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Learning to Teach Engineering Ethics

A "trailblazer" is literally someone who uses fire to mark the route of a new trail, someone who may or may not also be a trailbreaker. But the "blazes" I have seen were *cut* into trees or boulders, not burned, the work of foresters presumably abstaining from fire to avoid setting the trees or brushwood ablaze. Successful words pick up meanings over time. The word "trailblazer" now has a metaphorical meaning too, a pioneer or innovator, for example, someone who is first into a new academic field. Given that metaphorical meaning, I must begin this chapter with three cautions.

First, though born in 1943—and therefore old enough to have "blazed the trail" that became engineering ethics education—, I in fact belong to the second generation. By the time I entered the field in 1984, the way had been blazed. IIT's Center for the Study of Ethics in the Profession (CSEP) had been established eight years before. Bob Ladenson (along with several others) had already published *A Selected Annotated Bibliography of Professional Ethics and Social Responsibility in Engineering* (1980). Martin and Schinzinger had publish the first edition of *Ethics in Engineering* the year before. Kenneth Alpern, Albert Flores, Billy Koen, Caroline Whitbeck, and several others, including some present in this volume, were already teaching a course covering topics not much different from those covered in today's course in engineering ethics. And so on. It is therefore probably better to think of me as a roadbuilder than a trailblazer. A roadbuilder begins with a trail already blazed and turns its dust or mud into a graveled or paved way.

Second, if I did blaze any trails in ethics education, it was in legal ethics, not engineering ethics. I first taught legal ethics to third-year law students at Case Western Reserve University—in Spring 1975. The course was unusual at the time, a *philosophical* treatment of lawyers' professional responsibility. It was also unusual in relying on "cases" collected from lawyers I interviewed rather than relying on cases that had come before a court or bar committee. The course would probably still be unusual if I taught it

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today. Law schools seem to prefer to teach professional responsibility as just another law course. They teach "compliance" rather than ethics. Blazing a trail is no guarantee anyone will follow.

From 1977 to 1984, I taught a similar course to advanced *under*grads at Illinois State University—along with the usual philosophy courses. Pre-law students liked it. Then, in 1986, Frederick Elliston and I published a text for that course, including the "cases" I had collected.[1] The text was successful enough to have a second edition.[2] Much of what I have done in engineering ethics is to translate what I learned about professional ethics from lawyers. That may explain why much of what I have had to say about engineering ethics seemed novel. As far as I know, no one else reached engineering ethics through legal ethics. Medical ethics, philosophy of technology, and science and technology studies (STS) seem to have been more common routes.

Third, I have memorialized that bit of trailblazing and much of the road building before.[3] I shall try to avoid repeating myself here, but some repeating is necessary. As Nathan Hale almost said, "I regret that I have but one life to give my readers."

First Contact

A couple of years after I arrived at Illinois State, one of my colleagues, Louis Andrade, came to me with a problem. He was teaching Business Ethics. He had just taught Joseph Margolis's piece on conflict of interest—in which Margolis had analyzed conflict of interest as an avoidable exploiting of conflicting roles.[4] The day had not gone well; indeed, it had been one of the worst in Andrade's two decades of teaching. He was sure the cause had been the Margolis piece, though he had initially found it convincing. Andrade (correctly) guessed that I covered conflict of interest in Legal Ethics. He therefore wondered whether I might have a look at the Margolis piece. Perhaps I could help him figure out what went wrong.

Andrade's appeal to a junior member of the department deserves a bit more explanation. Illinois State's philosophy department had twelve members, many of whom taught courses we would now describe as "applied philosophy". But only Andrade taught Business Ethics and only I taught the other course at all likely to discuss conflict of interest. Andrade had no one in the department better to go to for help. He also had little

choice outside the department. The Business School did not discuss conflict of interest. Conflict of interest was not then the hot topic it has since become, not only in business but also in politics, medicine, research, and even engineering. Margolis had accurately described the *philosophical* literature at the time:

> The notion of a conflict of interest is singularly ignored in most attempts to examine the nature of moral and legal constraints. In attempting to supply an analysis, therefore, we will be breaking relatively fresh ground.

