

CURRENT PROBLEMS IN ENGINEERING ETHICS

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The December issue of the journal *Science and Engineering Ethics* published an exchange among engineers and philosophers, perhaps the preeminent scholars in the field, on the topic of engineering ethics (Broome, Weil, Pritchard, Herkert, Davis, 1999).² Though it was not its intent, the exchange emerged as a representative *par excellence* of what we see as the difficulties found at the intersection of two quite different fields. Primarily, engineering ethics as a field of study and research has been guilty of allowing a multitude of inexact vocabularies, including often home-spun and idiosyncratic uses of ethical language, and worse, sometimes cultural-, professional-, and ego-centric biases in ethical judgments of engineers' decisions. In his initiating article—and again, more fervently, in his rejoinder—Taft Broome commits himself to what is undeniably a home-spun and idiosyncratic understanding of ethics and its role in engineering, one that is difficult to square with formal theories in the field of applied ethics. Although Broome's essay is ostensibly about promoting a model of decision making for ethically-pertinent engineering decisions, the argument in this paper is that Broome's essay has little to do with ethics *as ethics*, and nearly nothing to do with *engineering ethics*, despite gesturing toward both fields.

As an item of engineering ethics literature³, Broome's essay commits at least two serious mistakes, both of which are representative of issues seen throughout the engineering ethics literature, and both of which we will take up in this paper. First, despite gesturing generally toward a certain limited sort of normative ethical frameworks, Broome says essentially nothing about what he means when he says "ethics," or what his personal narrative of his Hamletesque⁴ experience suggests about the role of ethics in engineering. Second, though Broome clearly intends his essay to contribute to what he calls "the body of scholarship now known as engineering ethics," which he sees as woefully behind the current needs of the engineering profession, he remains oddly silent on the actual relationship between engineering and ethical

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² Our focus here is primarily on Broome's opening paper, "The Concrete Sumo," though the four respondents added much to the exchange. All quotations in this paper reference Broome's article (Broome, Weil, Pritchard, Herkert, Davis, 1999) unless otherwise noted.

³ Vivian Weil, in her response to Broome's article explicitly locates his work in this context. Weil says, "Broome's story offers a narrative of the exercise of practical wisdom, told from the inside. It is a compelling contribution to the professional ethics literature." (p. 549)

⁴ Since Broome employs a literary analogy to tell his story, it seems appropriate to continue that type of analogy to critique his story. Prince Hamlet, from Shakespeare's famous play, is visited by the ghost of his father, King Hamlet, who gives the young prince guidance for what he should do now that the King is dead. King Hamlet is widely revered by his countrymen for his virtuous behavior, notably his leadership in battle. For more, see Shakespeare, & Bevington. (2008). *The Complete Works of Shakespeare* (6, illustrated ed.). New York: Pearson Longman.

theory, leaving even the basic concepts of the field ill-defined. We see this failure to fully engage the fields of engineering and ethics with each other, and the failure to parse out what such a dynamic relationship would look like (and how it would influence the behaviors of engineers) as a contributing factor to the field of engineering ethics trailing behind, as Broome points out.

Understanding ethics is a process often confounded by common sentiments such as “you know what is right,” and “my parents taught me right from wrong,” and other such folk philosophy. While these statements might in fact be true, most likely your parents did not teach you right from wrong in the context of your current engineering discipline. Nor did they likely teach you how to engage consistent and systematic moral-reasoning skills in relation to multiple normative frameworks while understanding the value of certain frameworks over others in a given context. Broome’s story is typical of these folksy confounds and we are using his paper and the responses it generated as a way to address these and larger issues in engineering ethics, namely the inconsistent use of ethical language and the ambiguous characterizations of the role systematic ethics plays in practical life, and especially in the profession of engineering. We chose this particular exchange from among others because of the special danger it represents: Broome holds forth with no ordinary philosophical candor, but with a powerful bravado and an air of certitude not often found in a field sometimes accused of hopeless relativism. In telling his story—an autobiographical tale of his first day on the job as an engineer—Broome appeals to the literary trope of the hero to emphasize the moral value of his behavior that day. He projects himself into the role of the hero, referring to himself as “the heroic engineer” and elevating his actions to the level of Prometheus, Siegfried, and Sir Gawain, three of literature’s most glamorized and idolized archetypes. But this is a false analogy. People who attempt to follow this as a guideline will be misled. Broome’s actions, as he tells them, are not heroic and they should not stand as the paragon of ethical engineering practice. In order to critique Broome’s message, and the larger issues in engineering ethics of which Broome is merely representative, it will be useful to continue his literary analogy, correcting it for accuracy. But the most pressing matter here needs no analogy.

