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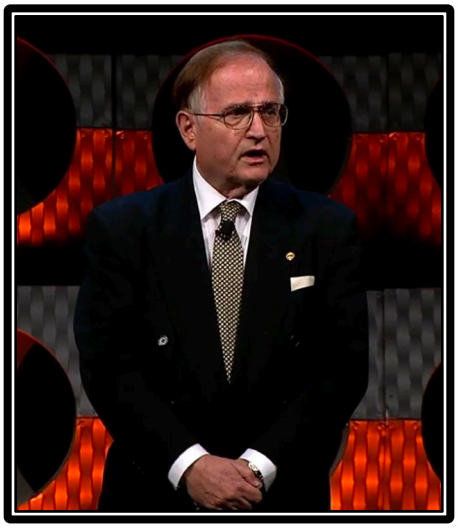

Convergence of Advanced Soft Matter Synthesis, Thermodynamic Intelligence and Biological Communication

Recent advances in the biomedical engineering field encompass a wide range of technologies, processes, (bio)materials, hybrid systems, medical devices, modern imaging techniques as well as new technologies for complex calculations, large data analysis and advanced computational techniques. The ultimate goals of all these developments is the ability to conduct non-invasive diagnosis, cause recognition and therapeutic action, often with improved automation and process differentiation but also containment or reduction of costs and ultimately with improvement of the quality of life of our patients.

New intelligent, physiologically responsive materials with long term bio- and blood compatibility is the next goal of the field. Advanced imaging techniques continue to be an important goal of the field of biomedical engineering. Biomarkers recognition is of utmost importance in medical applications including imaging, drug delivery, and regenerative medicine. This continues to be an important goal of the field. Use of biomimetic materials in advanced medical devices provides biomolecule recognition which is of utmost importance in medical applications, ranging from the design of diagnostic platforms to the development of new drug delivery systems. Antibodies are the gold standard for biologic recognition, but their incorporation into many clinical products is impaired by environmental instability, and expense. New processes re needed to achieve biomolecule specificity through spatial incorporation of functional monomers, thus providing an inexpensive and highly stable platform for medical applications.

More complex, yet functional tissues or organoids can be fabricated by combining the advances in biology, on-chip technologies, biomanufacturing, biomaterials, and drug delivery. Despite recent progress, there are still many challenges that remain to be addressed. For example, the formation of a niche that supports cellular growth, differentiation, and function is still the subject of many research studies. The natural extracellular environment may comprise a highly defined microarchitecture formed from various proteins, polysaccharides, and glycosaminoglycans resulting in modulation of cell-level and tissue level physical and chemical properties. The presence of a cocktail of factors affecting biological processes at different stages of tissue development and maturation combined with proper oxygenation, as well as nutrient transport result in the development and function of different tissues and organs in the human body.

Mimicking these properties in engineered tissue constructs, although desirable, is not trivial. To facilitate the formation of functional tissues, advanced biomaterials with controlled physical, chemical, biological, and electrical properties should be designed. Hydrogels and advanced biomaterials possess properties required for tissue engineering applications.

SHORT BIOGRAPHY Nicholas A. Peppas, Sc.D.

Nicholas A. Peppas, Sc.D. serves as the Cockrell Family Regents Chaired Professor in the Departments of Chemical, Biomedical Engineering, Pediatrics, Surgery and Pharmacy, and Director of the Institute of Biomaterials, Drug Delivery and Regenerative Medicine of the University of Texas at Austin. His work in biomaterials, drug delivery bionanotechnology and nanomaterials follows a multidisciplinary approach by blending modern molecular and cellular biology with engineering principles to design the next-generation of therapeutic agent release systems for treatment of diabetes, autoimmune and cardiovascular diseases, medical systems and devices for patient treatment. Over the past four decades he has set the fundamentals and rational design of biomedical systems and developed models of drug and protein diffusion in controlled release devices and biological tissues. He has 145,000 citations with H=178. His inventions include articular cartilage, new vocal cords, non-thrombogenic biomaterials and artificial organs, delivery systems for insulin (diabetes), calcitonin (osteoporosis), interferon-beta (multiple sclerosis) and other applications.

Peppas has received the Founders (Simon Ramo) Award of the National Academy of Engineering (NAE, 2012) and the Adam Yarmolinsky Award of the National Academy of Medicine (NAM, 2018), the highest recognitions of these two Academies. Italy bestowed upon him the Giulio Natta Medal (2012) an Germany the 1995 APV Medal for Distinguished Contributions. Other major awards include: from AIChE the Founders, William H. Walker, Jay Bailey, Institute Lecture, Bioengineering, and Stine Materials Awards, from the Society for Biomaterials the Founders and Clemson Awards, from the American Chemical Society the Herman Mark and the Applied Polymer Science Awards, from BMES the Pritzker Medal and the Distinguished Biomedical Scientist Awards, from ASEE the highest educational recognition in the USA, the Benjamin Carver Lamme Award, the 2017 Inaugural Pioneer in Nanotechnology Award from Johns Hopkins University, the 2010 Acta Biomaterialia Gold Medal, from the American Association of Pharmaceutical Scientists, the Distinguished Pharmaceutical Scientist Award, the Dale E. Wurster Award in Pharmaceutics, and the Research Achievement Award in Pharmaceutical Technology, and from the Controlled Release Society, the Founders, Eurand, Heller and Capsugel Awards.

Peppas is a member of the National Academy of Engineering, the National Academy of Medicine, the American Academy of Arts and Sciences, and the National Academy of Inventors. He is also a member of the Chinese Academy of Engineering, the Korean Academy of Science and Technology, the Indian National Academy of Engineering, the European Academy, the National Academy of France, the Royal National Academy of Pharmacy of Spain, the Academy of Athens, the Canadian Academy of Engineering, the International Academy of Medical and Biological Engineering and the Academy of Medicine, Engineering and Science of Texas.

He has served as President of the International Union of Societies of Biomaterials Science and Engineering (2008-16), President of the Engineering Section of the American Association for the Advancement of Science (2012-14), Chair of the Council of BME Chairs, (2011-12), President of the Society for Biomaterials (2003-04), and President of the Controlled Release Society (1987-88). He is the Deputy Editor of the journal “Science Advances” (AAAS, Science family) and Editor of the journal “Regenerative Biomaterials” (Oxford University Press). Peppas is a fellow of AAAS, AIChE, APS, ACS, MRS, SFB, BMES, AIMBE, CRS, AAPS, and ASEE. He holds a Dipl. Eng. from the NTU of Athens (1971), a Sc.D. from MIT (1973), Honorary Doctorates from the Universities of Ghent (Belgium), Parma (Italy), Athens (Greece), Ljubljana (Slovenia), Patras (Greece), National Technical University of Athens (Greece), University of Santiago de Compostela (Spain), University of Thesssaloniki (Greece).