The Human Community

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What is the role of humanities education in an engineering curriculum? More importantly <u>why</u> should humanities education be integrated in such a course of study, to have "full membership in the community of engineering educators"?

Engineering itself might be characterized as the art of fitting means with ends for practical results — results that make life much easier. Mathematical formulas, employed by the engineer, seem to draw from an abstract realm durable truths that manifest themselves in the reliability of products. The great debt owed to engineers, and thus engineering education, is that the world has become largely manageable — indeed <u>civilized</u> — in ways for which we are all thankful.

There is, however, a curious dichotomy that pertains to engineering and the civilization it has improved; indeed, an ironic split. For, while engineering has to be a discipline that is linear to the core, the civilization itself — Western civilization, for now — has become postmodern, and postmodernism is least of all linear.

Philosophically, postmodernism is a sense of groundlessness underlying the refutation of traditional systems of interpretation, especially those of the Western consciousness. It is a view that emphasizes the temporal sweep of appearance without a fixed system "behind the scenes" to account for the world; as such it is a very severe aesthetic that has produced works of austere beauty. On the negative side, it is manifest in the superficiality of contemporary cultural values, the breakdown of meaning, and thus the fractious nature of our society at the end of the twentieth century. It has arisen partly because the grounding metaphysics of the West has destroyed itself in helping to produce a technology that orients us more to the temporal than the eternal in making almost everything accessible, here and now; and partly because this technology is now nearly a global phenomenon, resulting in a more multi-cultured character to the media by which we know the world.

That is, postmodernism relegates the ancient anchoring of the temporal in the eternal to a merely historical interpretation that no longer obtains. Nietzsche was the first

philosopher to see the end of the metaphysics of groundedness in eternity, but twentieth century particle physics, after Einstein, Heisenberg and Bohr, and the work of mathematician Kurt Gödel have contributed to this understanding as well.

Briefly, Einsteinian physics undoes the fixity of time and space in Newtonian physics, and allows no absolute center to the universe; according to Einstein, reality is a function of how fast, relative to the speed of light, an observer is moving, and this allows for differing versions, each correct, of any event in time/space. Philosophically, this echoes Nietzsche's remark that there is no "true world." Heisenberg is significant because his Indeterminacy Principle forecloses on the optimism of the Enlightenment in which all factors of the universe, including both momentum and location of any particle, were knowable; Heisenberg showed that one must sacrifice knowing one for knowing the other. Bohr's Complementarity Principle allows that an electron "must be regarded as both a wave and as a particle, according to context," as William Barrett states it — a fact that seems to suggest that the venerable Law of the Excluded Middle in logic (either A or not-A, but never both) is defunct.[1] And Gödel's famous Incompleteness Theorem, while leaving mathematics functional, shows that, as a system, mathematics will be complete, with every theorem provable, only to the extent the system allows a huge contradiction, or inconsistency; obversely, mathematics will be perfectly consistent only to the extent it is incomplete in the sense above. Never both consistent and complete, math thus topples form the eternal realm of perfect truth to be a man-made means, with all the flaws — systematic paradoxes — a human making entails. Twentieth century mathematical physics, that is, seems itself to undermine the ideal — to the extent that ideal appeared as ultimately grounded in eternity — of linearity and its embodiment in rational procedures.

But this is not an understanding that arises from engineering education. Rather, I would argue that, for many engineers, a collateral sense to the activity of engineering is the subtly formed notion that dealing with the world is a linear process of taking the right steps, obtaining the right answers and making material and/or events behave accordingly. Engineering education teaches, in the final analysis, not only a way of managing the world but, inescapably, a way of understanding it. And <u>understanding</u>, for the philosopher Martin Heidegger, is nothing less than a mode of our <u>being</u> in the world. It is probably a safe generalization to say that people in their various professions tend to understand the world predominantly in terms of those professions; it is what the French call a *difformité professionelle*. Thus the potential problem that many graduates of engineering schools face is the cognitive dissonance between the way they understand the world and the way the world, as postmodern, undercuts that understanding.

This is to suggest that the engineering student, whose immersion in purely engineering curricula cannot help but emphasize a future to be secured by linear, problem-solving thinking — what William Spanos calls "the Western consciousness"[2] — may have expectations for being in the world that will be frustrated. The world of engineering itself may always be a pliable one, yielding to technique; but the world at large in

which we live, move, and have our being might ultimately estrange any of us who maintain only a linear mind-set.

Accordingly, I should like to concentrate in this paper especially on the value of historical understanding, arrived at through humanities education, for engineering students. My main thesis is that because the Western world, not to mention much of the rest of the world, has become or is becoming postmodern in character, it poses a real challenge for engineering graduates. And because postmodernism is least of all amenable to the traditional Western consciousness, all linearity and problem-solving in character, with its reliance on systematic thought, our being able, as educators, to approach the world in its non-linearity and resistance to rational systems is to provide a wholistic education to the engineering student. One way is the study of literature in an historical context.