ETHICS

If we think of ethics in the broadest possible way, it is the branch of philosophy tasked with answering the question, put roughly, “how should one act?” The answers to this question, as seems obvious, apply to everyone, at all times, in all contexts. This is a tall order to say the least, the solutions to which must be as diverse and as nuanced as the situations that require them. Typically in applying ethics to practical issues we appeal to established frameworks to justify our normative decisions. We say things like, “it is wrong to abort a fetus,” or “war is acceptable in certain circumstances,” and we offer *reasons* consistent with these established frameworks to justify our statements.

Even with such reasons, we are bound to disagree over some issues. One might, for example, cite the inevitable drain on the local economy or environmental resources—and therefore the disadvantage to a large number of people—stemming from bringing a new life into the community as a justification for the moral allowance of abortion. Others might cite the personal rights of the child to his or her life, body, and future as a justification for the wrongness of abortion. Each argument in this case presents a morally-justifiable imperative. That is, they both can be said to be “right” in the context of their reasoning. Were one to subscribe to a utilitarian principle of the good, as in the first case above, where the interests of the community take precedence over the interests of the individual, choosing not to introduce a new burden to the community would be the action most consistent with the utility principle. This is no mere personal preference. The principles of utilitarianism have long been shown to lead consistently to behaviors beneficial to the community.⁵ Likewise, a systematic respect for human rights—for example, people’s rights to life, to liberty, to property⁶—as in the second case, respects the dignity all people possess.

Broome himself promises something systematic: “I shall consider a systematic alternative to moral approximation in exigent decision making situations,” but then produces what is arguably the opposite. Like Prince Hamlet in the royal court of Denmark, only in a portable restroom on a construction site, Broome was visited by knowledgeable spirits who offer, in their turn, less ethical wisdom than generalized and folksy colloquialisms as befit their characters. The first is his Uncle Tubby, then John Roebling, the famous designer of the Brooklyn Bridge, and finally his Uncle Roy, a relative who has previously influenced the direction of young Broome’s life. Far from being systematic ethical frameworks or reasoned logical deductions tracing the causes, possible consequences, and active principles of the situation in which the young Broome found himself, the advice he receives comes as single statements typifying the personalities of each of these three characters. Though Broome has boiled down three personal philosophies, as he understands them, into digestible quips, he has not boiled down actual philosophies. Why then, if Broome’s intention was to suggest that reductionist heuristics offer valuable models of decision making, does he choose such idiosyncratic examples which are all but completely divorced from more established ethical frameworks? It seems that with relatively minor effort he could have parlayed these quaint colloquial quips into one-line summaries of actual systematic ethical frameworks.

Broome might, for example, have altered his story in the following way. Instead of suggesting that his Uncle Tubby appears to him with the advice, “no court in the land . . . would blame you

⁵ See, for example, Bentham, J. (1890). *Utilitarianism* (reprint ed.). Progressive Publishing Company, Mill, & Smith. (1969). *Mill's utilitarianism: Text and criticism Wadsworth Studies in Philosophical Criticism, and* Jamieson, D. (1999). *Singer and his critics* (reprint ed.). Oxford, UK ; Malden, Mass.: Wiley-Blackwell. Wadsworth Pub. Co.

