News and Views September 2020

Published online: 6 August 2020
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Awards and Recognitions

American Institute for Medical and Biological Engineering

The American Institute for Medical and Biological Engineering (AIMBE) inducted its 2020 Fellows in an online ceremony on June 5. AIMBE is the authoritative voice and advocate for the value of medical and biological engineering to society. Its mission is to recognize excellence, advance the public understanding of, and accelerate medical and biological innovation. AIMBE also drives advocacy initiatives into action on Capitol Hill and beyond. At AIMBE College of Fellows, Fellows are nominated each year by their peers and represent the top two percent of the medical and biological engineering community. They are considered the life-blood of AIMBE and work toward realizing AIMBE’s vision to provide medical and biological engineering innovation for the benefit of humanity.

Congratulations to the SFB Members who were inducted as 2020 Members of the AIMBE College of Fellows:

- Jianjun Guan, PhD, Washington University in St. Louis
- SuPing Lyu, PhD, Medtronic
- Jon P. Moseley, PhD, Wright Medical
- Angela Panoskaltsis-Mortari, PhD, University of Minnesota
- Josephine Allen, PhD, University of Florida
- Themis Kyriakides, PhD, Yale University
- Qiaobing Xu, PhD, Tufts University
- Lauren D. Black, PhD, Tufts University
- Jaime E. Ramirez-Vick, PhD, Wright State University
- Yunzhi Yang, PhD, Stanford University
- Christopher Bettinger, PhD, Carnegie Mellon University

The election to the Academy represents a highly selective process, and there are currently about 150 members before the announcement of Class 2020. The IAMBE Fellows are nominated by current Fellows, evaluated by the Membership Committee, and elected by a voting process of all active Fellows. The election to the Academy is in recognition of a colleague’s distinguished contributions to and leadership in the field of medical and biological engineering at an international level. The new Fellow Induction will be held in a Virtual Induction Ceremony, in conjunction with Carnegie Mellon Forum on Biomedical Engineering on September 18, 2020. The following are some of 2020 Class of Fellows:

- Christopher N. Bowman, PhD, University of Colorado Boulder
- Lisa Brannon-Peppas, PhD, The University of Texas at Austin
- Ashutosh Chilkoti, PhD, Duke University
- John Fisher, University of Maryland
- David Kaplan, PhD, Tufts University
- Cato Laurencin, PhD, University of Connecticut

POLY Fellows Program

The POLY Fellows Program was established in 2009 to recognize excellence in all ways that POLY members advance the field of polymer science, through either scientific accomplishments, service to the profession, or both. The awards are administered and sponsored by the POLY division of the American Chemical Society (ACS). Fellows are presented with an award plaque and special recognition during Fall ACS Meeting. Some of the 2020 POLY Fellows are:

- Matthew L. Becker, Professor of Chemistry, Mechanical Engineering, Material Science and Biomedical Engineering at Duke University, was elected to the class of 2020 POLY Fellows. Becker works at the interface of chemistry, organic materials, and medicine. His research focuses on developing families of degradable polymers with highly tunable physical and biological properties.
that are being applied to unmet needs in bone, soft tissue, and neural and vascular tissue engineering. He is also actively engaged in additive manufacturing and leads the development of custom inks that are enabling unique solutions to challenging problems in biomaterials and drug delivery. Dr. Becker earned a B.S. in chemistry at Northwest Missouri State University (1998) and a PhD in organic chemistry under the direction of Professor Karen L. Wooley at Washington University in St. Louis (2003) as an NIH Chemistry Biology Interface Training Fellow. Nicholas A. Peppas, Professor of Biomedical Engineering, Chemical Engineering, Pediatrics, Surgery and Pharmacy at the University of Texas at Austin and an expert in biomaterials and drug delivery systems, was recognized as a POLY Fellow for the class of 2020. Dr. Peppas was elected for his lifetime achievements in the areas of biomaterials, drug delivery, and chemical engineering. He is recognized for his extensive work on the preparation, characterization, and evaluation of biopolymers and hydrogels, used as biomaterials in artificial organs and in devices for the delivery of drugs, peptides, and proteins. The multidisciplinary approach of his research in biomolecular engineering blends modern molecular and cellular biology with engineering to generate next-generation systems and devices, including bioMEMS with enhanced applicability, reliability, functionality, and longevity. Dr. Peppas is a member of the National Academy of Engineering, the Institute of Medicine of the National Academies, the National Academy of France, the Royal National Academy of Pharmacy of Spain, etc.

