

## Still Pioneering: Sustainable Engineering in Arizona

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When I was younger and in charge of AT&T's Design for Environment program, I once suggested to a Bell Laboratories design team that we create a "sustainable telephone." We all thought it was a great idea, until someone asked me what one was and how it differed from an "ordinary" telephone. Would it "save the Earth"? Or perhaps "achieve social justice"? That seemed a lot to ask of a simple telephone.

The idea of "sustainable engineering" has gained in power since I was at AT&T. To some, it suggests that good engineering and appropriately designed technology can help achieve sustainability. For many environmentalists, however, "sustainable engineering" is a contradiction in terms, an unsuccessful attempt to make manufacturing new products or building new houses appear to be environmentally acceptable. Who is right?

To try to answer this question, Arizona State University's Ira A. Fulton School of Engineering, in partnership with Carnegie

Mellon University and the University of Texas, and supported by the National Science Foundation and the U.S. Environmental Protection Agency, has founded a Center for Sustainable Engineering. Although our efforts are just beginning, a few basic points have become clear.

To begin with, engineers are basically problem solvers. No matter where he or she works, an engineer's job is to produce a solution that works in the real world. That means engineers must satisfy many people: consumers, employees, regulators, outside activists. In a region like Phoenix, an increasingly important hub of education, science, and technology, globalization adds to the complexity of the engineer's task.

To achieve solutions, engineers rely on equations, numbers, and models. But this scenario presents problems, because the idea of "sustainability" is not yet one upon which most people agree. The fuzziness of the idea makes it difficult to integrate into the numerical procedures that engineering requires. To address this problem, we are developing a field called "industrial ecology," the practice of sustainable engineering.

Industrial ecology studies the economic, social, and environmental aspects of engineered products and industrial systems. An engineer can use industrial ecology methods, such as life-cycle assessment, to identify social and environmental effects of a product or process, and then use existing design and engineering methods to integrate that knowledge into their engineering activities.

Researchers at the ASU engineering school are also developing simpler guidelines for engineers in many areas. For example, some of ASU's civil engineers are working on a more systematic way of understanding infrastructure such as water, energy, transportation, and waste management, so that development in the Valley can become more sustainable. Others are studying management of electronic waste in Phoenix to determine

cost-effective ways of recovering valuable materials that otherwise might simply go to landfills. Still others work on air-quality and transportation-network models that enable us to improve public services and human health at the same time. With the growth of this

transdisciplinary field of industrial ecology, our emphasis is on adaptive solutions for an urbanizing world.

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