⁶ See Locke, J., & Filmer, S. R. (1947). *Two Treatises of Government: With a Supplement, Patriarcha, by Robert Filmer*. Hafner Pub. Co. and More, E. (2005). The Universal Declaration of Human Rights in Today's World. *Journal of International Communication, 11*(2), 26.

for letting the sumo dump the concrete in the entrance way,” he could have made his point more personal, more ethical, and more systematic. He could have said that while in the portable restroom he had a few moments for peaceful reflection, time in which he was able to consider how several different ethical frameworks would help shape the right and wrong ways of acting in this situation. Upon reflection he could have emerged saying that one way to think about this would be in terms of the Categorical Imperative.⁷ When I am unsure how to act, I could choose that action which, when universalized and applied similarly by everyone, would be rational, sustainable, and likely to lead to behavior any reasonable person would choose. In this case, Broome might say that he simply cannot make a decision about what to do with the concrete that is waiting to be delivered because if everyone went around making decisions they were not qualified to make, mistakes would quickly pile up, leading to many dangerous and otherwise avoidable situations.

In other words, instead of saying Uncle Tubby reminded him that he would not be at fault for any mishap, Broome could have said that he had entered into no certain agreement about being responsible for where the concrete would be delivered. This is not his responsibility and the driver would simply have to speak with the person responsible. That is, Broome could have appealed to contractarian principles of establishing moral obligation.

More broadly, the young Broome might have appealed to utilitarian principles, reasoning that by withholding instructions for what the driver should do with the concrete, he would, on the one hand be inconveniencing the driver who, Broome tells us, is already feeling inconvenienced. But on the other hand, Broome would be avoiding a situation in which all the concrete in question would be wasted, along with the time, energy, and money spent on its cleanup and replacement. In this case the potential for benefit, and the number of people who would be benefited, outweighs the relatively minor harm done to the concrete deliverer.

A similar reconfiguration is possible for each of the characters Broome mentions, although the advice from John Roebling is somewhat less clear. Roebling tells Broome, “you are an engineer, and engineers sacrifice all for their responsibilities to the business of engineering!” What exactly Roebling means by this, and what Broome expects the reader to infer, is not spelled out. At face value it seems that Roebling is suggesting Broome sacrifice whatever is necessary, perhaps including his reputation, his future career prospects, or even his life in the service of engineering—a reasonable enough interpretation coming from a man who left his native country to pursue engineering in the United States, and who later died of tetanus after insisting on experimental medical treatment to heal an injury suffered on the job so he could return to his work faster.⁸

⁷ See Kant, Guyer, & Wood. (1998). *Critique of pure reason*. New York: Cambridge University Press.

⁸ See Roebling, W. A., & Sayenga, D. (2009). *Washington Roebling's Father: A Memoir of John A. Roebling* (illustrated ed.). Reston, Va.: ASCE Publications. Also, it is worth noting that Washington Roebling, John Roebling’s oldest son and fellow civil engineer, suffered a physically-incapacitating injury while completing work

If we were to give Roebling's advice a more generous interpretation, we could take Roebling to mean that engineers, *as engineers*, should be prepared to sacrifice their personal preferences or biases in favor of whatever it takes to act in the service of engineering. *As an engineer*, Broome should overcome the personal concern he has for being wrong, or for making a bad first impression in his new job, and do whatever it takes to learn where the concrete should be delivered.

Roebling's advice to Broome, like his Uncle Roy's, might best be understood as ethical advice for Broome *the engineer*, rather than Broome *the man*. Uncle Tubby's advice would apply in any context. Uncle Tubby's sentiment is simple: if you were not explicitly responsible, you cannot be in trouble for the outcome. This is true no matter what one's profession is. But Roebling and Uncle Roy seem to be more contextualized. Roebling's advice, as we see, is specific to Broome's role as an engineer, not as a human being. Who knows what Roebling would say to Broome were he an auto mechanic instead? Uncle Roy's advice, at least in its scope, seems to be a combination of the first two contexts. His sentiment that, "this job belongs as much to you as to anyone else. So, you have a duty to either move this project along, or resign," is on the one hand appropriate advice for a professional engineer *as an engineer*, and on the other hand it is reconcilable with contractarian ethics, among others. Although Broome does not note the significance, Uncle Roy's advice constitutes proper engineering ethics, when properly parsed out.

