ENGINEERING ETHICS AND POLITICAL IMAGINATION

Recent attempts by American colleges and universities to teach ethics for scientists and engineers deserve strong praise. They represent a shift away from the idea that questions about ethics and morality are best left to humanists or to elder statesmen of science, a recognition that such matters ought to be an important part of education in the technical professions. One can hope that through these efforts a new generation of men and women will obtain a firm grounding in the ethical aspects of their vocations early enough to make a difference.

Despite these admirable aims, however, the approach often used to teach ethics to scientists and engineers leaves much to be desired. In the way the topic is usually presented, personal responsibilities are situated in extremely limited contexts and ethical choices made to seem something like extraordinary, unwelcome intrusions within a person’s normal working life. Rather than lead students to evaluate the most basic, most practical features of their career choices—the kinds of work they select and the social conditions in which that work is done—courses on professional ethics tend to focus upon relatively rare, narrowly bounded crises portrayed against an otherwise happy background of business as usual.1

One way in which college courses avoid the difficult underlying questions that technology oriented professions involve is to focus upon case studies of particular ethical dilemmas. This can seem to be nothing more than a useful attempt to transcend mere abstractions and to provide contexts for issues by locating them in the “real world” of practice.2 Unfortunately, what such moves often do is to bracket the realities of daily work in favor of hypothetical situations that are comforting because they are so remote. Cartoons of concreteness become the abstractions at hand. Hence the tone of such pedagogical case studies is often something like the following.

“You are an engineer working for a defense contractor helping to assemble the latest version of the cruise missile. One day you discover that the paint used on the shell of the missile is emitting toxic fumes that may be dangerous to people working in the assembly plant. The project is behind

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Paul T. Durbin (ed.), Broad and Narrow Interpretations of Philosophy of Technology, 53–64. 
The classroom filled with laughter; seldom is a point so eloquently made.

But the story does not end there. During the ensuing months I got to know this fellow fairly well. We took long walks by the Charles River and talked about his life and the choices he faced. It turned out that he was, in a pattern, fairly typical of engineering undergraduates, the son of a machinist and had gone to college to fulfill his working class family’s dream of upward social mobility. He talked about his major, electrical engineering, and expressed his qualms about some of the uses being made of computers these days and of his desire to use his skills for something socially beneficial.

Since I always encourage students to think about the social and ethical dimensions of their work, I thought to myself: “Good. Here is someone I have really reached.”

About a year later during the summer break I ran into the fellow walking across campus and asked how he was doing.

“Very well,” he replied, “I’ve got a great job.”

“Where is it,” I inquired.

“The Draper Lab,” he said.

“Oh. What do they have you doing?” I asked.

“Computer programming,” he said and went on to explain that it was programming of an especially intricate, challenging kind.

“And what are the programs used for?” I probed.

“Guidance systems,” he replied.

My next question was obvious. “And what do these guidance systems guide?”

“Intercontinental ballistic missiles,” he allowed with an uncomfortable smile spreading across his face.

“Bruce, you’re building bombs, aren’t you? Tell me, on the basis of your own personal commitments, how you can justify that.”

He went on to list the kind of deals today’s small time Fausts tend to make with today’s big time Mephistopheles: the problems were challenging in a purely technical sense, “cutting edge” stuff. The recognition by senior colleagues was gratifying, especially for someone who had never had much recognition. And, of course, you just could not beat the money they were paying.

I told him of my disappointment at what he was doing and silently pondered my contempt for a system that would lure a fine young fellow like himself into the company of those who build the instruments of war and death.
opportunity to re-evaluate or even reconstitute that field. Only after the newcomer’s basic compliance has been secured is he or she assumed ready for the bracing ethical challenges that lie ahead.

2. A SENSE OF VOCATION

The failure of engineering ethics courses to explore the phenomenon of power reveals another significant lack: exploration of the question of vocation, one’s calling in a moral sense.4 It is reasonable to expect that as a person contemplates committing several decades to a profession, some basic issues ought to be addressed. What are the fundamental ends of a life invested in this line of work? What is the purpose of developing my knowledge and skill in this direction in the first place? Who ought to control the most basic definitions of what my vocation entails? Our educational institutions now shortchange students by avoiding such issues, neglecting focused study of the moral and political groundwork of professional life.

Courses on engineering ethics tend to focus upon issues of right and wrong in personal conduct — extremely important matters indeed. But beginning with Aristotle, philosophers have noticed that there is a logical juncture where ethics finds its limits and politics begins. That turning point comes when we move beyond questions of individual conduct to consider the nature of human collectivities and our membership in them. This calls upon us to ponder the nature of political society and what membership in it means for us, not merely as individual actors but as participants in a community.

