Department of Chemical and Biomolecular Engineering

WILLIAM G. LOWRIE LECTURESHIP

2007 Lecturer

Dr. Greg Stephanopoulos

Professor of Chemical Engineering
Massachusetts Institute of Technology

Lecture I, 207 Koffolt, 11:30 AM, April 26, 2007
Lecture II, 161 MacQuigg, 9:00 AM, April 27, 2007

The Ohio State University
Chemical and Biomolecular Engineering
140 West 19th Avenue
Columbus, Ohio 43210

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).

-1996 Lecturer-
John F. Davidson
University of Cambridge

-1997 Lecturer-
William R. Schowalter
University of Illinois at Urbana-Champaign

-1998 Lecturer-
James Wei
Princeton University

-1999 Lecturer-
Judson King
University of California, Berkeley

-2000 Lecturer-
Robert Langer
MIT

-2001 Lecturer-
Roy Jackson
Princeton University

-2002 Lecturer-
Alexis T. Bell
University of California, Berkeley

-2004 Lecturer-
John H. Seinfeld
California Institute of Technology

-2005 Lecturer-
Charles A. Eckert
Georgia Tech

-2006 Lecturer-
Alice P. Gast
Massachusetts Institute of Technology

Lowrie Lectureship
Honors Banquet

6:00-6:30 Reception/Poster Session
6:30 Welcome - Dr. Stuart L. Cooper, Chair
6:40 Buffet Dinner

AWARDS PROGRAM

LOWRIE LECTURESHIP AWARD

Introduction: Stuart Cooper
Presenter: Dean Bud Baeslack
Awardee: Dr. Greg Stephanopoulos

SPECIAL RECOGNITION

Laura Ensign – NSF Graduate Research Fellowship winner; University Nominee for the Rhodes Scholarship and the Marshall Scholarship
Thomas Malott – NSF Graduate Research Fellowship
Theresa Vonder Haar – NSF Graduate Research Fellowship

AMERICAN INSTITUTE OF CHEMISTS FOUNDATION AWARDS

AIC Outstanding Undergraduate Student Award
Awardee: Brittany Valentine

AIC Outstanding Graduate Student Award
Awardee: He Bai

AIC Oustanding Postdoctoral Award
Awardee: Yubing Xie

DOW CHEMICAL

Dow Outstanding Junior Award
Awardee: Kim Hoang

AIChE STUDENT AWARD

AIChE Central Ohio Section Outstanding Student Award
Awardee: Sandy Abraham

Donald F. Othmer AIChE Sophomore Academic Excellence Award
Awardee: Craig Buckley

AIChE Student Chapter Officers
President – Sandy Abraham; VP – Taimur Shujaat; Treasurer – Laura Fisher; Secretary – Carol Udoh; Membership Chair – Andrew Williams; Philanthropy Chair – Blake Washington; Publications – Chad Bernard; Social Chairs – Steve Gronauer, Leslie Shumaker; Historian – David Bell; Webmaster – Adam Burley; ChemE Car President – Adam Peter; ChemE Car VP – Chad Bernard; ChemE Car Treasurer – Kim Hoang; ChemE Car Safety Chair – Elizabeth Curry

DEPARMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING AWARDS

Co-Op Award
Awardee: Andrea Breitenbach

Outstanding Undergraduate Award for Research Excellence
Awardee: Jessica Huber
Awardee: Allison Senefeld-Naber
Awardee: Laura Ensign

Outstanding Graduate Award for Academic Achievement
Awardee: Hongshu Chen
Awardee: Wu Ge
Awardee: Robin Ng
Awardee: Somnath Sinha
Awardee: Hua Song
Awardee: Luis Velazquez-Vargas
Awardee: Yuan Wen
Awardee: Danny Wong
Awardee: Yun Wu
Awardee: An Zhang

Outstanding Post-Doc Award for Research Excellence
Awardee: Jingjiao Guan
Awardee: Song-Geng Li
Awardee: Shengnian Wang
Awardee: Yubing Xie

CEGC Officers
Academic Officer – Elizabeth Biddinger
Social Officer – Burr Zimmerman
Recruitment Officer – Mike Vilt
Facilities Officer – Hua Song
Business Officer – Wu Ge

CLOSING REMARKS – Stuart L. Cooper

The William G. Lowrie Lectureship was established in the Department of Chemical Engineering at The Ohio State University on October 1, 1995, to honor William G. Lowrie, a distinguished alumnus. The lectureship is awarded once each year to an individual who has made outstanding contributions to fundamental or applied research in the field of chemical engineering.

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.

Lecture II: April 27, 2007
Room 161, MacQuigg Lab, 9:00 AM

LECTURE II: Chemical and Biological Engineering:
A New Dimension to a Successful Paradigm

Biological systems and processes owe their wonderful properties mostly to the (bio)chemical reactions occurring in them. Regulation of gene expression, cell-cell communication by signaling cascades, self-regulation and molecular recognition, metabolite overproduction by metabolic engineering, laboratory evolution of proteins, biocatalysis with single or multiple enzymes, cell-surface interactions for tissue engineering, controlled drug delivery, cell and tissue targeting for gene therapy, etc., are all critically dependent upon the type and extent of chemical reactions occurring in them. They can be, and are being dissected and optimized using chemical engineering tools: namely, kinetics, thermodynamics and transport. This central role of chemical engineering in advancing applied biology must be formalized by enriching the ChE curriculum with contextual information about biological systems and their relationship to the underlying chemical reactions. As biology, at the molecular level, is mostly a chemical science, it should become a foundational science, along with chemistry, of a chemical and biological engineering paradigm to support an exciting new area of engineering education and research. I will try to convey some of the excitement of modern biology, its impact on chemical engineering and fundamental contributions in constructing a rigorous framework for systems biology.