

LAST WORD

ENGINEERING A
LIBERAL EDUCATION

At the turn of the last century, President Woodrow Wilson wrote, "What is a technical education? It is one that condemns all but the extraordinary individual to a minor part in life, to a part not of command or direction but of specific performance." Nearly a century later, technology dominates the societal landscape, and we must ask ourselves whether we as engineers have risen to commensurate leadership positions in the "techno-society" in which we now live. The answer is implicit in a relatively recent Harris Poll, which indicated that the majority of Americans are not clear about what engineers do.

Engineering has traditionally been considered an extension of the sciences. Indeed, the shibboleth for selection to the profession is: "Do you like math and sci-

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ence?" The unfortunate result is that we have tended to train engineers in narrow, vocationally oriented disciplines preparing them to be productive on the job immediately upon graduation. Wilson relegated the "skillful servant of society along mechanical lines" to the nonruling class. "We want one class of persons to have a liberal education, and we want another class of persons, a very much larger class...to forgo the privilege of a liberal education."

Not surprisingly, many college-bound students, notably women, are unwilling to sign on for educational programs that promise such a narrow role in society. Ask a physician why she selected a career in medicine and you rarely hear: "I liked biology"; rather, the more common response is: "I wanted to help people." Contrast this with an engineer's most

common response: "I liked math and science"—and it is easy to see why many young people don't see a future in a profession perceived as isolating and lacking in social relevance. Indeed, in engineering disciplines where social relevance is manifest, such as environmental or biomedical, women are well-represented.

To be sure, it's not merely engineering that has suffered the effects of narrow training. The historical bifurcation of technical and liberal education has resulted in technological "advances" that have not always been in the long-term

best interest of society. Robert Pirsig, in the neo-classic "Zen and the Art of Motorcycle Maintenance," points to a possible cause. "What's wrong with technology is that it's not connected in any real way with matters of the spirit and of the heart. And so it does blind, ugly things quite by accident and gets hated for that."

Fortunately, history is not destiny. Pirsig also provides a ray of hope. "The way to resolve the conflict is to break down the barriers of dualistic thought that prevent a real understanding of what technology is—not an exploitation of nature, but a fusion of nature and the human spirit into a new kind of creation that transcends both."

With the ever receding horizons of technological limits, it is easy to see how engineering curricula can become increasingly dominated by technical courses. It is

time to dismiss the hegemonic notion that the best engineering education is one that exposes students to the most technical information. The social sciences and the humanities must assume parity with mathematics and the sciences in the preparation of well-educated engineers. Society can ill afford engineers with a casual exposure to social sciences and the humanities. Let us engage our students in the great debates that define our times; debates, such as the sustainable and equitable utilization of resources and global security, that, by their very nature include a fundamental understanding of technology and human nature.

New accreditation criteria have provided an opportunity for dramatic pedagogical reform. Engineers are no longer necessarily relegated to a narrowly focused vocational education but can aspire to "the greatest enterprise of the mind." Engineering faculty members cannot, however, simply consign young students to the other side of campus for humanities classes and consider our obligation for providing a broad and liberal education fulfilled. It is for us to complement the rigors of our technical classes with the humanistic framework within which engineering resides.

As the new century unfolds, the engineering profession is uniquely poised to redefine a liberal education. Thoughtfully considered, engineering education can develop in our students a fundamental and visceral view of the unity of knowledge and the ability to use this knowledge for socially responsible and reasoned judgement. The academy must lead the way in engineering a liberal education of our students and prepare them for the leadership roles required of a technologically advanced society.

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