ENGINEERING ETHICS

Engineering ethics, properly understood, is comprised of two separate and distinct fields: engineering, and ethics. This is not to be tautological, but to emphasize that neither field loses any of its character or its complexity when combined. As we study ethics as it is applied to engineering activity, and as we study engineering in terms of its ethically-pertinent activity, we see a synthesis, a new area of focus that is neither of the two fields making it up, but rather a new whole, with its own character. Engineering ethics involves the applications of normative ethical frameworks—that is, the systematic philosophical codes that in general terms answer the ethical question, "how should one act?"—in coordination with the codes of the engineering professions. In practice, then, applied ethics in engineering, or just "engineering ethics," involves an engineer considering the possible motives and consequences of actions in relation to common normative ethical frameworks *and* in relation to the profession's codes of ethics, with particular attention paid to how professional codes affect the application of the ethical frameworks.

on his father's design of the Brooklyn Bridge, an injury from which he ultimately died. Both father and son, it can be said, sacrificed "all" in the very literal sense of the term.

Broome's problem of what to do about a delivery of concrete would require him to parse his possible options against two different sorts of codes. He might begin with the more narrow code, the ASCE code of ethics⁹. There he would find guidance that is far more specific and far more appropriate to his situation than what his three spiritual visitors had to say. He would, for example, and as one of his original respondents, Michael Pritchard, pointed out (p. 552)¹⁰, note Fundamental Canon (b), which states "Engineers shall perform services only in areas of their competence." Clearly, *any* decision about this project is outside the young Broome's area of competence, having only arrived at the site that morning and having no practical experience. At that point, before he is briefed or brought up to speed, Broome is not qualified to act as an engineer on this project in any way whatsoever. To give the concrete deliverer instructions of any sort would be to violate Canon (b). *As an engineer*, Broome is bound by the codes of ethics of his profession in addition to the codes of ethics he is bound to *as a human being* in his community. Were Broome somehow to reasonably see himself as competent in this situation, or perhaps in future ethically-ambiguous situations, he could justify his actions *as an engineer* by appealing to this code and showing how he is not in violation of it—that is, that he is in fact competent—but he would still, then, have to reconcile whatever action he chooses with a broader ethical framework, as discussed above.¹¹ Only then would Broome have engaged in engineering ethics, properly understood.

Broome does not do this. He does not engage his discipline's code of ethics. He never even mentions it in this article ostensibly about engineering ethics. Nor does he mention any of the more common ethical frameworks. How then is this engineering ethics at all, we might ask? In order to answer that, we will have to consider how Broome redefines the task of engineering ethics in order to make his sentiments applicable.

Broome suggests that it is quite believable that engineers can make moral decisions well and make them when it counts. But he refers to such engineers as "moral savants," implying that such a person is in possession of out-of-the-ordinary decision-making skills. He then lowers the standard for all other "ordinary" engineers, saying they should merely "'do the best you can with the time you have,' i.e., attempt *ad hoc* an approximation of a defensible decision that suits the moment." Ethical decisions in engineering, he seems to imply, are typically exigent decisions, or made under duress. He passes over the more garden-variety ethical decisions that we know intuitively are made daily in the profession of engineering.

Why exigency? The situation he describes does not require a quick response, at least not one where he would not have enough time to reflect on his knowledge of ethical codes and frameworks, or, considering the danger posed to the project and to his career, to stop and seek

⁹ A summary of the ASCE code is included here as an Appendix.

¹⁰ Pritchard actually references the ASPE code of ethics, but the language in the ASCE code is the same.