Though Margolis was the trailblazer in philosophy for analysis of conflict of interest, he had, I noticed, overlooked the legal literature. Lawyers had long written about conflict of interest (and related concepts such as "adverse interest")—so much so that the *Code of Professional Responsibility* (1970) of the American Bar Association (ABA) included what I thought was the obvious analysis, a threat to the "independent judgment" of a lawyer (a problem arising within a role rather than between roles). Nonetheless, I also found the Margolis piece unobjectionable when I read it. Both the term "role" and "exploitation" seemed elastic enough to stretch to any purpose. So I amended the anthology I was then assembling for Legal Ethics, adding the Margolis piece, and tried it out the following semester. I had much the same experience that Andrade had and told him so. The Margolis piece made it difficult to discuss the cases of conflict of interest that I had had no trouble discussing the previous year. My students could not apply the Margolis analysis. Indeed, neither could I.

Andrade then asked me whether I might write up something he could use in Business Ethics in place of the Margolis piece. I wrote a three-page handout. It consisted of a definition (substituting for "lawyer" being "in a relationship with another requiring him to exercise judgment in that other's service"), an explanation of a few key terms (interest, judgment, and so on), and a few simple examples from ordinary life or business. When Andrade used the handout, his class went well.

The handout might have ended its career there, distributed every semester Andrade taught Business Ethics until he found something better or retired—except for a call for papers that Andrade passed on to me. Robert Baum was starting a new journal,

Business and Professional Ethics. It sounded like a venue in which to publish the handout, indeed, the only likely venue I knew of. I soon turned the handout into a short paper and submitted it. A few months later, Baum wrote back, explaining why he would not print the paper as it stood but suggesting a major revision. The paper devoted too much space to criticizing the Margolis analysis and not enough to explaining my alternative. Baum suggested cutting back the criticism of Margolis to a few sentences and considerably expanding my analysis. I did as Baum suggested, supposing he knew his audience better than I did, and sent in the result. Baum published it in the fourth issue of the journal's first volume.[5]

The publication came at a good time. My wife had enrolled at the law school of the University of Chicago (UC) in the autumn of 1982. Illinois State denied me tenure the next spring. So, I was ready to move. One of my wife's friends from her days as a graduate student in the UC's program in Russian history was then teaching in IIT's Humanities Department. She soon introduced me to the philosophers there, including Bob Ladenson, Fay Sawyier, and Vivian Weil. She thought we had much in common. Among the things we had in common was an interest in conflict of interest. Indeed, early in 1984, Bob asked me to discuss my paper at one of IIT's regular "philosophy colloquiums". I did.

Fay provided wine and nibbles. The atmosphere was relaxed. After my brief summary of what was in the paper, the audience asked (in various ways) how my analysis might apply to engineers. I responded by admitting ignorance and asking questions about what engineers did, who paid them, who relied on them, and so on. The group provided enough information for me to make a start at answering. When the substantive discussion ended, they explained why I had been invited.

Vivian had a grant from the Exxon Foundation for a series of "modules" (each about fifty printed pages) on various subjects in engineering ethics: loyalty, risk, technology assessment, and so on. The modules were for use in a free-standing course in engineering ethics or in an ethics segment of an ordinary engineering course. The module on conflict of interest was to be written by a team consisting of a philosopher and an engineer. The philosopher had recently died. Would I consider taking over for him? Since

I still thought I knew far too little about engineers in general and their conflicts of interest in particular, I asked what I should read. Vivian sent me home with a thick file.

At the top of the file was an incomplete typescript, maybe 30 pages double-spaced, definitely a first draft, the work of a philosopher who knew lots about moral theory but little about conflict of interest or engineering. I would have to start over. Under the typescript were photocopies of newspaper articles and Congressional hearings, most concerned with a recent scandal involving the American Society of Mechanical Engineers (ASME). The scandal made a good story and seemed to explain why ASME had recently amended its code of ethics to forbid conflicts of interest. But what was most important for me then was that the file included "Opinions" on conflict of interest published by "the Board of Ethical Review [BER] of the National Society of Professional Engineers". The BER Opinions resembled documents I knew from my work in legal ethics—in at least two ways. First, they dealt with cases in much the way ABA Opinions did. They relied on a formal code of ethics, earlier decisions, and an ideal of professional practice. Second, the engineers seemed to have problems of professional ethics similar to those lawyers had. Physics, chemistry, and mathematics seemed to have little or no part. In place of the equations that I had thought to be central to engineering ethics (as well as to engineering) were contracts, employers, business meetings, regulations, and so on. The deeper into the box I got, the more I felt at home. I agreed to do the module before reaching the bottom.

