UNIVERSITY OF DELAWARE

CHEMICAL & BIOMOLECULAR ENGINEERING

SPRING 2024 SEMINAR SERIES

SYNTHETIC GLYCOBIOLOGY: DESIGNING AND ENGINEERING GLYCOMOLECULES INSIDE AND OUTSIDE OF CELLS

APR 26 | 10:15 AM | 102 COLBURN LAB

MATTHEW DELISA

CORNELL UNIVERSITY

William L. Lewis Professor of Engineering

Attend virtually: https://udel.zoom.us/j/91386404306

Complex carbohydrates, or glycans, are involved in almost every human disease and biological process. Hence, the field of glycoscience has the potential to broadly impact society in areas as diverse as medicine, energy, and materials. In the last decade, an entirely new discipline called bacterial glycoengineering has made it possible to produce designer glycans on demand, some containing unnatural sugars, and to evolve enzymes, pathways, and host organisms that catalyze prescribed glycosylation reactions. In addition to their biotechnological potential, bacteria equipped with recombinant glycosylation pathways hold promise to improve our fundamental understanding of the glycosylation process. To overcome the complexity of cell-based processes and our inability to control glycosylation components at precise ratios, we have focused on the seamless integration of experimental and computational approaches to develop and optimize a first-of-its-kind cell-free glycoprotein synthesis system that permits biosynthesis and conjugation of customized glycans to target proteins of interest both in one-pot reaction vessels and microfluidic architectures. This talk will cover some of our recent progress towards the purposeful alteration and rational construction of diverse glycosylation systems in both living cells and cell-free reaction environments. By leveraging chemical and molecular biological approaches in conjunction with metabolic engineering and synthetic biology tools, our glycoengineering work has been instrumental in increasing our understanding of glycosylation networks and producing desired glycans and glycoconjugates.

ABOUT THE SPEAKER

Matthew P. DeLisa is the William L. Lewis Professor of Engineering in the School of Chemical and Biomolecular Engineering at Cornell University. His research focuses on understanding and controlling the molecular mechanisms underlying protein biogenesis -- folding and assembly, membrane translocation and post-translational modifications -- in the complex environment of a living cell. Professor DeLisa received a B.S. in Chemical Engineering from the University of Connecticut in 1996; a Ph.D. in Chemical Engineering from the University of Maryland in 2001; and did postdoctoral work at the University of Texas-Austin, Department of Chemical Engineering. DeLisa joined the Department of Chemical and Biomolecular Engineering at Cornell University in 2003. He has also served as a Gastprofessur at the Swiss Federal Institute of Technology (ETH Zürich) in the Institut für Mikrobiologie. He has garnered a number of honors and awards including most recently the ACS Marvin J. Johnson Award in Microbial and Biochemical Technology and the Biotechnology Progress Award for Excellence in Biological Engineering Publication, along with being named to the inaugural "Life Sciences Power 50" by City & State New York. He is an elected fellow of the American Institute for Medical and Biological Engineering, the American Academy of Microbiology, and the American Association for the Advancement of Science and in recent years has served on the IDA/DARPA Defense Science Study Group and the National Academies Committee on Innovative Technologies to Advance Pharmaceutical Manufacturing.

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