



Philosophy and Engineering

By Jon A. Schmidt, P.E., SECB

Philosophy and engineering – we do not generally think about them as going together. We all took engineering classes as part of our education, but few of us took philosophy classes. In my case, I have never taken a single philosophy class in my life, so I do not have any formal credentials that qualify me to write about philosophy – I am a professional engineer, but an amateur philosopher. That has not stopped me before, and here I am at it again!

If you are familiar with my previous columns, you know that I have done quite a bit of reading in this area on my own over the years and have found much of it to be fascinating. One of the things that I have discovered is that philosophy is not so much about finding the answers – it is really all about asking the questions. For example, what is philosophy? That is a philosophical question! Of course, the term itself is derived from two Greek words: *philos*, meaning love; and *sophia*, meaning wisdom. So philosophy is, strictly speaking, the love of wisdom. Interestingly enough, here is the first definition of philosophy in *Merriam Webster's Collegiate Dictionary*, 10th edition: “all learning exclusive of technical precepts and practical arts.” From that, it sounds like philosophy encompasses everything *except* engineering!

So here is another philosophical question: What is engineering? In this case, the etymology of the word itself is not as familiar. At first glance, it appears that engineers would simply be those who operate engines. This is why, if I tell a young boy (other than my own son) that I am an engineer, he is probably going to think that this is really cool and then ask me, “What is it like to drive a train?” However, in other languages – such as French, German, and Spanish – the word for “engineer” starts with the letter I, not the letter E. In fact, when we call ourselves “engineers”, what we really mean by that label is that we are people who exercise ingenuity.

The classic definition of engineering reflects this somewhat. It is attributed to Thomas Tredgold, and it dates to the 1828 charter of the Institution of Civil Engineers in England. It says, “Engineering is the art of directing the great sources of power in nature for the use and convenience of man.” This certainly sounds important and impressive! The problem is that it does not really capture what we as engineers do on a daily basis. How many of us will “direct the great sources of power in nature” this month?

There is another definition that I have come across, and I have seen it attributed to various individuals. My guess is that it is so pithy, and has been repeated so often, that no one really knows who originally uttered it. Here it is: “Structural engineering is the art of modeling materials we do not wholly understand into shapes we cannot precisely

analyze, so as to withstand forces we cannot properly assess, in such a way that the public at large has no reason to suspect the extent of our ignorance.” This strikes me as much closer to the mark!

One of the interesting things about both of these definitions is that, contrary to popular usage, neither refers to engineering as a science; instead, they refer to it as an art. What does this mean? If we turn to *Merriam Webster's Collegiate Dictionary* again, we find that the first four definitions of art are all potentially relevant: “skill acquired by experience, study, or observation... a branch of learning... an occupation requiring knowledge or skill... the conscious use of skill and creative imagination...” This last one is my personal favorite. Does it reflect how non-engineers typically perceive what we do for a living? More importantly, does it reflect how we ourselves typically perceive what we do for a living?

Skill and creative imagination are necessary to engineering because the outcomes are rarely black and white, right or wrong. Our clients give us their problems and expect us to solve them, even though there are no *objective* solutions – there are simply too many parameters and too many criteria. So they depend on us to exercise good judgment, grounded in our formal education and honed by our subsequent experience. As Steven Vick said in his book, *Degrees of Belief: Subjective Probability and Engineering Judgment*, “The novice begins with data and ends with a number; the expert begins with knowledge and ends with understanding.”

There is a widespread perception that engineers are little more than number-crunchers. This is not only inaccurate, it is dangerous. Data and numbers are meaningless – unless and until they are properly interpreted by someone who *knows* where they came from and *understands* what they mean. This is our role as engineers, our responsibility as engineers, and our reason for being engineers. Our reason for being – sounds like something *philosophical!*■

Jon A. Schmidt, P.E., SECB (chair@STRUCTUREmag.org), is an associate structural engineer at Burns & McDonnell in Kansas City, Missouri, and chairs the STRUCTURE® magazine Editorial Board. Reader comments on InFocus columns are always welcome.

The second Workshop on Philosophy and Engineering will take place November 10-12, 2008 in London, England. More information is available at www.illigal.uiuc.edu/web/wpe.

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