I did the first draft of *Conflict of Interest in Engineering* during the summer of 1984—after I moved to Chicago to be with my wife and new-born son. I showed the draft to Vivian early in the fall. During the academic year 1984-1985, I had a grant from the National Endowment for the Humanities (NEH) to work on a project concerned with punishment, but I took off a little time here and there to revise the module in response to Vivian's criticism. Vivian seemed to have a sense that I did not of what the average engineering student would understand. Her suggestions did not "dumb down" the module, merely substituted plain English for philosophical shorthand or just sloppy writing.

Once Vivian was happy with the draft, she passed it to my living co-author, the engineer in Omaha, whom I now learned was both a BER member and a senior partner in

a large engineering firm. She had conceived the module, the result of reading those newspaper articles and thinking that the conflicts of interest reported there reflected badly on her profession. Having collected the relevant materials, she thought it was up to someone like me to draft the module. She read it, made a few small changes, most concerned with technical matters, and approved. Vivian took over from there. The module was published in 1986, my first contribution to engineering ethics.[6]

 No sooner was that module safely off to the printer than Vivian offered me another. Heinz Lueghenbiehl had undertaken to do a module on codes of ethics but had developed writer's block. Vivian asked me to look over what he had done and see whether I could finish it. This was, I think, in the spring of 1986. I was then teaching philosophy at the University of Illinois at Chicago (UIC). I had a one-year appointment. When it ended, I planned to enroll in the UC law school. Then, thanks primarily to Bob Ladenson, IIT offered me the position of senior research associate (replacing Frederick Elliston who had just departed for the University of Hawaii). Vivian was CSEP's other senior research associate. Mark Frankel was still its director.

The Challenger disaster had been in the news since January—and Vivian, who read *The New York Times* from front to back every day, clipping as she went, was regularly passing me photocopies of news stories about the Challenger. The Challenger disaster seemed a good place to start a module on codes of engineering ethics for at least four reasons. First, the disaster seemed to be becoming the best documented engineering ethics case ever. Documentation generally makes writing easier. Second, engineers—and even engineering students—seemed to find the disaster deeply troubling, especially the relations between the engineers and their managers. There was much to discuss in class. Third, codes of engineering ethics seemed to have something helpful to say to the engineers involved. Fourth, the case had drama.

I gave Vivian a draft of the module at the summer's end (1986). I had thrown out most of Heinz's work except his discussion of five "Rules of Thumb" for approaching ethics problems. The Rules seemed like a useful guide for an instructor wondering how to lead an ethics discussion as well as a useful guide for students wondering how to approach an ethics problem. I later used the Rules myself, slowly amending some and adding others until they became my Seven-Step Method.[7]

Vivian did her usual thorough editing and I revised all through the fall. Then we passed the module to Heinz, expecting hurt feelings and considerable criticism of the new approach. Instead, he quickly approved. He seemed relieved. But, by then, the publisher had lost interest. Sales of the preceding modules had not been good.[8] The Exxon grant did not have enough left in it for a subvention. So, it seemed my second module was doomed to die in a filing cabinet. Then, late in 1987, I had the idea of converting the first half into a journal article. Because the Challenger was still in the news, I thought I might have a chance to publish the article in *Philosophy and Public Affairs*, then as now the leading journal of applied ethics.[9] To my surprise, the paper was accepted a few months later, published in 1991, and quickly became a common reading not only in engineering ethics but also in professional ethics generally. CSEP republished it online for its twentieth anniversary (1996).[10] Meanwhile, CSEP "published" the full module in 1992, making it available in typescript on request. It was a decade or so later before CSEP published the full module—online.[11]

Teaching engineering ethics

That is how I began my career in engineering ethics but not how I began teaching the subject. The teaching began in the fall of 1986 when Vivian asked me to take a three-hour session of her Engineering Ethics that fell during the Jewish High Holidays. Vivian thought I should have no trouble with the class, though I had never taught engineering ethics. I was worried about teaching the class—well, almost terrified. I thought that engineering students would be like my law students back at Case Western Reserve, tough on those who lacked the proper technical training, until they proved themselves knowledgeable. Vivian, on the other hand, assured me that I would be fine. The subject of the day was the Challenger. The readings consisted of a few news clips and a paper by a philosopher.

