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ELMER L. GADEN JR., widely known as the "father of biochemical engineering," received all his degrees from Columbia. Shortly after receiving his doctorate in 1949, he became a faculty member and remained at Columbia, often serving as department chair, until 1979. He was the inaugural editor of *Biotechnology and Bioengineering* (1959–1974), and retired as Willis Johnson Professor from the University of Virginia in 1994. He received many awards throughout his career for scholarship, outstanding teaching, and service to the many professional organizations he served. In 2009 he was awarded the Fritz and Delores Russ Prize, one of engineering's highest honors, in delayed recognition of the profound effect of his work and leadership on the large-scale production of antibiotics following the Second World War.

THE GADEN MEMORIAL LECTURE is an annual examination of the changing interface between chemical engineering, cognate sciences, and society.

PAST GADEN LECTURERS

George Georgiou	2007
Frank Bates	2008
Frances Arnold	2009
John H. Seinfeld	2010
Chaitan Khosla	2011
Manfred Morari	2012

The Department of Chemical Engineering
Columbia University

2013 Gaden Memorial Lecture

presented by

Enrique Iglesia

Theodore Vermeulen Chair in Chemical Engineering
at the University of California at Berkeley

Faculty Senior Scientist at the Lawrence Berkeley
National Laboratory

ENRIQUE IGLESIA is the Theodore Vermeulen Chair in Chemical Engineering at the University of California at Berkeley and a Faculty Senior Scientist at the Lawrence Berkeley National Laboratory. He received a B.S. from Princeton University (1977) and a Ph.D. from Stanford University (1982) in chemical engineering. He joined Berkeley in 1993 after 12 years as a research scientist and manager at the Exxon Corporate Research Labs. He served as editor in chief of *Journal of Catalysis* (1997–2010) and acts as president of the North American Catalysis Society. He is a member of the National Academy of Engineering (2008) and a fellow of the American Chemical Society (2010).

His group addresses the synthesis and the structural and functional characterization of solids used as catalysts for production of fuels and petrochemicals, for conversion of energy carriers, and for improving the energy and atom efficiency and the sustainability of chemical processes. His work combines synthetic, spectroscopic, theoretical, and mechanistic techniques to advance novel concepts and applications in heterogeneous catalysis. He has coauthored more than 300 publications and 40 patents.

His research has been recognized with the 2012 ENI Prize, the ACS Somorjai and Olah Awards, the AIChE Wilhelm and Alpha Chi Sigma Awards, the Emmett and Burwell Awards of the North American Catalysis Society, the Cross Canada Lectureship of the Chemical Institute of Canada, and the François Gault Award of the European Federation of Catalysis Societies. He has also received the Award for Excellence in Natural Gas Conversion, the Tanabe Prize in Acid-Base Catalysis, a Humboldt Senior Scientist Award, and the Noyce Prize, the highest teaching honor in the sciences at Berkeley.

Abstract: Chemical reactions occur at the smallest of dimensions, where bonds cleave and form. The size of molecules, active structures, and their containers matters at such nanometer scales. Diversity and specificity in catalysis exploit size to expand the properties of elements. Reactivity in metals and oxides changes markedly as coordination and electronic environment at surfaces vary with cluster size. Low-coordination atoms stabilize transition states for reactions limited by bond cleavage on bare surfaces, but also make chemisorbed reactants less reactive, making small clusters effective in steps requiring such species. On oxides and sulfide semiconductors, the charge delocalization required at transition states connects naturally reactivity with electronic/optical properties. Confining active domains within small voids protects them from growth and impurities and allows preferential access by certain reactants, while also selecting specific transition states, thus conferring enzyme-like specificity to chemical catalysis.

The Department of Chemical Engineering
at Columbia University
is pleased to announce

THE SEVENTH ANNUAL GADEN MEMORIAL LECTURE:

Nanoparticles and Nanospaces: The Catalysis Toolbox

presented by

Professor Enrique Iglesia

Department of Chemical Engineering
University of California at Berkeley

Tuesday, October 8, 2013
4:00 p.m.

Davis Auditorium
412 Center for Engineering and
Physical Science Research (CEPSR)
Columbia University