A Global Perspective on Engineering Ethics

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During the past forty years in which I have taught, written, and lectured about engineering ethics, the discipline has undergone tremendous changes. In fact, at the beginning of that time it would have been a mistake to refer to it as a discipline at all. It was, rather, a collection of writings mostly within the framework of the history and philosophy of technology, and a few impassioned pieces by engineers whose full-time work was on the technical side, some mention of engineering ethics in technical classes, and occasional papers presented at engineering meetings. There was no consistency or scholarly development among these various activities. Each new contribution seemed to be a fresh start. Now there is a core of academic writings that build on each other, journals devoted at least in part to the subject, conferences focused on the latest work in engineering ethics, involving both engineering practitioners and philosophers, and an emphasis on stand-alone courses devoted to issues facing future engineers. Yet there is still much progress to be made: The core of full-time scholars devoted to investigating issues in the field is still very small relative to the impact of engineering on our lives, the work of teaching is often left to junior members, and the importance of the work is by no means universally recognized. However, as the following discussion will show, throughout my decades-long activities, there are many reasons to be hopeful about the future prospects of the discipline.

My contribution to engineering ethics has been a long evolutionary journey, one which began in a relatively unpopular field of philosophy and ended in a perspective suitable for a new world order. It was aided by several fortuitous circumstances and elements of personal history that combined to form what now seems to be an almost inevitable conclusion to my philosophical career. To fully understand my current perspective on engineering ethics, it is necessary to review both what led me to the discipline in the first place and what contributed to my long-term association with the field.

What first led me to the study of philosophy professionally was a sense of fascination with the work of an individual philosopher. During high school I was attracted to the fictional writings of Jean-Paul Sartre, with their emphasis on individual responsibility and theme of no excuses, perhaps because of my own background. I was born an illegitimate child in early postwar Germany (when that was still unacceptable), was part Asian in a white society, and an immigrant to the United States with no English skills at the age of eleven. Having to take charge of my own destiny was thus a major theme of my place in the world. I believed, like many lower middle-class Americans, that the best path to a brighter future was through the study of engineering. At university I enrolled as an engineering major. The grades from my first quarter quickly revealed that I had made a bad choice: an A in “Humanities for Engineers” and Ds and Fs in my core

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courses. I was smart enough to recognize that I lacked the kind of discipline necessary for the study of engineering. A change of major to philosophy quickly followed and set the path for the rest of my career.

When I received my Ph.D. in 1976, the job market for philosophers was quite poor, and even more so for students who had studied Continental philosophy like myself. I was fortunate to be hired by a small engineering college that had no prior philosopher on the faculty. It was looking for a generalist, but one who could teach a course in the philosophy of science, and I was given complete freedom in selecting the courses I would actually teach. I soon discovered that discussions of ethical questions held the attention of students in the Philosophy of Science course, not the core issues of the philosophy of science. This was to be expected, as most of the students had a practical orientation toward the job market, not one focused on graduate study. Since most of the enrollees were engineering majors looking at industry as their career path following graduation, I soon introduced ethical concerns from engineering, and that was rapidly followed by a stand-alone course, "Business and Engineering Ethics." While there was an immediate positive response from students – as evidenced by high enrollment – putting the course together was quite difficult. There were texts available for the business ethics portions of the course, but nothing of a similar nature for engineering. The writings, as pointed out previously, were scattered and often not of a serious academic nature. For someone who had no previous experience teaching in the field, that made developing a rigorous course difficult and time consuming. One fortuitous circumstance soon changed that situation.