Vivian was right, of course. I had no trouble with the class. In fact, the overall impression I took away from that class, one that returns every time I teach engineering students, is that engineering students are much nicer than law students. Nonetheless, I left the class troubled. The philosopher, Richard DeGeorge, important in business ethics, argued that engineers should do what their managers told them to do and, in any case,

their managers told them so little about the context of what they were doing that an engineer was seldom in a position to see an ethical issue.[12] I had recently found a similar argument in Edwin Layton's *Revolt of the Engineers*. I therefore wondered whether teaching engineering ethics was good for engineering students. If most employers organized engineers as DeGeorge and Layton suggested, engineers could only act ethically when their superiors allowed them to—which would only be when it served the corporate interest. When a manager told an engineer to ignore what was professionally proper—as actually happened the night before the Challenger exploded (the infamous "take off your engineering hat and put on your management hat")—, the engineer, it seemed, had a stark choice: either obey or be fired.

When I recounted these thoughts to Vivian, she said that that was not what the few engineers who visited her after graduating reported. After further discussion, we did a simple survey. We sent out a short questionnaire to all the students who had taken Engineering Ethics since Vivian had started the course ten years before, close to a hundred (thanks to addresses the alumni office provided). Almost 90% responded. Most said they had found the course helpful. Some even recounted examples of its utility, including a few examples of when an argument learned in the course changed a manager's mind. There was nothing of the adversarial relationship between engineers and managers that seemed to be central to the Challenger disaster—or to the existing literature.

We should have published the results of that survey. But, at the time, we did not appreciate how little research on the effectiveness of teaching engineering ethics had been done or how important even a simple assessment like ours might be for defending the course against critics. Instead, Vivian filed the study someplace and lost it. Meanwhile, we continued talking. Eventually we came up with the idea of interviewing engineers and managers about relations between them (eventually thirty managers and thirty engineers). In 1988, we had discovered a philanthropy to fund the research, the Hitachi Foundation. By 1990, we had completed the study and written a long report. The relationship between engineers and managers turned out to be more complicated than the literature led us to suppose. On safety, engineers seemed to have the final word in all the companies in which we did interviews. On other questions, engineers had more or less

say, depending on the kind of question and kind of company. That satisfied Vivian and me. We could now teach Engineering Ethics with a clear conscience. We would not be hurting our students.

We did not, however, initially think about publishing the report in a journal. There was no journal that would publish that long an article on that subject. So, we simply made it available on request (which, in those days, still meant through ordinary mail). We did, however, publish parts of it when invited.[13] Then, in 1996, Caroline Whitbeck alerted the editors of a new journal, *Science and Engineering Ethics*, to the report and suggested publishing it. When asked, we agreed, of course.[14] The report was published under my name because I did more interviews than anyone else, I actually wrote the report, and Vivian was trying to polish my record in the hope that I might one day get tenured. Tenuring me at IIT would not be easy; senior research associates were not eligible for tenure. Yet, in 1997, I was granted tenure—as a full professor—thanks to Vivian and to a provost who liked what I did.

Though the publications and tenure were important, more important for me was the assurance that the empirical research gave me in the classroom. The Hitachi interviews had been done in person on site (usually with another interviewer, a social scientist teaching in IIT's business school). The interviews tended to last about two hours, during much of which the interviewee described what he (or, in a few cases, she) did. Some of the engineers gave us a tour of their workplace after the interview, not only the offices of their colleagues but the factory floor as well. Sometimes this tour amounted to letting us tag along for several hours while they worked. In this way, I learned much about what engineers actually do, enough that I can speak to my students with authority about what engineers typically do and about the organizations in which they work. The first time I taught the course for a whole semester was in 1990 when Vivian replaced Rachelle Hollander for a year as Director of the Ethics and Values Studies Program (the NSF office concerned with funding projects associated with engineering ethics—as well as with science and technology studies).

Also, thanks to one of the historians on the Hitachi project's advisory panel (Tom Misa), I had learned to check for sources when a writer made an empirical claim about engineers. If the source was not itself an empirical study, I was to check its sources, and

so on, following the sources until I found the original empirical study or, as happened more often, something a well-known engineer had said, or a conclusion drawn from a sociologist's theory (usually Marx's, Weber's, or Durkheim's). When I did that, I discovered that the Hitachi project was the only significant empirical study of how engineers and managers worked together. Much of what scholars working in engineering ethics thought they knew had no empirical basis.

