Politecnico di Torino

DiSAT

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SEMINAR

Polymeric Proteomimetics: Protein-Scale Precision Materials for Cancer and Neurodegenerative Disease

Speaker:

PROF. NATHAN C. GIANNESCHI

Jacob & Rosaline Cohn Professor
Departments of Chemistry, Materials Science & Engineering, Biomedical Engineering and Pharmacology
Northwestern University (US)

Abstract:

We describe a pioneering approach to address areas of clinical unmet need. “Materials Biology” seeks to harness concepts in materials science and engineering to perturb, probe and drug cellular systems. These approaches do not include drug carriers or drug eluting entities; rather, they are materials capable of directly engaging with their targets (e.g., proteins, carbohydrates, nucleic acids) to probe and/or alter biological processes. Indeed, their function is often intrinsically linked to multivalency and macromolecular architecture mimetic of natural materials and complex protein systems. Hence, Materials Biology has as its analogue, “Chemical Biology,” a field that utilizes chemical tools to probe and perturb cellular/biological systems. Materials Biology emerges where small molecule probes and traditional antibody/biomolecule-based approaches have failed or continue to struggle. This has opened up opportunities for rethinking how we tackle key problems and questions in biology using materials at the same length scale as nature’s building blocks. For example, the problem of probing and disrupting complex protein-protein interactions (PPIs) occurring at the 0.1 to 10 nm length scale, between intrinsically disordered proteins and/or within protein aggregates and phase separated states that are more material than molecular in nature and behavior. Such complex, disordered proteins and indeed biological barriers including the skin and the BBB combine to severely limit the utility of traditional, large nanoparticles, small molecules and current biologics. We describe the development of new therapeutic material platform technology with translational potential in oncology and incurable neurodegenerative disease.

ORGANIZER: **giovanni.pavan@polito.it**