The Power List 2020

The Medicine Maker’s annual Power List, published every April, compiles the top 100 most prominent and inspirational individuals involved in biopharmaceuticals and advanced medicine. The year 2020 has proven to be a challenging year for humanity: volcanic eruptions, bushfires, floods, storms, the melting of glaciers, and the emergence of COVID-19, which has brought much of the world to a standstill. The professionals highlighted here are driving the industry forward and saving lives by developing new medicines. Some of these individuals are also lending a helping hand in bringing COVID-19 vaccines and treatments to market. Some of the inspirational medicine makers that were named in the 2020 Power list are:

Robert S. Langer, the David H. Koch Institute Professor at Massachusetts Institute of Technology, is the most cited engineer in history and one of the most prolific inventors in all of medicine. Dr. Langer has nearly 1300 issued and pending patents, many of which have been licensed or sublicensed to over 350 pharma, chemical, biotech, and medical device companies. He has been honored with over 200 major scientific awards, including the United States National Medal of Science and the 2002 Charles Stark Draper Prize. Langer has been elected to the National Academy of Medicine, the National Academy of Engineering, the National Academy of Sciences, and the National Academy of Inventors. He has also founded a number of biopharma companies, including Moderna Therapeutics, which is one of the companies pursuing the development of a COVID-19 vaccine.

Justin Hanes, the Lewis J. Ort Professor of Ophthalmology and the Director of the Center for Nanomedicine at John Hopkins University (JHU), conducts research at the interface of nanotechnology and medicine. Dr. Hanes is internationally recognized for designing and synthesizing new biodegradable plastics to create nanoscopic, drug/gene-filled particles, capable of targeted delivery to specific sites in the body. His lab discovered methods to make drug- and gene-loaded particles that efficiently penetrate mucus barriers, which may allow for more effective therapies for eye diseases. Dr. Hanes received his PhD in chemical engineering from MIT and completed a two-year postdoctoral fellowship in oncology and neurosurgery at Johns Hopkins prior to his initial faculty appointment in 1998.

Antonios G. Mikos is the Louis Calder Professor of Bioengineering and of Chemical and Biomolecular Engineering at Rice University. Mikos’ research focuses on the synthesis, processing, and evaluation of biomaterials for use as scaffolds in tissue engineering, carriers for controlled drug delivery, non-viral vectors for gene therapy, and platforms for disease modeling. His work has led to the development of orthopedic, dental, cardiovascular, neurologic, and ophthalmologic biomaterials. “A major obstacle for tissue engineering is the translation of biological discoveries into regenerative medicine solutions for the treatment of patients,” says Mikos. His vision for advanced medicine focuses on the development of biomaterials to enable engineers, scientists, and clinicians to work collaboratively to create viable tissues and organs.

María José Alonso is the Professor of Biopharmaceutics and Pharmaceutical Technology at the University of Santiago de Compostela (USC). Alonso’s lab has pioneered numerous discoveries in the field of nanopharmaceutical technology and nanomedicine. She believes that drug development could improve if academic researchers adopt a more “rational approach towards unmet needs and criteria to ensure quality and reproducibility.” She has coordinated several research consortia.
financed by the WHO, the Gates Foundation and the European Commission. She is the author of over 280 scientific contributions with more than 17,800 citations and the inventor of 22 patent families. Alonso has also received numerous awards, including the “King Jaume I Award” on New Technologies, the “Maurice Marie Janot Award,” and the “CRS Founders Award”. Alonso is the past president of the Controlled Release Society. She is also a member of three Academies in Spain and the US National Academy of Medicine. She is also an editorial board member of Regenerative Engineering and Translational Medicine.

