BMES Distinguished Achievement Lecture Award:

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University of Texas, Austin

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8:30AM
BALLROOM D, CONVENTION CENTER

From Drug Delivery and Targeted Therapeutics to Advanced Intelligent Biomedical Devices for Improved Health Care

DURING THE EARLY DAYS of drug delivery studies, forty years ago, the field was considered outside of the main scope of biomedical engineering. Yet, major successes in health care and disease treatment through careful engineering design of advanced drug delivery systems led to maturity of the field, where biomedical transport phenomena and biopolymer development merged to create a generation of general and targeted drug delivery systems for the treatment of a wide range of diseases. These days, successful targeted delivery systems are designed to allow delivery of therapeutic or diagnostic agents to a preferential site. As targeted nanodelivery involves local delivery of therapeutics and diagnostics at disease sites, this method has received considerable attention and is poised to have a significant impact on medicine. Efficient targeted delivery systems allow for a reduced systemic dosage while resulting in relatively higher or more efficient dosing at the target site. Targeted delivery has become a rich field of drug delivery and nanomaterials. Nanoscale materials are a necessity for most targeted delivery systems as they must be allowed to transport through different tissue spaces in order to localize at the target site. The ability of nanoparticles to localize at a target site is dependent on chemical properties, the presence of a targeting ligand, or size. Even with targeted delivery, only a fraction of the administered dose localizes at the target site while the remaining nanoparticles distribute throughout the body. Pharmacokinetics pertaining to the nanodelivery system determine the dose in non-targeted tissues. Understanding of nanoparticle biodistribution and pharmacokinetics is significant in the successful development and translation of targeted delivery systems. The design of optimized targeted delivery systems is based on the drug or agent of interest, the nanoparticle type that allows sufficient loading of the drug, and the physicochemical properties that allow for targeting. We highlight some of this recent work on targeted delivery systems and focus on in vivo performance, localization, and the incorporation of diagnostic and therapeutic agents in targeted delivery systems.

NICHOLAS A. PEPPAS is the Fletcher Stuckey Pratt Chair in Engineering, Professor of Biomedical Engineering, Chemical Engineering and Pharmacy, and Chair of the Department of Biomedical Engineering at the University of Texas at Austin. He is a member of the Institute of Medicine of the National Academies, the National Academy of Engineering, the National Academy of Pharmacy of France, and the Texas Academy of Medicine, Engineering and Sciences. Peppas has been a leader in biomaterials, drug delivery and pharmaceutical bioengineering. The multidisciplinary approach of his research blends modern molecular and cellular biology with engineering to generate the next-generation of medical systems and devices for patient treatment. He has been recognized with the Pierre Galletti Award from AIMBE, several awards from AIChE (Founders Award, William Walker Award, Institute Lecture, Bailey Award, Bioengineering Award, Materials Award), Society for Biomaterials (Founders, Clemson and Hall Awards), Controlled Release Society (Founders, Heller and Eurand Awards) and other Societies. He is a fellow of BMES, AIMBE, AIChE, APS, MRS, SFB, CRS, AAPS, AAAS and ASEE. He is the President of the International Union of Societies of Biomaterials Science and Engineering, the Chair-elect of the BME Chairs Council, and a member of the Board of BMES. Peppas has served as President of the Society for Biomaterials and the Controlled Release Society, as Chair of the College of Fellows of AIMBE, and as Director of AIChE. He was the Editor of Biomaterials from 1982 to 2002. Presently, he is Editor-in-Chief of the SFB/Wiley Biomaterials Book Series and Associate Editor of the Cambridge University Press Biomedical Engineering Series, the AIChE Journal and Biomedical Microdevices. He has published 1100 papers and 45 patents and has supervised the research of numerous postdoctoral and graduate students including 88 PhDs, 37 of them presently professors in other Universities. Dr. Peppas holds a Dipl. Eng. from the National Technical University of Athens (1971), a Sc.D. from the Massachusetts Institute of Technology (1973), and honorary doctorates from the University of Ghent, Belgium, the University of Parma, Italy, and the University of Athens, Greece.