



The Chemical and Biological Engineering Department of the  
University at Buffalo School of Engineering and Applied Sciences  
is Proud to Announce

## The 2013 Eli Ruckenstein Lecture

# “Intelligent and Diagnostic Therapeutic Systems: Advanced Biomaterials and Improved Health Care”

### Nicholas A. Peppas, Sc.D.

Fletcher Stuckey Pratt Chair in Engineering

Professor of Biomedical Engineering,  
Chemical Engineering and Pharmacy

Chairman, Biomedical Engineering  
Department

Director of Center on Biomaterials,  
Drug Delivery, and Bionanotechnology  
The University of Texas at Austin

Tuesday, April 23, 2013  
1:30 p.m.

Screening Room  
First floor, Center for the Arts  
UB Amherst Campus

*Reception to follow*



## About Eli Ruckenstein:

Eli Ruckenstein, SUNY Distinguished Professor, has been on the faculty of the University at Buffalo for nearly forty years. Over this time, his prolific and imaginative research has advanced almost every area of interest to chemical engineering. Ruckenstein spent his formative years behind the Iron Curtain, in Romania, where — with a combination of native intellect, genuine scientific curiosity, and sheer strength of will — he prepared himself for a lifetime of achievement in engineering and science. His work quickly gained international recognition, and he escaped to the West in 1969, joining UB in 1973.

Eli Ruckenstein has received countless honors paying tribute to work across many fields of research, and was most recently elected to the 2012 class of the American Academy of Arts and Sciences. From the American Institute of Chemical Engineers he won the Alpha Chi Sigma Award for his work in transport phenomena, the Walker Award for his work in catalysis, and the Founders Award for his overall contributions to science. From the American Chemical Society he received the Kendall Award for his research in colloids and interfaces, the Langmuir Lecture Award for his contributions to macromolecules, the Schoellkopf Medal for his work in supported metal catalysts, and the Murphree Award in Industrial and Engineering Chemistry. He was given the Humboldt Award by Germany for his work in surfactants, and the Creativity Award by the National Science Foundation for his work in biomolecules. In addition he has been invited numerous times to present named lectures around the world. These contributions and more were further recognized with the National Medal of Science, bestowed in a White House ceremony in 1999. Ruckenstein was elected to the National Academy of Engineering in 1990 and he received the Founders Award from the Academy in 2004. He is a fellow of the American Institute of Chemical Engineers, which, with the occasion of its 100th anniversary, designated him as one of 50 Eminent Chemical Engineers of the Foundation age.

### The Ruckenstein Lecture Series

Is supported by the Ruckenstein Fund, a new endowment with an ongoing campaign. Funds generated from this endowment will be used to support the Ruckenstein Lecture Series and provide resources to improve teaching and research laboratories in the Department.

### Previous Lecturers

- 2009 Rakesh K. Jain, Harvard Medical School and Massachusetts General Hospital
- 2010 George Stephanopoulos, Massachusetts Institute of Technology
- 2011 Pablo G. Debenedetti, Princeton University
- 2012 Dennis C. Prieve, Carnegie Mellon University

[www.cbe.buffalo.edu](http://www.cbe.buffalo.edu)

### The UB Department of Chemical and Biological Engineering

offers a world-class undergraduate education while pursuing integrative research and graduate training at the frontiers of chemical engineering, in the main areas of nanoscale science and engineering, computational science and engineering, and biochemical and biomedical engineering.

The Department was founded in 1961 and is among the youngest in the Nation. From the start its founders inculcated it with a deep respect for scholarship, and as a consequence the Department quickly grew to the national prominence that it continues to enjoy today. The CBE department is now undergoing a phase of tremendous growth as we expect to add several new faculty in our ranks that already include three members of the National Academy of Engineering.

# Intelligent and Diagnostic Therapeutic Systems: Advanced Biomaterials and Improved Health Care

Nicholas A Peppas, Sc.D.

Fletcher Stuckey Pratt Chair in Engineering  
Professor of Biomedical Engineering, Chemical Engineering and Pharmacy  
Chairman, Biomedical Engineering Department  
Director of Center on Biomaterials, Drug Delivery, and Bionanotechnology  
The University of Texas at Austin

## Abstract

Engineering the molecular design of intelligent biomaterials by controlling recognition and specificity is the first step in coordinating and duplicating complex biological and physiological processes. Recent developments in protein delivery have been directed toward the preparation of targeted formulations for protein delivery to specific sites, use of environmentally-responsive polymers to achieve pH- or temperature-triggered delivery, usually in modulated mode, and improvement of the behavior of their mucoadhesive behavior and cell recognition. We address design and synthesis characteristics of novel crosslinked networks capable of protein release as well as artificial molecular structures capable of specific molecular recognition of biological molecules. Molecular imprinting and microimprinting techniques, which create stereo-specific three-dimensional binding cavities based on a biological compound of interest can lead to preparation of biomimetic materials for intelligent drug delivery, drug targeting, and tissue engineering. We have been successful in synthesizing novel glucose- and protein-binding molecules based on non-covalent directed interactions formed via molecular imprinting techniques within aqueous media.

## About Nicholas A. Peppas:

Nicholas A. Peppas is the Fletcher S. Pratt Chaired Professor in the Departments of Chemical Engineering, Biomedical Engineering and Pharmacy, and Chairman of the Department of Biomedical Engineering of the University of Texas at Austin. His work in biomaterials, polymer physics, drug delivery and bionanotechnology follows a multidisciplinary approach by blending modern molecular and cellular biology with engineering principles to design the next-generation of medical systems and devices for patient treatment. Over the past 35 years he has set the fundamentals and rational design of drug delivery systems and developed models of drug and protein diffusion in controlled release devices and biological tissues. In 2012 he received the Founders Award of the National Academy of Engineering, the highest recognition of the Academy, for these contributions to the field. Peppas is a member of the NAE, IOM, the National Academy of France, the Royal Academy of Spain, and the Academy of Texas. He has been recognized with awards from AIChE (Founders Award, William Walker Award, Institute Lecture, Jay Bailey Award, Bioengineering Award, Materials Award), the Biomedical Engineering Society (Distinguished Scientist Award), the American Institute of Medical and Biological Engineering (Galletti Award), the Society for Biomaterials (Founders, Clemson and Hall Awards), the Controlled Release Society (Founders, Heller and Eurand Awards) and other societies. In 2008, AIChE named him one of the One Hundred Chemical Engineers of the Modern Era. He is President of the International Union of Societies of Biomaterials Science and Engineering, Chair-elect of the Engineering Section of the American Association for the Advancement of Science, and Past-Chair of the Council of BME Chairs. Previously, he served as President of SFB and the Controlled Release Society. He is a fellow of AAAS, AIChE, APS, ACS, MRS, SFB, BMES, AIMBE, CRS, AAPS, and ASEE. He has supervised the research of 95 PhDs and about 180 postdocs and graduate students. Peppas holds a Dipl. Eng. from the NTU of Athens (1971), a Sc.D. from MIT (1973), and honorary doctorates from the Universities of Ghent, Parma, Athens and Ljubljana.





Engineering

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