Engineering Ethics across the Curriculum

Vivian did not "deed" me Engineering Ethics until 2010 (when she began teaching a course in research ethics instead). Until then, I only took over the course during Jewish holidays or when she had to go out of town. Instead, I regularly taught Philosophy of Law, Ethics, Political Philosophy, and Social Philosophy and, starting in 2000, Architecture Ethics (which Fay Sawyier had pioneered two decades before). So, my chief contribution to engineering ethics education could not have been in the ordinary classroom. It arose instead through four major grants from NSF to carry out a program we called "ethics across the curriculum". It began this way.

One day in 1988, two young associate professors of mechanical engineering came to CSEP asking for help with what they called "ethics across the curriculum". That term was new to us (that is, to Bob, Vivian, CSEP's librarian, and me). We therefore asked what they meant by it. What they meant was including engineering ethics in technical engineering courses, for example, Thermodynamics (which both of them taught). The two thought we would have materials we could take from a shelf and give them. At first we thought so too–those Exxon modules. But it soon became clear we did not. Neither of the engineers was willing to set aside even a day of Thermodynamics for engineering ethics; they also did not want to assign even one module's worth of reading outside the text. We had, of course, heard about such time constraints before—from scientists as well as engineers—but the time constraints were usually a reason to do nothing. The two engineers before us clearly wanted to do something.

What they had in mind was using a few minutes here and there for ethics in a way that students would see as not much different from the rest of the course. Since we did not know enough about Thermodynamics to prepare such materials, the engineers would

have to be the ones to prepare them. The most we could do was to teach them what they needed to know to do that. We needed a curriculum for teaching faculty how to integrate ethics into their technical courses.

Though this definition of the problem seems simple enough today, it actually took us several months, with one meeting a week, to understand that much. We had to show the two engineers the materials we had developed for teaching ethics. They had to explain why those materials would not work (along the way solving the mystery of why the modules had not sold as well as we had hoped). We had to explain what philosophers know (and, more importantly, what they do not know). The engineers were surprised at how much less philosophers know about teaching engineering ethics than they had thought. They had to show us what they did in class, what a problem assignment looked like, how they normally graded it and, most important, the connection between engineering practice and what they taught. We had, in short, to create a domain between engineering and philosophy in which we could meet more or less as equals. We had to invent engineering ethics education.

Once we had a statement of the problem we all understood, we realized that the problem the two had brought in was part of a larger problem: how to introduce professional (and business) ethics into technical courses generally. We therefore set up a working group consisting of the two engineers, some other faculty we knew to have an interest in teaching professional ethics (mostly non-engineers, including some natural scientists, computer scientists, and a business professor), and the three philosophers then most active at CSEP (Bob, Vivian, and me). We tried to determine what our two engineers and the scientists would need to know to develop their own materials for their own technical classes. We began with an introduction to moral theory. "Interesting", the engineers and scientists said, "but we're not competent to teach that and we don't have the time anyway". The engineers then countered by asking about writing cases. "Nothing to it", we said. "Must be", they said, "we don't know how". So, we held several meetings about case writing. The philosophers thought it all quite elementary. The engineers and scientists nonetheless found the meetings very informative. Eventually, the engineers and scientists began writing their own "cases". The first few were disasters, but the engineers and scientists soon caught on. For example, they would take a problem they already

assigned, add enough context to force an ethically significant choice, and then ask their student to choose and explain the choice. We eventually called these small-scale interventions "micro-insertions". The engineers and scientists started using micro-insertions and were happy with the results. We began to see that much of what philosophers could contribute to engineering (and scientific) ethics education was not "philosophical" but pedagogical.