In the late 70s the National Science Foundation sponsored a summer workshop lasting several weeks, for teams consisting of one engineer and one philosopher, to develop joint courses and writings about engineering ethics. While the program came just too early for me to participate, I believe even then Rachelle Hollander, from the NSF, was centrally involved in supporting the program. Later she did much work to foster advances in the field. It is unclear how much lasting impact the workshop had on the majority of participants, but one seminal and long-lasting product did result, the ground-breaking text *Engineering Ethics*, written by Mike W. Martin and Roland Schinzinger. The field now had a text, one which was accessible to students and manageable for faculty who had no previous background in the field, both from philosophy and from engineering. In addition, a collection of writings was soon edited by James Schaub, Karl Pavlovic, and M.D Morris, *Engineering Professionalism and Ethics*, and a journal, *Business and Professional Ethics*, was founded by Robert Baum.

My own direct connection with professional developments in the field began with my participation in the Second National Conference on Engineering Ethics, hosted by Vivian Weil and her newly founded Center for the Study of Professional Ethics at the Illinois Institute of Technology, also funded by the NSF. Proceedings from the conference, *Beyond Whistleblowing: Defining Engineers' Responsibilities*, shows that many future influential figures in the discipline, such as John Ladd, Mike W. Martin, Larry May, and Taft Broome, were participants. My contribution to the Proceedings focused on the role of codes of engineering ethics and the

education of future engineers. Based on my own background, it emphasized the themes of autonomy and professional responsibility, which guided many of my future contributions to the discussion. In reviewing early twentieth century engineering codes of ethics, which were largely based on the model of independent medical practitioners, I found that they emphasized the role of engineers as solely responsible for their actions. Although I supported this view, it soon came up against countervailing considerations, such as the fact that most engineers are employees of corporations and thus subject to the whims of their superiors. My early connection of business and engineering ethics, largely forced by the circumstance of available materials, thus had particular relevance. Consequently, I tended to argue for the assertion of engineers' professional status within organizational frameworks, which made a reliance on autonomous ethical judgment essential for them.

As I was completing a module on the codes of ethics in the early eighties for the IIT Center, I came up against the beginnings of a seismic societal shift. When I wrote my dissertation on Martin Heidegger, I had titled it "The Essence of Man." I cannot recall one comment about the use of the word "man" to characterize all human beings. By the time of the writing of the module I received a comment from Vivian Weil questioning my use of male pronouns to write about engineers. At the time, and for many years after, my engineering college was an all-male institution. This fit squarely in the historical context of engineering schools, although my institution was, I believe, the last to switch to a coeducational model. Perhaps it should not be surprising then that my initial reactions to her comments were negative. Both philosophy and engineering have historically been male-dominated professions and resistance to change was, at times, intense. I learned a powerful lesson from the experience: the status quo must be challenged from an ethical perspective, and it can blind us to the need for change. As male scholars, we must use our privilege to highlight and fight against problems faced by women and other minorities in occupational contexts.

Another lesson for my study of engineering ethics arose out of my early professional work as well. By the early eighties the Nazi party membership of Martin Heidegger had become a contentious issue. Although scholarship on his work continued apace, many questioned whether his political beliefs should influence judgment of his work (this applied to some prominent non-German philosophers as well). For my understanding of engineering ethics, this became important in considering the professional responsibilities of engineers. Traditional approaches had largely ignored that engineers, like all workers, have lives outside of their occupational work. Yet, when dealing with actual human beings, their outside lives are often more significant than what they do at work. There is thus a built-in conflict of obligations when these worlds collide. Should concerns about family, for instance, override professional obligations, and under what circumstances? What are our obligations to people distantly removed from us, for instance, in developing nations, when the effects of engineering work can have global significance? Thus, engineering ethics interacts with the ethics of technology more generally, and with a larger framework of applied ethics. Throughout my career, I have seen tentative steps towards

interactions between these groups, although these interactions have been fragmentary and not necessarily long lasting. My contributions to meetings of societies studying the philosophy and history of technology, and applied ethics, have been welcome. The participation of members of these groups in activities devoted to the study of engineering ethics has been less common.

