

Turning people on to science

Those of us responsible for communicating science, mathematics and technology are clearly doing something wrong—very wrong. Speaker after speaker, questioner after questioner at the National Academy of Sciences Convocation on Pre-College Science and Mathematics Education eloquently made this clear (see news report, page 57). As teachers, scientists, mathematicians or engineers, we are not “turning on” youth or adults to either understanding or mastery of our fields of study to a degree that meets the needs of individual citizens or of society. We are all thus being cheated: Individuals are being denied the vocational and avocational options that could be developed through enhanced learning and love of science, and institutions are being deprived of the options provided by more scientifically and technically knowledgeable leaders and workers. That our nation, with its proud heritage of commitment to freedom of choice, must find new ways to reverse this trend was the resounding consensus of speakers at the convocation, representing among them a variety of perspectives from academe, business, industry and government. Presumably they all agree with the message of John Slaughter, director of NSF, that the availability of options is the highest privilege a nation can provide its citizens. However, our political and economic philosophies are different from those of many countries held up as examples at the convocation: We must find our own ways to our educational goals.

Our failure to communicate derives as much from failure of the message (that is, what science, technology, and mathematics really *are*) as from the medium (the classroom, the media, the community). Science must be presented as not only basic but beautiful, as those of us whose lives and professions have been touched by this beauty are so proud and privileged to know.

How to improve both what we say about science, mathematics and technology and how it is delivered is a mission in which academe, industry and government can and must join both with precollege teachers and with researchers. Scientific societies, such as the American Association of Physics Teachers, The American Physical Society and the American Vacuum Society, are already assessing and identifying roles for their memberships in this mission. The goal is to reach effectively many, many more of all our citizens, so many with potentials not yet recognized and tapped—including females and minorities brought up with additional attitudinal and environmental barriers.

That a national agenda and national leadership is needed to develop the comprehensive view required by the depth and breadth of these “problems and opportunities” (to quote the Commission’s charter) was recognized by the National Science Board in setting up its Commission on Pre-College Education in Science,

Mathematics and Technology. The commission has been directed to examine the existing evidence on the quality of secondary school education related to both general and pre-professional training in mathematics and the sciences. It is to develop an understanding of the roles and potential of groups, organizations and institutions in the process of delivering education in the sciences and mathematics. It is to identify failures in the entry, selection, education and exploitation of the full range of potential scientific and technological talent. The commission will seek out and describe exemplary mathematics and science programs, curricula and pedagogy that others may emulate. And lastly, the commission will develop, recommend, and promulgate a set of principles together with options and educational strategies that can be employed by all concerned, nationwide at the local level, to improve the quality of secondary-school mathematics and science education using both formal and informal approaches. Such an agenda is needed to promote American industrial productivity, employment opportunity and social programs.

To fulfill this mission, those responsible for selecting the commission members, felt it essential to recruit highly respected persons representing a wide variety of fields and constituencies. As scientists, mathematicians and engineers, we know we will identify many more variables than equations and thus anticipate no single or simple solutions. As educators we know the variability of the human equation: Our students will continue to surprise and delight us with their potential and the new visions that scientific literacy will bring. As citizens and leaders we know we must not let our nation suffer the “lost generation” of scientific illiterates that Carl Sagan warned us about. As parents and individuals valuing personal development we know that monumental efforts must be made, and that the generations to come will reap the rewards.

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