In my own teaching of engineers and scientists I find some who are actually prepared to act heroically at the level of individual ethics, but who have no sense whatsoever what their work means in an organizational or political sense. It comes as a surprise, for example, for students to learn that engineering projects tend to reflect some economic or social interests and not others. They learn next to nothing about the history of their fields, about who works for whom and how that came to be. These are, once again, well kept secrets. By the time one gets to be a graduating senior, all he or she may want to know is: Where are those nice people with all the high paying jobs?

The lack of an ability among engineers and other technical professionals to engage in political reflection is by now much more than a small failure in education; it threatens to become a great tragedy. We live in an age of scientific technology. Many of the most significant ways in which old forms of power are reproduced and new ones created are reflected in the technologies we use. To a great extent the possibilities of social and political life
in the twentieth century are defined by technological opportunities and constraints. Whether we are to have a good society or a bad one is powerfully influenced by the technologies we develop and put to use. For that reason the role of engineers and technical professionals is crucial. They are intimately involved in maintaining key social patterns and in inventing new ones as well. In that work they become, in effect, unelected delegates and representatives of the rest of us, charged with the work of building basic structures of our social and political future. If it turns out that they lack vision, lack the ability to make choices that express not only knowledge but also personal strength born of wisdom, our society is headed for trouble.

From this vantage point what is needed is less the study of pre-packaged ethical dilemmas than the cultivation of two crucial skills: political savvy and the capacity for political imagination. At some point in their education engineering students need to examine critically the historical origins of their own chosen profession. They need to understand how their branch of engineering was first organized, by whom, and for what reason. They need to examine the kinds of social and economic interests their field represented at the beginning as well as the ones it expresses now. And they need to understand who controls the choice of projects and why.

Casual observers might suppose that learning to become savvy about the social realities of the world students are entering would be a standard part of a good engineering education. In fact, it is almost never explicitly addressed. What students receive instead is a kind of hidden curriculum, a set of unstated assumptions, expectations, and role models which provide a subtle but thorough enculturation. Its underlying text is: Do not ask questions; just find your place in the established hierarchy and obey orders.

There are many ways in which political savvy of this kind might be nurtured and even tested. In my own courses, for example, I have sometimes used the following quiz.

Read carefully Lewis Mumford's chapter, "The Nucleation of Power," in The Pentagon of Power and answer the following questions:
1. Do you consider Mumford's description valid or not?
2. Will you in all likelihood join "The Power Complex"?
3. Explain why.

Of course, achieving political savvy alone is not sufficient; it may leave a person aware but cynical, thus accomplishing more harm than good. For that reason there is a need to nurture more — political imagination, the ability to envision the contributions of one's work to society as a whole, to the quality of public life. Within the plans, methods, and prototypes an engineer produces are the blueprints of our social future. This is true whether these products have to do with water projects, highways, industrial machines, electronic components, or energy systems. As part of mastering the fundamentals in their fields, engineers and other technical professionals ought to be encouraged to ask: Can we imagine technologies that enhance democratic participation and social equality? Can we innovate in ways that help enlarge human freedom rather than curtail it? How can planning for technological change include a concern for the public good as distinct from narrowly defined economic interests?

An ability to investigate questions like these ought to be part of the intellectual tool chest that engineers carry with them when they leave the university. While there is no established curriculum that imparts such skill, many of the disciplines in the humanities and social sciences have important resources to offer, resources that at present remain largely untapped. In political philosophy, for example, it is possible to build bridges to the study of engineering by showing ways in which political philosophers are to some extent designers. From Plato to Jean-Jacques Rousseau to John Rawls, political theory has involved an attempt to translate the ideals of the good society into workable institutional structures. Those who met at the Philadelphia convention of 1787, for example, sought to invent a political machine, the U.S. Constitution, that would provide beneficial results generation after generation. To some extent, therefore, political theory and engineering share a common project — making things that will endure. It might even be argued that they share some of the same criteria of evaluation: a concern for the appropriate furnishings of the good life.

