

**MECHANICAL ENGINEERING
DEPARTMENT
ME FOUNDERS DAY
(ME/IE 8773-8774)**

The sixth annual ME Founders Day focuses on the topic of thermodynamics and solar energy and highlights the research activities of Edward A. Fletcher.

**Topic: THERMODYNAMICS AND
SOLAR RESEARCH
Host: Jane H. Davidson**

**Advances in the Thermochemical
Production of Solar Fuels**

by

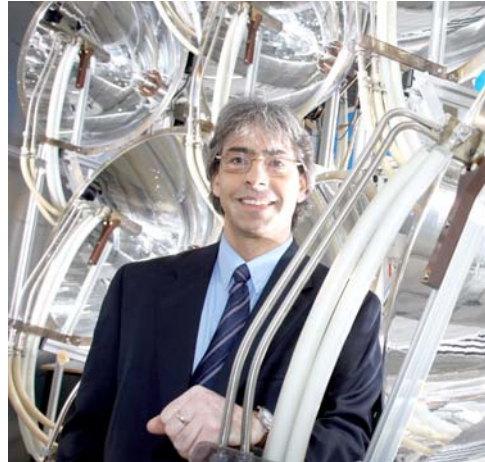
**Aldo Steinfeld
Department of Mechanical and Process
Engineering
ETH Zurich
Switzerland**

**Wednesday, April 11, 2007
4:00 p.m.
Room 2-650 Moos Tower**

ABSTRACT — In 1977, the *Science* article entitled “Hydrogen and Oxygen from Water” - authored by Prof. Edward A. Fletcher and his graduate student - laid the underlying thermodynamics for efficiently storing intermittent solar energy into chemical fuels via high-temperature endothermic processes. The scientific concepts presented in that paper, as many of the pioneer ideas proposed by Prof. Fletcher, were ahead of time. Thirty years later, and in the midst of a global debate about mitigating greenhouse gas emissions and securing energy supply, the production of solar fuels emerges among the most viable paths towards sustainable energy utilization.

Solar thermochemical processes make use of concentrated solar radiation as the clean energy source of high-temperature process heat. Considered are water-splitting thermochemical cycles based on metal oxide redox reactions at 2000 K, and reforming/gasification/decomposition processes for the thermal decarbonization of fossil fuels at 1500 K. The research work encompasses fundamental studies in chemical reactor engineering, with emphasis on

the analysis of radiation heat transfer in reacting flows. Solar reactor prototypes, for a solar power input from 10 to 500 kW, are designed and tested in a high-flux solar furnace, and further optimized for maximum solar-to-fuel energy conversion efficiency.



BIO — Aldo Steinfeld is Professor at the Dept. of Mechanical and Process Engineering of ETH Zurich. He further leads the Solar Technology Laboratory of the Paul Scherrer Institute. He received his B.Sc. in Aeronautical Engineering from the Technion in 1983, and his Ph.D. in Mechanical Engineering from the University of Minnesota in 1989. In 1990 he was appointed research fellow at the Weizmann Institute of Science, and in 1991 he joined the Paul Scherrer Institute to lead the solar chemistry R&D program.

His research program is aimed at the advancement of the thermal, thermochemical, and electrochemical engineering sciences applied to the field of renewable energy technology. The research focus is in radiation heat transfer and high-temperature chemical reactor engineering, with applications in solar fuels production (e.g. hydrogen), fossil fuel decarbonization processes, and CO₂ mitigation technologies. Prof. Steinfeld is the Editor of the *ASME Journal of Solar Energy Engineering*. He has authored over 100 research articles in refereed scientific journals and has contributed chapters to the *Encyclopedia of Physical Science & Technology* and the *Encyclopedia of Energy*.

RECEPTION: Tuesday, April 10, 2007 at 5:30 PM,
Lounge Corridor of the Campus Club, 4th Floor
Coffman Memorial Union, 300 Washington Ave SE