At about this time, we (the entire group) began to think that we had an idea that NSF might be interested in. After some phone calls to Rachelle Hollander, we converted the developing syllabus into the core of the proposal that eventually, after one failure, became the first of four major grants concerned with integrating ethics into technical courses (1991-1995).[15]

Assessment

The first three years of the first grant were for IIT faculty; the fourth was for the rest of the world (though two IIT faculty slipped into that fourth year as unfunded auditors). The next two grants were also open to the world. All followed much the same curriculum and provided a stipend. One condition for the final payment was that the recipient use in class the materials developed in the workshop, perform an anonymous student survey to see what the students thought of the ethics, and report back, sending the raw student surveys with the report. We had designed a short survey for everyone to use. After three grants, we had close to four thousand surveys that students had filled out. I published a paper describing the results as well as examples of the "micro-insertions" participants of the workshops had reported. Several social scientists I knew dismissed the surveys as "mere self-reports", showing nothing about what the students had learned. They were right, of course. The self-reports did not show that students had learned the ethics they were supposed to have learned. The social scientists were nonetheless wrong to dismiss the survey results. The surveys established that students overwhelmingly welcomed the introduction of ethics into their technical courses, something many faculty in engineering and the sciences had doubted.[16]

By the time the third grant ended (2003), we had decided to try one more set of workshops. These would focus on "assessment", that is, showing that students had

learned the ethics they were supposedly being taught. We chose that focus for at least three reasons. First, we wanted to know whether micro-insertions actually taught the student what they were supposed to teach. Second, we wanted to compare micro-insertion against other methods of teaching ethics. Third, NSF was increasingly concerned with justifying its programs to Congress. And Congress was demanding assessment. NSF even convened a meeting of grantees working in ethics education to discuss ways of assessing grant outcomes. Considerable work had been done on assessing moral judgment (or moral development)—with the assumption that ethical judgment was much the same thing. But nothing much had been done about assessing improvement in ethical sensitivity or ethical knowledge. That would be the focus of our newest proposal. We also decided to focus on engineering *graduate* students, since NSF just then seemed especially interested in ethics for grad students and we had access to more engineering grad students than to science grad students.

The proposal had anticipated using "off the shelf" assessment tools (such the ethics component of the Fundamentals of Engineering exam). Once we received the grant and recruited engineering faculty from IIT, UIC, and Howard, we found that we could not use off-the-shelf assessment tools. None of the engineers we had recruited (or could recruit) for the workshop was willing to devote enough time in class to the testing we had planned. We also found that the assessment tools we anticipated taking off the shelf seldom, if ever, lined up with the ethics our engineers wanted to teach. We therefore had to develop a form of assessment–what we might call "micro-assessment"–corresponding to the micro-insertion of ethics. When we asked several educational psychologists how to do such micro-assessment, they replied that that was a problem that educational psychology had yet to solve or even consider. We were more or less on our own.

I then wrote an email to the engineering instructors who had gone through a workshop under the fourth grant. That email admitted that I did not know how to do the assessment within the constraints they had imposed. Only a few expressed interest in helping to figure out how to do the assessment: they were happy with the results they saw. I invited the few who did express an interest to a meeting that included two IIT philosophers beside me (Bob and Vivian) and an IIT psychologist who was also working on assessment. Out of that meeting came a novel plan for assessment. We would rely on

the *ratio* between a pre-test score and a post-test score. Both the pre-test and post-test would cover only the ethics actually taught in the class. The two tests would, in effect, appear to be (and actually be) ordinary tests appropriate to the course in question.

Once we had a plan, we needed at least one engineer to do the assessment according to the plan. Only one volunteered. Since the engineer taught the targeted course only once each year, it took four years to work out the details, do the assessments, and evaluate the results. The engineer wrote the assessment questions and did the statistics. I wrote the first draft of the paper describing what we did, often stopping mid-sentence to email for information on this or that point. When I had a first draft, I sent it to him for comment, revised, and sent it back to him. We both found it a hard paper to write, since we were both working in an unfamiliar domain. We showed the nearly final draft to an expert on educational testing. He made further suggestions, as did the reviewers of the journal to which we submitted the paper (apparently, experts in assessment). We accepted some suggestions and rejected others.[17]

Final remarks

As I recount my part in the last forty years of engineering ethics education, I find myself emphasizing the part philosophers have played. I seem to be doing this for at least three reasons. First, as a philosopher, I am inclined to pick out the philosophers among the engineers, social scientists, psychologists, religious ethicists, lawyers, and others who also had a part in developing engineering ethics education as a field—a natural bias to be allowed for but excused. Second, I emphasize the part philosophers played because I think their part was important, starting with Rachelle Hollander's part in directing NSF funds to engineering ethics education. Third, much of the literature of engineering ethics education, including much just now appearing in print, has been the work of philosophers. This would not be the first time that philosophers helped to start a new academic field. But, ultimately, how important philosophers were to the foundation of engineering ethics education is a question for historians, not philosophers. I am just adding my testimony to the record.

