

## 2007 WILLIAM G. LOWRIE LECTURER

**Greg Stephanopoulos**  
**Professor of Chemical Engineering**  
**Massachusetts Institute of Technology**



Dr. Gregory Stephanopoulos received his BS from the National Technical University of Athens, MS from the University of Florida and his PhD from the University of Minnesota, all in Chemical Engineering. Upon finishing his doctorate in 1978, he joined the Chemical Engineering Faculty of Caltech and in 1985 he was appointed Professor of Chemical Engineering at MIT where he is the W. and H. Dow Professor of Chemical Engineering and Biotechnology. He served as Associate Director of the Biotechnology Process Engineering Center (1990-97) and member of the International Faculty of the Technical University of Denmark (2001-). He is also the Taplin Professor of Health Science and Technology (2001-) and Instructor of Bioengineering at Harvard Medical School (1997-). His current research focuses on *metabolic engineering* and its applications to the production of biochemicals and specialty chemicals as well as mammalian cell physiology as it pertains to diabetes and metabolism. He has co-authored or -edited 5 books and ~260 papers and 21 patents. He has supervised 50 graduate and 40 post-doctoral students and is presently the Editor-in-Chief of *Metabolic Engineering*. He also serves on the Editorial Boards of 7 scientific journals. He has been recognized with the Dreyfus Foundation Teacher Scholar Award (1982), Excellence in Teaching Award (1984), Technical Achievement Award of the AIChE (1984), PYI Award (1984), AIChE-FPBE Division Award (1997), M.J. Johnson Award of ACS (2001), and the R.H. Wilhelm Award in Chemical Reaction Engineering of AIChE (2001). In 1992 he chaired the FPBE Division of AIChE and was elected a Founding Fellow of the American Institute for Medical and Biological Engineering. In 2002 he received the Merck Award in Metabolic Engineering and was elected to the Board of Directors of AIChE. In 2003, he was elected to the National Academy of Engineering (NAE). He was awarded the honorary doctorate degree (*doctor technices honoris causa*) by the Technical University of Denmark (2005).

## WILLIAM G. LOWRIE LECTURES Chemical and Biomolecular Engineering Lecturer: Dr. Greg Stephanopoulos

**Lecture I: April 26, 2007**  
**Room 207, Koffolt Lab, 11:30 AM**

### **LECTURE I: Metabolic Engineering: Engineering Microbes for Overproduction of Fuels and Chemicals**

Though the field of metabolic engineering is just over 15 years old, it has developed a well-defined methodology and a focused research portfolio of rich intellectual content and particular relevance to biotechnology and biological engineering. Its goal is to harness the immense potential of microorganisms for the production of useful products, especially from renewable resources by engineering cellular metabolism so as to favor product-forming pathways while maintaining normal cellular functions. After many successful applications, metabolic engineering now needs to adapt itself to rapid changes whereby instead of too few genes we have lots and lots of genes and, instead of a handful of measurements, avalanches of data. Although the focus (e.g. improving cells) and a central component (e.g. assessing cell physiology) of metabolic engineering remain the same, new tools are required to take advantage of these developments. Such tools will come from a systemic view of cellular function and will strengthen the *integrating and quantifying* aspects that have given this field its unique identity. The talk will review how metabolic engineering helped crystallize these concepts along with the main challenges in aligning metabolic engineering with the goals and mind-frame of the new biology. New concepts of importance in the post-genomic era will be presented that allow the engineering of cells to elicit multigenic properties, a task difficult to achieve following the usual single gene paradigm. These ideas will be illustrated with examples from applications of metabolic engineering in the production of chemical products and biofuels from renewable resources.