Life-centered Design – A Paradigm for Engineering in the 21st Century

Andrew S. Lau, P.E.
The Pennsylvania State University
School of Engineering Design, Technology, and Professional Programs
213F Hammond Building
University Park, PA 16802
andylau@psu.edu

The engineering field, particularly engineering education, is in need of a new paradigm. We need a vision of engineering that encompasses traditional technical competence with the enlarged scope of social responsibility in a world that is ever more changed by the work of engineers. Edwin Layton, in *The Revolt of the Engineers*, goes so far as to say that engineers are now "socially responsible for ensuring progress and the benevolence of technological change." A major reason for this change is that the scale of human activity has reached unprecedented levels, resulting in significant resource depletion, global-scale environmental impacts, and increasing inequities between the rich and the poor. As engineers, we have contributed both to the successes of technology, as well as these related failures, typically with little ability to understand or anticipate the negative consequences. One of the most curious aspects of engineering education is its nearly complete neglect of the life sciences, including biology and ecology (except for selected fields such as agricultural and biological engineering and environmental engineering). We have continued to require what might be called, in contrast, the "dead sciences," including physics and physical chemistry. Furthermore, engineers are provided little direction and education in political science, sociology, economics, and philosophy. Most engineering programs have no plan that ensures graduates will understand the complex world in which their designs will operate. Incremental curricular changes cannot keep up with the need for a broadly-educated, socially-responsible professional. This paper presents a vision for a new paradigm for engineering, namely sustainability, or better yet, life-centered design. The classic definition of sustainability, meeting the needs of the present without diminishing the ability of future generations to meet their needs, does not really provide a vision of how it is to be achieved. A better term, although imperfect, is life-centered design, which captures the focus of this engineering paradigm – to practice engineering such that life is nurtured, both now and in the future. This vision sees engineering as fulfilling the first canon of the NSPE Code of Ethics: *Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health and welfare of the public*. While its vision is deeply imbedded in the idea of nature as a model, it encompasses some of the recent environmental initiatives such as LCA (Life-Cycle Assessment), DFE (Design for Environment), DFD (Design for Disassembly), Industrial Ecology, and Biomimicry. This paper will review these recent initiatives and then go on to develop this life-centered engineering vision, its rationale, and its potential to transform engineering education and engineering practice.