Another question for historians is what part the philosopher's specialization played in what the philosopher did in engineering ethics. My impression is that, except

for the engineers, most of the true trailblazers of engineering ethics education came from STS or the philosophy of technology. Many of these were at RPI in the 1970s. They recruited some philosophers with other specializations. Many of these recruits (like John Ladd and Michael Pritchard) specialized in moral theory (what philosophers call "ethics"). But the rest had other specializations. For example, Vivian Weil's was action theory; Bob Ladenson's, philosophy of law. I too belong to the motley residue. I came from political philosophy. My dissertation defended social contract as an actual contract—and I have held that position ever since, though refining it over the years.[18]

So, when I started thinking about professions, I unsurprisingly thought of them as voluntary associations—that is, as a number of individuals held together by an express or tacit contract. I thought that so obvious that I did not think about writing a paper arguing for that way of thinking about them until I was asked to—and that was not until the fall of 1985.[19] How I came to be asked is still something of a mystery to me. Here is what I can piece together.

Because I held an NEH grant for the academic year 1984-85 and was living in Hyde Park, I asked to be a visiting scholar in the UC's Philosophy Department. That status not only gave me access to its libraries but also, apparently, alerted Russell Hardin to my presence. Hardin chaired a continuing Workshop on Ethics and Public Policy attended by philosophers, lawyers, political scientists, and religious studies faculty from all over "Chicagoland". The workshop met every month or two. Membership was by invitation. Each meeting began with the reading of a paper by a member of the workshop or a visitor from out of town. There would be a critical discussion of the paper after the reading. During one of those discussions, I must have said something about "authority". I no longer remember what. But a few months later, I got a letter from one of the editors of NOMOS, asking me to contribute to the next volume, which was to be on "authority". This was my second contact with NOMOS. The first occurred two years earlier when I was asked to allow the reprinting of a paper on punishment that I had published in *Ethics* the year before that. Hardin was then Editor-in-Chief of that respected journal. NOMOS has never asked to me to write anything before or since. Hence, my guess that Hardin was the link.

NOMOS specifically asked for something about the authority of professional codes. That fit with my new interest in the professional ethics of engineers. But the profession I focused on was lawyers. The paper has a simple form: 1) an analysis of "authority", identifying three kinds; 2) a definition of "profession" (one I have not changed much since); 3) an analysis of the authority of a professional code, emphasizing its formal (conventional) authority rather than one of the other two kinds; and 4) an explanation of why that authority is primarily moral even though formal (since its authority rests on something like a promise).

I presented an early draft of the first half of this paper *in absentia* at IIT's philosophy colloquium on December 2, 1985. I was absent from my own presentation because the teenager who was to babysit my son failed to show up. Those present, having read the paper, asked questions and then imagined what I would have replied. Bob later called me to report the lively discussion. I found it useful. I presented the penultimate draft of the paper to Hardin's workshop a day before the Challenger exploded.

So, when I came to write the module on codes of ethics in engineering, I had a theory already worked out and ready to apply, but not one then popular in the engineering ethics literature. Some of the others treated society as a body with power over individuals, one that could contract with individual engineers, a professional association, or the profession as a whole, or could simply issue commands or be owed a duty because of the benefits it bestowed. Such society-based theories seemed to come from scholars with roots in STS. The other theories then current seemed to come from scholars with roots in moral theory or medical ethics. They appealed to some sort of "hypothetical consent" (inspired by John Rawls) or to duties of justice, beneficence, non-maleficence, and respect for autonomy (inspired by W. D. Ross). All these alternatives to contract-among-members-of-the-profession seemed to me to be mistaken for the reasons offered in the paper.

Notes

[1] *Ethics and the Legal Profession*, eds. Michael Davis and Frederick Elliston (Prometheus Books: Buffalo, NY, 1986).

[2] *Ethics and the Legal Profession*, *2nd*, eds. Elliot Cohen, Michael Davis, and Frederick Elliston (Prometheus Books: Buffalo, NY, 2009).

[3] Michael Davis, "The Ethics Boom: What and Why", *Centennial Review* 34 (Spring 1990): 163-186; Michael Davis, "Collaborating across disciplines", in *The SAGE Handbook of Research Management*, ed. Robert Dingwall and Mary McDonnell (SAGE, 2015), pp. 213-224; Rachelle D. Hollander, Michael Davis, Deni Elliott, and Michael S. Pritchard, "Remembering Vivian Weil", *Science and Engineering Ethics* (June, 2017): 637-651.