Among engineers and engineering departments, contributions from ethicists have generally been welcome. Throughout my career I have had frequent opportunities to lecture to engineering societies and departments, as have many other prominent engineering ethicists. However, the lasting impact of these occasions is not certain. Is it simply a justification for checking off another box, or is the intent to have a lasting impact? There is a significant core among engineering practitioners and professors who have a deep interest in discussing and resolving ethical issues. They are often passionate about these concerns, but often fail to take the same scholarly approach to these concerns as they would to the other parts of their work. I have talked to several professors who have taught courses in engineering ethics as uncompensated overloads or have attended engineering ethics conferences on their own funds. In research universities there is still a tendency to marginalize the study of engineering ethics, although more and more institutions have begun requiring a course in the field.

Within the discipline, there have been visible signs of a maturing process. Several journals, such as the groundbreaking *Business and Professional Ethics*, edited by Robert Baum, were founded. Over time, the most influential of these became *Science and Engineering Ethics*. A number of textbooks, after Martin and Schinziger's, were soon written, giving an indication that more and more courses on the subject were being offered. The most prominent of these was written by Charles E, Harris, Michael S. Pritchard, and Michael Rabins, titled *Engineering Ethics: Concepts and Cases*, also based on an NSF-funded project. In general, the NSF, guided by the influence of Rachelle Hollander, did much to support groundbreaking work in the discipline, cobbling together funds from various divisions and ensuring that prestigious Early Career NSF Faculty Development awards focused on ethics. Also instrumental was an initiative over several years to fund ethics-centered projects. The discussions of these at review panels involved a number of faculty who were newly involved in the field, and projects were submitted by both mature engineering ethics researchers and new entrants. This initiative did much to broaden the scope of interested academics. Simultaneously, a smaller group of dedicated scholars was being formed, many of which are contributors to this volume. The basis for an actual discipline of engineering ethics was thus in place.

The next step in the development of the discipline was its internationalization, a process aided by two important developments. One was the signing of the Washington Accord. An agreement originally signed in 1989 among a few primarily English-speaking countries to harmonize undergraduate engineering degree requirements, it has since expanded to include 19 countries. Since an emphasis on ethics was a feature of some of the original signatories' standards, this became a part of the signed framework and influenced the future establishment of ethics in engineering curricula around the world. The other development was a push by the U.S.

Accreditation Board for Engineering and Technology (ABET) to make available equivalent accreditation in countries other than the U.S. Since an emphasis on ethics was part of the U.S. accreditation requirements, this meant that it would have to be integrated into any application for accreditation from universities abroad, which might not previously have thought of it as an integral part of the curriculum.

Simultaneously, an emerging interest in engineering ethics as an area of research was developing in Europe, especially in the Netherlands. A standout among these was the work at the Delft University of Technology, which hosted a number of conferences and workshops and started a Ph.D. program at the intersection of engineering ethics and the philosophy of technology. A large cadre of serious researchers immensely aided the development of the discipline as a serious academic enterprise. Workshops at Delft were followed by others in locations like London and Beijing. A focus on engineering ethics thus began to take on a true international flavor.

My involvement in the discipline's internationalization came through an invitation by Professor Jun Fudano to teach a course in engineering ethics in Japan in the 1990s. At the time there was little or no emphasis on engineering ethics in Japanese curricula. Through five subsequent leaves or summers in Japan, as well as a semester teaching in Taiwan, I was able to spread word about the discipline through many lectures at Japanese universities and conferences. The process began with a course largely modeled on my work in the U.S. I thus served as an advocate for a model that emphasized the professional autonomy of engineers. While I had previously studied the process of technological innovation in Japan and contrasted it with that in the U.S., and saw it as a reflection of a differing set of value hierarchies, this had little influence on my understanding of engineering ethics in Japan, although it should have had a major influence. As was the case for many, it took me time to sort out the connections between engineering ethics and the philosophy of technology.

