28 October 1983, Volume 222, Number 4622 **SCIENCE**

Engineering Education

On this editorial page last year, Edward E. David, Jr., proclaimed, "The time for action to deal with the precarious state of engineering education in the United States has come."* Much has happened since. Industry has provided funds for stipends and equipment to make graduate engineering study more attractive and to help attract and keep beginning faculty. A number of universities have begun to set "engineering faculty compensation at a level that realistically reflects the market for such talent in industry." Yet these beginning steps are overwhelmed by the increasingly inadequate output of Ph.D.'s in engineering, far too few of whom come from the upper 15 percent of graduates receiving B.S. degrees. Across the country a terribly overloaded faculty strives valiantly to educate a growing number of the brightest and best students ever to enter engineering schools. Almost every school of engineering is unable to provide what it views as an adequate quality of education because of obsolete instructional laboratories and facilities and an increasing shortage of qualified faculty.

Given no other choice, many schools have already granted tenure to the best of the inadequate people available and will continue on this downward path. Yet engineering graduates will be turned out in appreciable numbers, although many schools are restricting their enrollment. It is the quality of education, not the quantity, that progressively degrades. That is the insidious nature of the crisis in engineering education, devastating to the economic welfare and defense capability of the country on a time scale of less than a decade ahead.

Now our attention as a nation is turned to the deplorable state of primary and secondary education. That massive problem will take huge sums of money and far more than a generation of great change. It is all too likely that, unless there are loud and frequent reminders, the far smaller sums from all sources ($5 per person per year) needed to completely solve the crisis of quality in engineering education in less than 10 years will not be made available. Should that happen, our children's children may know enough arithmetic to balance a checkbook and be literate enough to read bank notices, but our economy will not be strong enough to permit them to have a checking account.

Perhaps once the crisis is understood and ameliorated we can devote long overdue attention to the education itself. The sophistication of analytical and computer techniques produces the comfortable feeling that we are prepared for whatever will come along. It is easy to delude oneself that all the new mathematics, physical science, life science, and social and behavioral science along with the associated engineering sciences that develop are far too esoteric ever to be useful. Each engineering curriculum tends to co-opt more and more of its own students' time. The frontiers of apparently less applicable knowledge recede over the horizon to each side as we repeatedly barricade those winding secondary roads that historically have led to the engineering of the future and devote full attention to the well-traveled superhighway of our own discipline. Also, times of economic recession or stagnation cause us to focus on design and current practice rather than R & D and the likely long-range future.

Without adequate faculty with ample time for contemplation, these backward steps are taken in the name of progress. We call for unity of the engineering profession and educate our students so that they can barely communicate with each other on a professional level. Time indeed is running out for our system of engineering education and our country.

—D. C. DRUCKER, *Dean, College of Engineering, University of Illinois at Urbana-Champaign, Urbana 61801*

*E. E. David, Jr., *Science* **216**, 465 (1982).