[4] Joseph Margolis, "Conflict of Interest and Conflicting Interests", in *Ethical Theory and Business*, ed. by Tom L. Beauchamp and Norman B. Bowie (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1979). This is the text Andrade was using and this seems to be the only place of publication of the Margolis piece.

[5] Michael Davis, "Conflict of Interest", *Business & Professional Ethics Journal* 1 (Summer 1982): 17-28.

[6] Paula Wells, Hardy Jones, and Michael Davis, *Conflict of Interest in Engineering* (Kendall/Hunt: Dubuque, 1986). The order of authors was officially justified by history and unofficially justified by politics (Wells was too important to engineers to put last). It neither followed philosophy's custom (alphabetical order) or engineering's.

[7] Michael Davis, "Developing and Using Cases to Teach Practical Ethics", *Teaching Philosophy* 20 (December 1997): 353-385.

[8] This seems odd. Several of those modules became classics, cited outside of engineering ethics as well as within—but, it seems, by philosophers rather than engineers. See Marcia Baron, *The Moral Status of Loyalty* (Dubuque, IA: Kendell/Hunt Publishing, 1984); Martin Curd and Larry May, *Professional Responsibility for Harmful Actions* (Dubuque, IA: Kendell/Hunt Publishing, 1984); and Mark Sagoff, *Risk-Benefit Analysis in Decisions Concerning Public Safety and Health* (Dubuque, IA: Kendell/Hunt Publishing, 1985). All the modules are now available for download at http://ethics.iit.edu/projects/modules-applied-ethics.

[9] Michael Davis, "Thinking Like an Engineer: The Place of a Code of Ethics in the Practice of a Profession", *Philosophy and Public Affairs* 20 (Spring 1991): 150-167.

[10] http://ethics.iit.edu/projects/thinking-like-engineer (accessed June 8, 2018).

[11] Heinz C. Luegenbiehl and Michael Davis, *Codes of Ethics in Engineering* (Center for the Study of Ethics in the Professions: Chicago, Illinois, 1992), http://ethics.iit.edu/projects/modules-applied-ethics (accessed June 4, 2018).

[12] Richard T. DeGeorge, "Ethical Responsibilities of Engineers in Large Organizations: The Pinto Case", *Business and Professional Ethics Journal* 1 (1981): 1-14.

[13] Michael Davis, "Technical Decisions: Time to Rethink the Engineer's Responsibilities?" *Business & Professional Ethics Journal* 11 (Fall-Winter 1992): 41-56; Michael Davis, "Ordinary Technical Decision-Making: An Empirical Investigation", in *Responsible Communication: Ethical Issues in Business, Industry, and the Professions*, ed. James A. Jaska and Michael S. Pritchard (Hampton Press, 1996), pp. 75-106; and Thomas Calero, Michael Davis, and Vivian Weil, "Responsible Communication Between Engineers and

Managers", in *Responsible Communications: Ethical Issues in Business, Industry, and the Professions*, ed. James A. Jaska and Michael S. Pritchard (Hampton Press, 1996), pp. 307-321.

[14] Michael Davis, "Better Communications Between Engineers and Managers: Some Ways to Prevent Ethically Hard Choices", *Science and Engineering Ethics* 3 (April 1997): 171-213.

[15] For details, see Michael Davis, "Ethics Across the Curriculum: Teaching Professional Responsibility in Technical Courses", *Teaching Philosophy* 16 (September 1993): 205-235.

[16] Michael Davis, "Integrating Ethics into Technical Courses: Micro-Insertion", *Science and Engineering Ethics* 12 (October 2006): 717-730.

[17] Michael Davis and Alan Feinerman, "Assessment of Teaching Ethics to Graduate Students in Engineering," *Science and Engineering Ethics*, 18 (July 2012): 351-367.

[18] For my most recent statement, see Michael Davis, "Locke, Simmons, and Consent: A Lawyerly Approach", *Social Theory and Practice* 43 (October 2017): 667–690.

[19] The Moral Authority of a Professional Code", *Authority Revisited: NOMOS XXIX* (New York University Press: New York, 1987), pp. 302-337.