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A Different Kind of "Bio" Engineering

My first exposure to bioengineering was watching *The Six Million Dollar Man* on television as a teenager. In the show's opening sequence, former astronaut Steve Austin (played by Lee Majors) crashes during a test flight of an experimental aircraft. His badly broken body is barely alive when the director of the Office of Scientific Intelligence suggests: "We can rebuild him. We have the technology. We have the capability to build the world's first bionic man. Steve Austin will be that man: better than he was before. Better, stronger, faster."

Austin regains consciousness to learn that surgeons (in an operation that cost $6 million) have given him a bionic left eye with a 20:1 zoom lens and infrared imaging and night vision, a bionic right arm with the strength of a bulldozer and a built-in Geiger counter, and two bionic legs that allow him to run more than 60 miles per hour and make giant leaps. In return for his life being saved, he becomes a secret government agent and travels the world to fight bad guys.

As a college freshman, fascinated by this new technology, I took the introductory course for a double-major in biomedical engineering. But bionics seemed to involve more mechanical and electrical engineering than chemical engineering, so I switched my double-major to engineering and public policy.

In the years since, we've seen chemical engineering departments at numerous universities incorporate "bio" into their names. I've learned a lot about the many diverse contributions of chemical engineers to the field of biological engineering, and we have covered these extensively in *CEP*. Every year, *CEP* publishes two Society for Biological Engineering (SBE) special supplements on topics ranging from the Chinese Hamster Ovary (CHO) Consortium to disposable equipment to biofuels.

The December 2007 SBE supplement on bioengineering included the articles "Engineering Organs: Heart and Esophagus," "Bioprinting: Directed Tissue Self-Assembly," and "Conducting Polymers: A Bridge Across the Bionic Interface." In the first article, Buddy Ratner discussed some of the challenges involved in growing living tissues and organs, such as carrying oxygen to new tissue, limiting inflammation, promoting healing, integrating new organs into the body, matching new tissue to the old, and manufacturing tissue in commercial quantities.

In this issue (p. 10), we report on progress Ratner and his colleagues have made in addressing some of those challenges. They recently built a scaffold that can deliver new stem-cell-derived cells to a heart damaged by a heart attack.

This month's cover story (pp. 32–37) deals with a very different kind of bioengineering — the use of chemical engineering principles to improve your personal health. Nick Hallale relates the most fundamental concept of *Energy In = Energy Out + Accumulation* to weight loss through diet and exercise.

Many of us make New Year's resolutions to lose weight and exercise more, only to give up a few weeks or days (or hours) later. This month marks the start of a new school year. We might have better luck making a resolution to get into better shape now. By taking Nick's advice and applying our chemical engineering expertise to this personal challenge, by January 1 we could be the envy of all those who make diet and exercise resolutions for 2011.

Cynthia F. Mascone, Editor-in-Chief