You are
Cordially invited
to attend

The 42nd Annual

Harry G. Fair Memorial Lecture in Chemical Engineering 2016

Thursday, February18, 2016
Seminar – 1:45 P.M.
Room M-204
Sarkeys Energy Center
100 East Boyd
University of Oklahoma
Norman, Oklahoma

Coffee and refreshments will be served.

Harry G. Fair Memorial Lecturers

2016	Nicholas L. Abbott, University of Wisconsin-Madison
2015	Antonios G. Mikos, Rice University
2014	Mark E. Davis, California Institute of Technology
2013	Alexis T. Bell, University of California, Berkeley
2012	Charles Zukoski, University of Illinois
2011	Peter C. Stair, Northwestern University
2010	Juan J. de Pablo, University of Wisconsin-Madison
2008	Donald R. Paul, University of Texas at Austin
2007	David Mooney, Harvard University
2007	John Prausnitz, University of California, Berkeley
2006	George Georgiou, University of Texas at Austin
2005	James A. Dumesic, University of Wisconsin
2004	Robert C. Armstrong, Massachusetts Institute of Technology
2003	Nicholas Peppas, University of Texas at Austin
2002	Richard C. Alkire, University of Illinois
2001	Ralph T. Yang, University of Michigan
2000	Enrique Iglesia, University of California, Berkeley
1999	George Stephanopoulos, Massachusetts Institute of Technology
1998	Stuart L. Cooper, University of Delaware
1997	Keith E. Gubbins, Cornell University
1996	H. Scott Fogler, University of Michigan
1995	Gary L. Haller, Yale University
1994	Christopher W. Macosko, University of Minnesota
1993	Larry V. McIntire, Rice University
1992	Dan Luss, University of Houston
1991	E. N. Lightfoot, University of Wisconsin
1990	George A. Samara, Sandia National Labs
1989	James Wei, Massachusetts Institute of Technology
1988	C. Judson King, University of California, Berkeley
1987	Eli Ruckenstein, SUNY Buffalo
1986	Stuart W. Churchill, University of Pennsylvania
1985	John M. Campbell, John M. Campbell & Co.
1984	Richard G. Askew, Phillips Chemical Co.
1983	B. H. Sellers, Sellers Chemical Co.
1982	Lynn T. Reed, Warren Petroleum Col.
1981	Robert S. Purgason, Perry Gas Processors
1980	A. B. Slaybaugh, Conoco Inc.
1979	Charles R. Perry, Perry Gas Cos.
1978	Raymond W. Lowe, E. I. DuPont de Nemours
1977	Laurance S. Reid, Ball-Reid Engineers Inc.
1976	Harry L. Blomquist Jr., Coastal States Gas Co.
1975	Stanley Learned, Phillips Petroleum Co.

School of Chemical, Biological and Materials Engineering
Gallogly College of Engineering
University of Oklahoma
Sarkeys Energy Center, 100 East Boyd, Room T-301
Norman, Oklahoma 73019-1004
(405) 325-5811, cbme@ou.edu.

The UNIVERSITY of OKLAHOMA
Gallogly College of Engineering
School of Chemical, Biological and Materials Engineering

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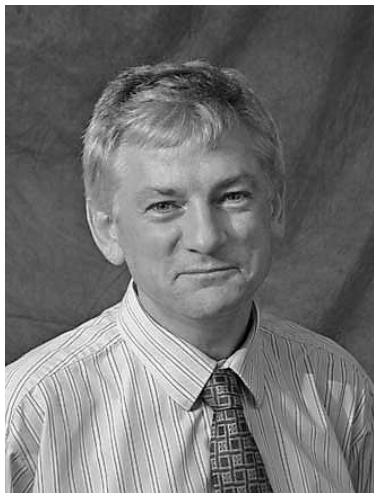

Nicholas L. Abbott
Chemical and Biological Engineering
University of Wisconsin
Madison, Wisconsin, USA

Modulation of the Strength of Hydrophobic Interactions Using Immobilized Ions

Harry G. Fair

Each year, a special lecture is given in memory of Harry G. Fair, an outstanding OU alumnus. Fair was born in Okmulgee, Oklahoma, on June 3, 1916, and earned his bachelor of science degree in chemical engineering in 1939. He joined Phillips Petroleum Company in 1939 and worked his way up to vice president for supply and transportation, with responsibility for worldwide exchange of crude oil and all transportation facilities. In 1966, Fair joined M. W. Kellogg Company as executive vice president in charge of all engineering activities. He was named executive vice president of Coastal States Gas Corporation in 1971, a post he held until his death on July 27, 1974. A member of a number of professional societies and a licensed professional engineer, Fair was active in service to society and his alma mater.

This lecture is made possible by the Harry G. Fair Memorial Fund established by his widow, Jane Swift Fair. Arrangements for the lecture are made by the School of Chemical, Biological and Materials Engineering in OU's College of Engineering.

Modulation of the Strength of Hydrophobic Interactions Using Immobized Ions

Nicholas L. Abbott

Chemical and Biological Engineering
University of Wisconsin
Madison, Wisconsin, USA

The structuring of water near non-polar molecular fragments or surfaces mediates cohesive interactions (so-called hydrophobic interactions) that underlie a broad range of interfacial, colloidal and biophysical phenomena. Substantial progress has been made during the past decade towards understanding hydrophobic interactions in simple model systems, but in most biological and technological contexts, non-polar domains are found in close proximity to polar and charged functional groups. Theories and simulations hint that the effects of nanometer-scale chemical heterogeneity on hydrophobic interactions may be important, but these ideas have not been tested experimentally. In this presentation, I will show that ions immobilized adjacent to non-polar domains can substantially increase or decrease the strength of hydrophobic interactions, with the effect strongly dependent on the specific ion type. By using chemical force microscopy and surfaces presenting alkyl and amine/ammonium (Am) units, we have found that protonation of amines can double the strength of hydrophobic interactions. In contrast, guanidine/guanidinium (Gdm) groups, when co-immobilized with alkyl groups, are found to eliminate measurable hydrophobic interactions. These divergent effects of proximally immobilized cations were confirmed by single-molecule force measurements with sequence-specific oligopeptides. Overall, our results demonstrate that the "hydrophobicity" of non-polar domains is not a property of the species that constitute the domain but rather is strongly modulated by functional groups located as far away as 1 nm. This understanding provides a fresh starting point for optimizing molecular recognition processes as well as the self-assembly of synthetic amphiphiles, colloids, or macromolecules by judiciously placing charged groups near non-polar domains to tune hydrophobic driving forces.

Nicholas L. Abbott Biography

Nicholas Abbott received a Bachelor of Engineering (Chemical Engineering) from University of Adelaide, Australia in 1985, and a PhD in Chemical Engineering from Massachusetts Institute of Technology in 1991. He was a postdoctoral fellow in the Chemistry Department of Harvard University from 1991-1993 prior to his first academic appointment at University of California-Davis.

He is currently the Sobota Professor and the Hilldale Professor of Chemical and Biological Engineering at University of Wisconsin-Madison. He is also Director of the Wisconsin Materials Research Science and Engineering Center.

His research interests focus on colloid and interfacial phenomena, and he is a Member of the National Academy of Engineering. He currently serves as Editor-in-Chief of *Current Opinion in Colloid and Interface Science*, and is on the editorial boards of *Langmuir* and *Surface Science*.