**Academic Appointments**

Dr. Anthony Guiseppi-Elie is joining Anderson University as the founding dean of the new Engineering College, where he will serve as vice president for industry relations and Distinguished University professor. Anderson University is known for its innovative approach to higher education and rapid growth into the largest private institution of higher learning in South Carolina. Dr. Guiseppi-Elie was previously at the Texas Engineering Experiment Station (TEES) and was a Professor of Engineering in the College of Engineering at Texas A&M University. Guiseppi’s research interests are in engineered bioanalytical microsystems in the service of human health and medicine. He has published over 145 scientific papers. He is the Editor-in-Chief of Bioengineering, and Associate Editor of Biomedical Microdevices and member of the editorial boards of The Journal of Bioactive and Compatible Polymers, NanoBiotechnology, and Applied Biochemistry and Biotechnology. He has been a Guest Editor for the IEEE Journal of Biomedical and Health Informatics. He holds degrees from the Massachusetts Institute of Technology, University of Manchester Institute of Science and Technology, and the University of the West Indies.

**Advancements in Academia**

In a study published in Science Translation Medicine, the research groups of Dr. Jianzhong Jeff Xi, Professor in the Department of Biomedical Engineering at the Peking University, and Jia-Fu Ji, Professor at the Department of Gastrointestinal Surgery at the Peking University, developed patient-derived tumor-like cell clusters (PTCs) for drug testing in cancer therapy. PTCs resulted from the migration and self-assembly of dissociated primary cells into clusters. These PTC models recapitulate the original tumors as they contain stromal cells like macrophages and fibroblast cells and epithelial cells and enable personalized drug testing within two weeks of obtaining the tumor samples. This study showed that the PTC models could predict a patient’s clinical response to chemotherapy with very high accuracy in gastrointestinal, colorectal, and breast cancers. Even though these findings are yet to be validated in a large clinical trial, the paper indicates that the PTC model can be utilized in making a clinical decision for selecting the suitable therapy.

In a recent study in Nature Communications, the research groups of Dr. Carl A. Gregory, Assistant Professor at the Department of Molecular and Cellular Medicine at the Texas A&M Health Science Center, and Dr. Roland Kaunas, Associate Professor at the Department of Biomedical Engineering at Texas A&M University, describe a highly osteogenic mesenchymal stem cell (MSC) line generated from induced pluripotent stem cells which generated high yields of an osteogenic cell matrix (ihOCM) in vitro. They demonstrated that the intrinsic osteogenic activity of ihOCM surpassed bone morphogenetic protein 2 (BMP2) driving healing of calvarial defects in 4 weeks in mice by a mechanism mediated in part by collagens VI and XII. The study indicated that ihOCM may represent an effective replacement for autograft and BMP products used commonly in bone tissue engineering.

The research group of Dr. Mehdi Nikkhah, Assistant Professor in the School of Biological and Health Systems Engineering at Arizona State University, developed a microfluidic platform for 3D modeling of cardiac tissues where cardiomyocytes were co-cultured with interstitial cardiac fibroblasts embedded within hydrogels in the microfluidic platform. This platform was precisely engineered through incorporation of surface topography in the form of staggered microposts to enable long-term culture and maturation of cardiac cells, resulting in formation of physiologically relevant cardiac tissues with anisotropy that mimics native myocardium. After two weeks of culture, human pluripotent stem cell–derived cardiac tissue exhibited well-defined sarcomeric striations, highly synchronous contractions, and upregulation of several maturation genes. The beating rate analysis of cardiomyocytes showed that larger variations in beating rates were observed on tissues cultured on chips without the posts than the ones with posts. These findings demonstrate the ability of the proposed engineered platform to mature animal—as well as human stem cell–derived cardiac tissues over an extended period of culture, providing a novel microfluidic device with the capability for cardiac disease modeling and therapeutic testing. This study was published in the journal Biomaterials.

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