Whatever specific fields in the humanities may be chosen to illuminate such questions, however, it is crucially important to allow our students to become competent not only as scientific and technical problem-solvers (the only need currently recognized by the academy and business), but as dreamers and visionaries as well. Drawing upon materials in their own fields, they should be encouraged to imagine the best possible uses to which their intelligence and know-how might be put. Engineers and technical professionals are the unacknowledged legislators of our technological age. Choices that affirm the public good or trample it often rest in their hands. If they overlook this critical role and responsibility, they will also acquiesce in yielding power to agents whose ends are increasingly distant from humanity's best.
3. OURS IS NOT TO REASON WHY

Much of the vocation of engineering is legitimately, admirably involved with questions of “how?” – how to solve problems, how to achieve particular results within physical and economic constraints, how to get things done. Such concerns are and will always be central to an engineer’s daily activity. Providing students the wherewithal to grapple effectively with “how” questions is bound to remain the heart of engineering education. But in a world of rapidly advancing technology, issues about “how” are often less important than ones that concern “why.” Our society has increasingly powerful means at its disposal and a great many expediences that seem to justify applying these means all over the planet as rapidly as possible. But typically missing from our deliberations about new technical means are deeply grounded reasons to guide our choices.

Yes, it is possible to build the next intriguing generations of space-based offensive and so-called defensive weapons. In the face of pressing human needs in other domains, why invest our scarce resources in things designed only to destroy? Before going further, it is crucial that we examine the underlying rationale that governs policy. Perhaps that pause for reflection would suggest alternatives other than blindly continuing the arms race.

However, it now appears possible to renovate the genetic structure of life forms on the planet. But why? In what sense are such projects needed? What ends or purposes are to be served? Before going ahead, one needs to explore the reasons.

And yes, it is possible to build any number of nearly or totally automated systems of production. But why? Which ends will be furthered? Who stands to benefit and who to lose? Before we engineer systems of this kind, we need to be clear about the grounds that justify our projects.

As one examines such topics, the question of “why” can be reformulated in a number of useful, challenging ways. One can ask: For the sake of what deeply meaningful ends are our technologies well suited or ill suited? In response to what central human needs are our techniques and instruments developed and applied? On the basis of what fundamental orienting principles do our technology-based practices and institutions find their uses and their limits? In selecting a particular engineering project, what kind of world do we affirm and seek to create?

There are bound to be strong disagreements in our answers to any of these questions. Indeed, it is no easy matter to set about clarifying the basic notions that ought to guide the development and use of our technical means. People have widely different understandings about the meaning and proper application of terms like freedom, justice, security, human rights, well-being, public good, and other key concepts. But it is crucial that such ideas be continually discussed and debated throughout our deliberations about key technological choices. If we do not do this, ideas about “how” begin to comprise the whole of our thinking. Indeed, as Jacques Ellul has argued, it appears to be the destiny of modern thought to replace any living concern about human ends with sterile discussion about instrumentality and efficiency.8

A stunning example of this tendency was the Star Wars debate of the early 1980s. President Reagan announced the Strategic Defense Initiative in March, 1983, proclaiming its noble goal for the United States, that of “rendering nuclear weapons impotent and obsolete.” From that moment forward most of the debate, for and against, focused on the question: Will it work? Will the technologies function as planned? In the heated debates that followed, people seized upon the instrumental issues – issues about “how” – as if they were the truly essential ones.9 Looking back on this period of history, it is interesting that S.D.I. was offered at a time in which there was, for a while, intense public questioning around the world of the very ends of defense policy, questioning expressed in the Nuclear Freeze movement and in widespread discussion of Jonathan Schell’s book, The Fate of the Earth.10 Reagan’s move was a clever one. Once again it got people back to talking about gadgetry and instrumental concerns far away from thinking about fundamental purposes and the relationship between ends and technical means.11

This unwillingness to explore the basic reasoning behind our policies accounts for much of the absurdity that passes for informed discourse about technological choices nowadays. Thus, there is much attention to “cost/benefit” analysis, but without the slightest regard for the ultimate foundations of our judgments of benefit and cost. Similarly, one finds people nodding in confident agreement about “efficiency” without pausing to consider what is being maximized and for what reason; that is, what defines our numerators and denominators and on what grounds? Or one hears a great deal of praise for “progress” which seems to assume that one is progressing along a particular path, but never is the path or its destination specified. Similarly, there are anguished cries for increased national “competitiveness” with no attempt to justify the desirability of the things at stake in the competition.12

In all discussions of ambitious proposals for technological change, inevitably the most revealing and embarrassing question one can ask is
simply, "Why?" What one discovers in a great many cases is that the answers have somehow been ignored, forgotten or even suppressed. That is why any program of engineering education that does not equip students insistently to inquire into the basic purposes of their work is simply an affront to reason. Any technical analysis that asks "how?" without first considering "why?" is bound to be vacuous.