¹¹ Broome would also be interested in considering other fundamental canons in the ASCE code of ethics. In particular, consideration of (a), (d), and (f), in addition to (b), would be useful in this situation.

guidance from others or from written ethical codes. Such deliberation would take only a moment or two.¹² Instead of this, Broome advocates engineers “transcend morality” and make their ethical decisions based on personal interpretations of their own personal, or perhaps literary heroes. Broome calls this an “ethics praxistics,” by which he means something akin to decision making based on heuristics rather than on more detailed and nuanced theory. In this case, the heuristics are in the form of Broome’s personal heroes who appear to him and offer a quick characterization of their own personal philosophies. For Broome, these summaries represent decision-making models that he can apply in a way that guides his own decisions as an engineer.

Broome seems to choose his Uncle Roy’s way of deciding, although it is possible he worked out some combination of the three and went with that. In the end, Broome tells us, he “conjured up a do-or-die attitude about the situation” and then took action. He looked around, saw the day’s plans, and gave the order to “pour that elevator pit!” In hindsight, we see that the young Broome did nearly everything wrong, ethically speaking. He felt a powerful urgency to make a decision he knew he was not qualified to make. He contemplated several possible modes of action, though without considering his discipline’s code of ethics or any of the larger philosophical theories. He considered only his personal experiences and biases, and used them to conjure courage rather than a systematic and defensible decision. Finally, with an attitude to take action no matter the consequences, he made a decision grounded in a series of ethical mistakes and then kept the whole story of his experience secret from his employers until, years later, and on the occasion of his resignation, he relayed the events of this day to his supervisors. It seems odd, then, that Broome would later analyze this story for its “heroic content.”

THE TRAGIC HERO

A literary hero, as many of us know it, is a character who at once embodies the very best qualities of a person while also being “one of us.” A hero is someone we identify with, look up to, and respect for his or her righteous and valorous actions in times of trial. But heroes also transcend humanity in their status. They are elevated to a mythological plane, standing above the reproach of the common person, exemplifying all that we aspire to. Broome presents himself as such a hero for his moral behavior on his first day as an engineer. He wants us to see that an ordinary engineer, fresh out of school with no professional experience, can rely on general personal heuristics to make proper ethical decisions as an engineer.

¹² One could argue that this situation *does* call for urgency, at least since Broome deliberately set it up that way. He gives us a snarly, annoyed, physically intimidating figure in the concrete deliverer who Broome suggests might actually do him physical harm if Broome does not make a decision quickly and instruct him where to pour the quickly-curing concrete. But this is a story, and this part is exaggerated for dramatic effect. In reality, though concrete deliverers might very well be annoyed if they are made to wait with a fleet of trucks filled with concrete and idling outside, a threat of violence to a first-day-on-the-job engineer is unlikely, and any delay this engineer causes would easily be justified through professional codes, ethical frameworks, and plain common sense.

Whereas literature is full of heroic figures—Broome mentions three: Sir Gawain, Siegfried, and Prometheus, to be clear about what he means—it is far more common in literature to encounter the trope of the *tragic* hero. This is a character that at first embodies the traits of the hero: we identify with him or her, we are drawn into the story, we see his or her actions as noble, as righteous, as the ideal. But then the character becomes too proud, commits a serious error, and falls from that height.¹³ The hero becomes fallen, becomes a tragic hero, and becomes, in literature, a tragedy. Broome's story presents such a fall.

¹³ Where Sir Gawain and the Arthurian Knights represent the ideal of heroism, tragic heroes are represented by Hamlet, Othello, Antigone, or Oedipus (a character Broome himself mentions in his article, yet one he does not identify with).

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Appendix

ASCE CODE OF ETHICS

FUNDAMENTAL PRINCIPLES

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- a. using their knowledge and skill for the enhancement of human welfare and the environment;
- b. being honest and impartial and serving with fidelity the public, their employers and clients;
- c. striving to increase the competence and prestige of the engineering profession; and
- d. supporting the professional and technical societies of their disciplines.

FUNDAMENTAL CANONS

- a. Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development³ in the performance of their professional duties.
- b. Engineers shall perform services only in areas of their competence.
- c. Engineers shall issue public statements only in an objective and truthful manner.
- d. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
- e. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
- f. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.
- g. Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.