sian. It has been a regular "citation classic" for being referenced in the literature with a frequency comparable to such classics as Abramowitz and Stegun (Handbook of Mathematical Functions) and Carslaw and Jeager (Conduction of Heat in Solids). It is recognized as the most important textbook in the profession in the last quarter century.

In 1974 Ed published the pioneering text *Transport Phenomena and Living Systems* which showed how to use the art and science of chemical engineering to solve important bioengineering problems by including details of the physiological and pharmacological phenomena.

Recently he has devoted his efforts to the development of modern biotechnology, with special emphasis on the engineering of metabolic pathways and materials separations. He was the driving force in the organization of the Bioprocess and Metabolic Engineering Consortium at the University of Wisconsin. With the support of Abbott Labs, Agracetus, APV Crepaco Inc., Becton Dickson, Bio-Technical Resources, DuPont, Kraft, New Brunswick Scientific Co., Procter and Gamble, Promega Biotech, Universal Foods and Xylan, the consortium promotes the use of biological organisms and biochemical processes to produce specialty chemical products.

Just this year Ed led a University/Industry/State-of-Wisconsin team in the development and design of an industrial process to produce high purity lactic acid from waste cheese whey. This industry seeks to produce valuable chemicals and jobs from a particularly troublesome waste product of one of the state's largest industries. This service to industry and state follows Ed's successful approach to research in combining the science and practice of engineering. □

## RANDOM THOUGHTS

**Continued from page 7.**

is to watch for them, and when we find them (which we will), explain and affirm their learning process to them. They probably already know all about the drawbacks of their style, but it usually comes as a revelation to them that they also have advantages–that their creativity and breadth of vision can be exceptionally valuable to future employers and to society. Any encouragement we provide could substantially increase the likelihood that they will succeed in school and go on to apply their unique abilities after they graduate.

*Postscript: 10 years later*

Susan graduated and went on to get a masters degree in chemical engineering, got a number of good job offers, and went to work in the process design division of a large petrochemical company. She did extremely well and is now making rapid progress up the technical management ladder. Glenda went through a lengthy job search when she graduated–all those C's on her transcript worried prospective employers–and finally found a position with a small firm of design consultants. Her first project involved designing and installing process simulation software for a pharmaceuticals manufacturer. She did almost nothing on the project for months, despite increasing pressure from her supervisor. Then she came up with a package that not only did the required simulation but also used it to schedule production, manage inventory, and determine production bottlenecks and the best methods of eliminating them. The company estimated that the program led to savings of two million dollars in its first year of use. Glenda now gets the problems too difficult for anyone else in the firm to solve. Sometimes long periods go by without any apparent results, but no one pressures her any more. □

[1] R.M. Felder and L.K. Silverman, "Learning and Teaching Styles in Engineering Education," *Engineering Education*, **78**(7), p.674 (1988). Susan is a representative sequential learner and Glenda is a representative global learner, but not all sequentials are just like Susan and not all globals are just like Glenda. These labels simply denote tendencies that may be strong or weak in any given individual, and everyone exhibits characteristics of both types to different degrees.

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