions toward turning around the inadequate scientific, mathematical, and engineering education in this country.

Education is in some ways very much like a natural resource, like coal, or oil, or timber. It fuels rapid economic growth and progress; indeed much of America's prosperity

and incredible growth in the postwar years has been due to the extraordinary quality of the educational system. But natural resources are not different in some respects from human resources. They have to be taken care of appropriately and effectively over a long period of time before their true productivity can ever be realized.

The flourishing private business sector has been the result of the coming together of educational, scientific, financial, and management resources into a synergism — a whirl of activity in which the whole is greater than the sum of its parts. Out of that synergistic whirl has emerged tremendous prosperity for this nation, but (if you'll forgive a pun) there cannot be any synergism when no one is feeding the sinners. And there can be no future profitability or even survival of American business if it does not have a healthy and secure relationship with the American public school system.

Now in the past, business has not shirked its obligations to education in many respects. Support has been generously extended to postsecondary institutions, but the time has come to extend that regard and help into the area of the secondary schools, without abandoning the postsecondary institutions. I want to mention a few of the things I have seen effectively done in the junior high schools and high schools by American private business — things that are really important to go on feeding those sinners. Some of these things are really quite simple; others take a great deal of effort. For example, some of the systems that have been very effective involve no more than an industry finding a junior college, a community college, or a high school that is now clanking along with equipment that is wildly out of date and making a donation of equipment that is just a little bit out of date. That is an instance when business can do both good and well at the same time — doing something very good for those schools and at the same time giving itself a perfectly nifty tax writeoff. I don't mind at all if people do well by doing good; and I don't mind appealing to lesser sensibilities than conscience if cupidity will get me what I need for the children.

There are also things that involve a great deal more; for example, there are severe shortages of teachers of mathematics in the secondary schools. Secondary school teachers are paid miserably, and they lead a hard life. To ask somebody of more than ordinary sense — let alone of extraordinary intelligence — to work at a rate of pay that is significantly less than for those who do routine blue-collar labor is to ask him to do things that are contrary to economic and personal good sense. We still have dedicated teachers who do that because they take teaching as a calling, like becoming a member of the clergy, but you cannot expect to populate the schools with teachers who are all seeking roads to canonization.

We need real help for these teachers, and so I have encouraged people in the private sector to consider taking some of these dedicated science and math teachers and arrange for them to spend a year's sabbatical in the private

business sector, during which they will finally be paid a decent salary. This should not only give them a new enthusiasm about what they do, but also give them an opportunity to have greater outreach and thus to bring back more into the classroom.

As Secretary of Education, I have been developing a whole recipe book of similar projects. I don't mean to suggest that it is the federal government's business to preside at shotgun marriages between the private sector and secondary schools. Not at all. But I don't think there's anything wrong with inviting the two groups to a courtship ceremony. If they get together, fine.

In short, there are many things that American businessmen can do, and that a number of them are already doing. But it must not be too little and too late. I don't need any elaborate study to know who are going to be the entry-level workers, the graduates, and those who are going into postdoctoral work in the late eighties and nineties. All I need to do is to go into any junior high school in the United States. There they are. That's the population we have; that is *all* of them. And that is why I am not only extolling the virtues of getting involved, but I am also saying that getting involved is survival. The children of this nation are not simply part of our future; they are the whole future. That is why it has been such a wonderful opportunity for me to begin to work with and for education on a much broader scale than was ever possible before.

One other aspect of my report card for American education that I want to mention is the marvelous diversity and intricacy of our educational system. We need to understand and think carefully about what the American public elementary and secondary schools mean to this country because we can never simply abandon them. We can never leave the poor behind. Brilliance and talent do not come simply in one color of skin, in one gender, or in one group of people in one economic sector. Talented people appear at all economic levels and in all colors of skin, and though some of them may have fewer advantages, they are just as necessary a part of a bright future as our more traditional students.

I believe firmly in setting national goals and undertaking bold missions — like those of the early days of our commitment to science, to space, to exploration beyond the limits of our immediate grubby sense of instantaneous territorial concerns. We do not do anything that really counts for the future unless we are willing to take a soaring leap of the imagination — to set not only a hilltop as a goal but a margin in outer space, saying "We shall go there. We shall go together; we are going to make the investment. We are going on a great trip for all humankind."

I hope in the years to come we shall see a renaissance of the spirit, not simply of going across the street to help our neighbor — though that trip must always be made — but that we shall set our sights and our minds and our spirits for the whole nation to continue that great voyage of exploration of the human mind. □