During my initial lectures, Professor Fudano served as an "interpolator" – this is how he described it, rather than simply as an interpreter – of my lectures. This was made necessary by the fact that the Japanese students, although all of them had had many years of English instruction, were unprepared to follow lectures in English. (Their English instruction was focused on passing the written college entrance examination rather than on real world communication.) The benefit of having Fudano's help was that it formed the basis of his own further work in the discipline, which subsequently led to his becoming the leading Japanese authority on the discipline in Japan – he founded a center, introduced engineering ethics as a required course at his home institution, and gave countless lectures and consulted on the subject throughout Japan and the world. He has become a significant force in the process of internationalizing the discipline.

At the same time my own perspective on engineering ethics was evolving. Beginning with an understanding of the importance of the group in Japan, and the idea of loyalty to one's employer, I began to see that the ideal of professional independence was rooted in U.S. engineering culture

and was not a standard that translated well to Asian contexts. Perhaps not even well to all Western contexts. A leading authority on engineering ethics in France, Christelle Didier, has convincingly argued that the professional model does not apply to French society. Professional autonomy as a foundation for engineering ethics might thus be questioned in a global context. This led to my final perspective on engineering ethics.

After retiring I had the opportunity to teach for several years in Shanghai. There I met a young philosophy colleague, Rockwell Clancy, who took over my teaching of engineering ethics after my departure from Shanghai. At his suggestion we collaborated on a text that was published as *Global Engineering Ethics*. The thesis of this work was that the foundations of engineering ethics needed to be fundamentally rethought for a global context. The discipline should not be founded on a set of U.S. criteria but a respect for local values and standards universally agreed upon norms. This work thus served as a culmination of my own evolving thought about the discipline, which had gone on for many years. It included a new perspective on what a global code of engineering ethics should look like, in combination with guidance for prospective and practicing engineers about how to deal with practical ethical problems in engineering. I hope that it points to a future where the discussions in engineering ethics are no longer dominated by those from the U.S. but, instead, becomes a global endeavor, which is required by the worldwide influence of modern technology.

I conclude with the advice I would give to a young colleague who came to me for guidance as to whether to pursue the study of engineering ethics as a career option, as Professor Clancy did. My answer is a definite yes, if one is willing to recognize limitations in one's role. There is still a tremendous amount of work to be done in the discipline and room for growth remains. We are still at the beginning of historical developments in the discipline. The opportunity still exists for fundamental and foundational contributions.

Real barriers to such contributions also exist, however. The number of serious academics devoted to the study of the subject remains relatively small and of a somewhat transient nature. The discipline is also influenced by serious "hobbyists" from engineering who are guided more by passion than detached norms of inquiry.

Second, any potential contributor must be guided by a genuine spirit of interdisciplinarity. This requires an openness to not only other areas of philosophy, such as the philosophy of technology, but also a broader range of other disciplines, from engineering itself to psychology and social studies of science and technology. It must also be kept in mind that the ultimate audience for one's work is not a set of academics but a set of practitioners dealing with real world issues.

Third, it is probable that one's greatest potential for a successful career will be in smaller institutions with a predominant focus on engineering. A review of the major figures in the discipline shows that most of them come from contexts that emphasize engineering education. Throughout my career, I interacted with engineers and their concerns on a daily basis, because I

was in an environment that stressed engineering education. This fostered both my understanding of the concerns of engineers and supported my work in a positive manner. It was only in my post-retirement work that I encountered a multiversity setting. The faculty there, focused on graduate engineering education, exhibited a certain degree of arrogance towards not only the role of the humanities but also all “support” disciplines. This was an indication that the greatest success for potential recruits to the field is likely in undergraduate contexts and not in traditionally large engineering or philosophy departments, where the contributions will continue to be made by junior scholars and educators.

Finally, as I look back on my own career and on the evolution of the discipline, it is with a high degree of satisfaction. Much of what has happed has not been the result of conscious decisions but fortuitous circumstances. Perhaps the autonomy I sought in my initial experience with Sartre escaped me, but the experience of having influenced the real-world decisions of practicing engineers brings with it a special sense of accomplishment that overcomes the limitations of the role of being an engineering ethics educator and scholar.