With some ingenuity, the "why" could well be included in difficult technical courses, not just humanities electives set aside in a separate, easily forgotten corner of the curriculum. For example, one useful strategy in doing cost/benefit analysis is to begin by listing costs and benefits and, before plowing on, simply reverse the labels over the two columns to see how things look. Analyses by transportation engineers during the 1950s counted "increased traffic flow" as a benefit, something that communities affected by highway planning would later count as a significant cost. To approach cost/benefit analysis by reversing labels always causes a great commotion and you seldom get asked back, but it can add some life to the otherwise rigid, routinized processes of technocratic thinking.

4. ENGINEER AS CITIZEN

In sum, the great need at present is for our professionals to take a mindful, critical stance with respect to their own work. This requires, first of all, that a person scrutinize the projects in his/her field and the consequences of those projects within the context of a continuing dialogue about our culture's most cherished ideals and principles. It implies, secondly, that scientific and technical professionals must locate and, when necessary, actively create public roles in which one's understanding of important conditions can become a focus of new thinking, debate, and action for the public as a whole. Ethical responsibility now involves more than leading a decent, honest, truthful life, as important as such lives certainly remain. And it involves something much more than making wise choices when such choices suddenly, unexpectedly present themselves. Our moral obligations must now include a willingness to engage others in the difficult work of defining what the crucial choices are that confront technological society and how intelligently to confront them.

The first requirement, therefore, might be called the responsibility of dialogue; the second, the responsibility of citizenship. Both of these were, of course, well understood by the ancient Greeks. Our task is that of bringing these practices to life for the era of high technology. It is obvious that in fact these are not responsibilities that are widely cultivated or practiced. At present, engineering students are encouraged to become careerists and self-interested in ways that exclude dialogue altogether. Their university degrees could well carry not only the title "Bachelor of Science," but also "Certified Uncommitted."

Nevertheless, considerable hope can be found in a single fact: it does not require many people to turn things around. Even one voice speaking at the right moment and in the right area can make all the difference. The contribution of Rachel Carson in the early 1960s was an instance of this kind. At first widely denounced by many of the community of scientists and chemical engineers, Carson's message foreshadowed an international environmental awakening and a gradual move away from the use of destructive chemicals in agriculture. A similar sense of ethical commitment was evident in the petition drive by many scientists and engineers of the mid-1980s, pledging not to work on any part of Reagan's Strategic Defense Initiative. Organizations such as Physicians for Social Responsibility, Computer Professionals for Social Responsibility, the Union of Concerned Scientists, and other groups have set out to raise public consciousness about important public policy issues in their fields. A number of computer scientists in the United States and Europe, for example, have begun devoting their attention to ways in which new information systems might protect freedom rather than undermine it.

Examples like these suggest what I understand to be the genuine promise of the exercise of responsibility among scientific and technical professionals: a gradual reorientation of patterns of research, development, and application of emerging and already existent technologies to accord with our civilization's higher principles. It is "progress" conceived in this manner, rather than melodramatic rehearsals for whistle blowing, that offers the real challenge for engineering ethics in our time.

Those who acknowledge the two kinds of responsibility I have mentioned, those of dialogue and citizenship, face an unsettling paradox. On the one hand it is clear that, properly speaking, a person can be responsible only for his or her own decisions, actions, and their consequences. At the same time, there is an important sense in which each person is now responsible for nothing less than the future of humanity itself. Confronted with that paradox and the burdens it carries, many people are inclined to flee into the security of their private lives and the satisfactions of narrowly defined competence, areas where they feel they have at least some safety and control. That impulse, more than any other cause, is what renders technical professionals morally
impotent, ready to be manipulated by whatever enticements the state and large corporations have at their disposal. Any effort to define and teach engineering ethics which does not produce a vital, practical, and continuing involvement in public life must be counted not just as a failure, but a betrayal as well.

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NOTES

1 See, for example, Stephen H. Unger, Controlling Technology: Ethics and the Responsible Engineer (New York: Holt, Rinehart and Winston, 1982).
2 For a defense of this method see C. Roland Christensen et al., Teaching and the Case Method (Boston: Harvard Business School Press, 1987).
10 Jonathan Schell, The Fate of the Earth (New York: Knopf, 1982).
15 I discuss such attempts in “Political Ergonomics: Technological Design and the Quality of Public Life,” Wissenschaftszentrum Discussion Papers, IIUG dp 87–7 (Berlin: Wissenschaftszentrum Berlin, 1987).