Postmodernism in Literature

The postmodern view is anti-systematic in the extreme; it begins as early as Kierkegaard's laughter in the first half of the nineteenth century at the philosopher Hegel's grand system of reality; the former believed that there is no system possible for human existence. Postmodern works of contemporary literature bear out this rejection of the linear mind-set that promotes taking the right steps to get the right answers. Donald Barthelme, in a tongue-in-cheek story called "Me and Miss Mandible," cites the ideal of education (which may be extended especially to engineering education) as his narrator discovers it in an open text on the desk of Miss Mandible (a teacher): "[Students will gain] confidence in their ability to take the right steps and to obtain correct answers." "I take the right steps, obtain correct answers," he wryly observes, "and my wife leaves me for another man."[3]

Works of literature in the Western historical tradition, from the eighteenth century onward, herald and eventually realize the postmodern view; I teach these literary works as historical documents, or at least as contextual bearers of the time in which they were composed. Instructive here is that as early as 1726 Jonathan Swift was protesting the new science and the overuse of logic in daily affairs. In his *Gulliver's Travels*, the eponymous hero visits the floating island of LaPuta — "the whore" named thus probably in reference to Martin Luther's epithet, "the whore, Reason" — to encounter beings who are pure Platonists, unable to relate to real life or especially to passion.[4] Gulliver is measured for new clothes with a quadrant and a sextant (the clothes fit horribly) and his food is cut up into geometric shapes; he observes the Laputans attempting to extract light from plants by reversing the process of photosynthesis. Writing a good thirty years before the birth of William Blake, whose protestations against the industrialization of society involved phrases such as "Satanic mills," Swift seems to have been prophetic in his view that a life lived only in reason and logic must be protested because such is not life, but, as Fyodor Dostoevsky was to say in the latter half of the nineteenth century, "the beginning of death."[5]

Instructive here as well is the example of Voltaire's *Candide*, a work one might think, with its Enlightenment propaganda for science and reason, would have little to say to engineering students. But Voltaire knew that a life of pure reason, of merely calculating means for ends, was foreign to the human condition — indeed, that man has a deeply irrational core; were this not the case, he suggests, we would all commit suicide immediately, so horrible can life be. He has the character of the Old Lady, supposedly the once beautiful and privileged daughter of a pope and a princess, end up with a dead fiancé, made the mistress of pirates, the witness of her mother's quartering, the victim of betrayal by a trusted servant, a sufferer of the plague, a slave, a member of a harem who loses a buttock to starving soldiers; finally she is forced to be a scullion and a maid. "A hundred times I wanted to kill myself, but always I loved life more. This ridiculous weakness is perhaps one of our worst instincts; is anything more stupid than choosing to carry a burden that really one wants to cast on the ground? to hold existence in horror, and yet to cling to it? to fondle the serpent which devours us till it has eaten out our heart?"[6] In a sense, this irrationality is only a foreshadowing of what, in the next century, becomes a staple of romanticism, a full-scale rebellion against the sterility and austerity of reason.

Perhaps the most virulent condemnation concerning the ideal of a perfectly linear, reasonable life, comes from Dostoevsky in his *Notes from Underground*. The "underground" here refers to the festering dissent certain writers felt in regard to the ideals of the Enlightenment, forced on the Russians by Peter the Great. It is one of the first works many critics regard as postmodern, not only in that it lacks a structure corresponding to what Aristotle had fixed as the guide to making great works of drama, but also because the sentiments expressed there are so radical. For the "Underground Man,' the speaker in this piece, places human freedom — even the freedom to make mistakes, to do something irrational just for the kick it might provide — as the highest ideal to which man might aspire. One ought to be free, he advises, from the tyranny of taking the right steps to get the right answers, so as to be able to do even something harmful to the actor, because the "most advantageous of all advantages" is remembered in such an action: the freedom to desire "something stupid, even very stupid" that "preserves for us what's most important and precious, that is, our personality and our individuality,"[7] It is no freedom at all to be free only to choose what is rationally acceptable. This was to argue, in effect, that a life of rational judiciousness is a "one-size-fits-all" standard, lowering man to the level of a herd animal. Indeed, existential philosophy — and Dostoevsky is considered a prototypical thinker in that field — makes one of its major concerns just this theme of fallenness into the "they," the superficial understandings and social acceptability of "the crowd," in which a non-realized individual merely does as "one" does. This is explicitly the theme of Leo Tolstoy's novelette*, The Death of Ivan Ilyich*, written toward the end of the nineteenth century.

In this work, also referred to as postmodern, Ivan Ilyich is a judge in the great Russian bureaucracy. All his choices are indeed made on the basis of what the impersonal (but actually fictitious) "one" would approve of. His whole life is the taking of right steps and getting right answers; for that matter, he gets married simply because "one"

marries, especially if "one" is in a position such as his—though love and passion never enter into his motivation. Eventually, while fixing up his new house to look like it must in order to signify his standing within the upper middle-class, Ivan injures himself in a silly accident. At first it seems to have been harmless but eventually he discovers nothing less than that he is dying. It is here that Tolstoy develops the theme that the knowledge of death can call one away from the crowd, since the act of dying is absolutely unique to each person, thus a call toward an individualistic, authentic existence. Tolstoy considers the crowd much as Kierkegaard did, the inauthentic means for living a received existence, and thus not a true existence at all. Ivan dies in the knowledge that he has not even bothered to live. This of course is the most explicitly moralistic bit of literature one might study, but such was Tolstoy's later style.

