

## **181b Toward Defining the Practice of Sustainable Engineering**

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The word “engineer” is derived from the Latin *ingeniare* (to contrive) or, as a noun, *ingenium* (ability), and has been variously defined, in modern times, as “the practical application of science to commerce or industry,” “the application of science in an economic manner to the needs of mankind,” and “the application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems.” Implied in these definitions is the recognition that systems, both natural and constructed, are constrained by physical laws, that the world in which we live is a finite, resource-limited place, and that management strategies are required in order to make intelligent choices. Sustainability science presents us with a different way of envisioning how science is practiced and applied, from one in which systems are divided into their simplest parts and studied, usually within a specific disciplinary focus, to one in which we are asked to develop an understanding of self-organizing, complex systems, to integrate knowledge (often across many scales), and in most instances to include an assessment of the roles of societal structures. Such an approach is decidedly interdisciplinary, and changes fundamentally the way in which our understanding of the interactions between humans and the environment is framed. In this talk examples drawn from systems engineering, measurement science, and curriculum design will explore how engineering practice can be both transformed by sustainability science, and in turn support its implementation.