

Fundamental Concepts and Processes Inspired by Nano-biosystems to Create Biomaterials

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ABSTRACT

This talk will illustrate fundamental concepts and processes of 1) self-assembling and quantum effects, 2) programmable synthesis in nano-scale, and 3) transition from non-human to human living nanostructures inspired by nano-biosystems, through three case studies, including 1) GFP/YFP-inspired fluorescent peptide nanoparticles, 2) ivy adhesive inspired tunable nano-composite, and 3) sundew adhesive inspired biological hydrogels.

SHORT-BIO:

Mingjun is a Professor of Biomedical Engineering at Ohio State University, Columbus, OH, USA. His research interest lies in bio-inspired nanoparticles and bio-inspired robotics. In 2008, his research group first discovered that ivy secretes nanoparticles for surface affixing (*Nano Letters*). In 2010, his group found that the highly elastic adhesive secreted from sundew plants could be used to create nano-scaffolds for tissue engineering. In 2011, his group discovered a unique multi-flagella-based swimming mechanism of *Giardia* (*PNAS*). In 2012, his group discovered that the curved swimming trajectories of whirligig beetles were more energy efficient than linear trajectories, which explains why they are more often observed in nature (*PLoS Computational Biology*). In 2013, his group discovered that nanoparticles secreted from a carnivorous fungus have immunostimulatory properties and exhibit mild cytotoxicity (*Advanced Functional Materials*). In 2014, his group reported that *T. foetus* has distinct flagellar beating motions for linear swimming and turning, similar to the ‘run and tumble’ strategies, and multi-flagellated propulsion does not necessarily contribute to greater thrust generation, and may have evolved for greater maneuverability or sensing (*J. Royal Society, Interface*). His group also developed an approach to produce tea nanoparticles for drug delivery and cancer therapeutics (*Oncotarget*). In 2015, his group synthesized bio-inspired fluorescent peptide nanoparticles that can shift ultraviolet light to visible and near infrared ranges (*Nature Nanotechnology*).