Tolstoy's *Death of Ivan Ilyich* is nothing short of a condemnation of a life lived without the spontaneity of true self-consciousness. He considered the civilized ways of everydayness to be the grand, unconscious conspiracy to keep us from facing ourselves in our freedom and uniqueness. His postmodernism takes the form of shaking the foundations of societal being, and explicitly gives us no answers, as if all we had to do were to implement them and get over any existential crisis; rather, in a clear reversal of Aristotle's view that the function of dramatic art is to provide *katharsis,* or purging of the emotions of fear and pity, the postmodern aesthetic rather wishes to prolong the existential crisis provoked by its works.[8] And this is already a moral undertaking in that it refuses to be complicitous in the illusion that linear, "correct" thinking creates about being in the world.

One very important twentieth century postmodern play I have my students study is Samuel Beckett's *Waiting for Godot.* In it a speech by one of the characters, a speech that has all the incoherence of abysmal rambling — for if even logic no longer holds up, why should a character have to speak with logical sense? — refers, with the repeated phrase "unfinished for reasons unknown," to fictitious great works that might have "explained" everything. And this is not some nihilistic, demoralizing prank the playwright is playing; compare Beckett's character's babbling to the remark of Herman Weyl, a great mathematician who himself discovered the bankruptcy of previous systematic thought and expressed it this way: "We have tried to storm Heaven, and we have only succeeded in piling up the tower of Babel."[9]

Waiting for Godot is not an engineering student's kind of play, I have discovered. But it is essential for all students in the twentieth century, in that it codifies, poetically, what even the sacrosanct realms of math and physics have discovered about themselves; by extension, it bears out what really is the case in our time: a certain sense of not knowing what ultimate answers there are anymore, largely because in our time technology in general is reorienting the world away form its grounding in tradition, even in cultures where such reorientation was seemingly unthinkable. This is not to say religious experience, even faith, is impossible in our time; but these are authentic only when mystical and not rational. Many of the engineering students I work with tend to have routine religious beliefs; they are least of all profoundly religious.

The value of having to study such a play is that, for the open-minded student (a true student, not just a technical trainee), it is possible to see that we are always at "square one," that everything is, in a sense, absolutely open. We are brought back to Kierkegaard's observation that there is no system possible for human existence, and as well to Nietzsche's remark that never before has "the sea, our sea . . . been such an open sea."[10] The freedom that this implies is invaluable knowledge for students who must necessarily fit means to ends in a largely predetermined manner; it may save their emotional lives. But more than that is the potential the awareness of such freedom holds.

The Value of Humanities Education

In a world that has lost its traditional bearings, all things being open, one becomes cognizant of pure possibility. In some fields this raises an unlovely specter — genetically engineered human beings, for one — but in others it becomes an inspiration for benign developments. New ways of solving old problems, unthought solutions to engineering glitches, ways of preventing global disaster, maybe eliminating for all time the bane of drought: pure possibility can fire the imagination. That this is so is proved by what some engineering educators already do: challenge students to come up with unique and effective answers, sometimes arrived at in non-linear ways, to given barriers.

Humanities education, whether it emphasizes the postmodern aspect of our culture or not, is applicable in an interdisciplinary way. I also teach a survey of music and the theoretical changes one finds as music historically evolves. Although the experience of music is emotionally concrete, the study of music is largely the study of abstract structures. This should surely appeal to the engineering mind-set. I say this because a recent study at Florida Tech shows that students in engineering courses have aptitude for hypertextual learning — interdisciplinary ways of understanding, in which various associations are used — and learn best this way. However, the study also reveals that this is not the kind of education engineering students are getting; instead, their education is designed for "field-independent convergers" — that is, its mode and methods are largely rather linear and disassociative.[11]

That being said, I think the ultimate value of integrating humanities education into engineering education is that, in a postmodern world where almost every tradition seems to be breaking down, a purely outer-directed way of understanding, or attempting to understand, the world will be unsatisfactory. Because, with the arts, history and philosophy, the humanities tend toward inwardness — that is, to what speaks to the individual as an individual — students who have studied them are acquainted with a realm apart from the fortunes of the social world. Another, collateral value is a sense of irony that goes with the study of the humanities. And while I would worry about, say, crossing a bridge that a civil engineer had designed with irony in mind, I do recommend it as a way of staying sane in today's world,

Accordingly, the mostly separate communities of educators — engineering educators and humanities educators — ought to interact to provide students a fuller education. In that way it is possible to achieve a wholistic education for engineering students, articulated in a single educational culture that might be called "the human community."

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[11]Unpublished doctoral dissertation research by Rachel Schippers, graduate student in Florida Tech's School of Psychology.

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