

*Weldon School of Biomedical Engineering
Distinguished Seminar Series*

Wednesday, November 30, 2022

9:30-10:20am

MJIS 1001 or Via Zoom:

Students registered for the seminar are expected to attend in-person.

<https://purdue-edu.zoom.us/j/7731446991?pwd=RHdkZTVnRkxTM3J3dnRvY1VLWTIYUT09>

Engineering protein reporters to image molecular events with magnetic resonance



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Abstract: Answers to some of the most pressing biological questions – such as how cancer cells metastasize, how neurons communicate, and how therapeutic cells find (or miss) their targets – are buried deep inside the body, beyond the reach of conventional optical reporter genes, such as fluorescent and bioluminescent proteins. Conversely, magnetic resonance imaging (MRI) is well-suited to imaging at any depth but lacks robust genetic reporters to visualize biological functions at the molecular and cellular levels. Our research is conducted at this somewhat unusual interface, where we engineer biological molecules, such as water channels, bacteriophages, and paramagnetic proteins, to guide the design of conceptually new biomolecular reporters for MRI. In this talk, I will highlight our recent efforts in this area by focusing on three examples of engineering proteins for MRI: (1) modulating water movement in and out of cells to image gene expression and protease activity, (2) reducing ambiguity in imaging studies by exploiting ligand-induced protein stabilization for background-free MRI, and (3) engineering antimicrobial immunity proteins into calcium biosensors.

Bio: Arnab Mukherjee is an Assistant Professor of Chemical Engineering at the University of California, Santa Barbara, where his lab started in the summer of 2018. Prior to arriving at UCSB, he completed a Boswell fellowship in Molecular Engineering at Caltech and obtained his Ph.D. from the University of Illinois at Urbana-Champaign. The Mukherjee lab takes advantage of the unique physical and chemical properties of biological molecules to guide the design of conceptually new technologies for MRI, allowing the latter's application in molecular-level studies in living organisms. Research in the Mukherjee group has been recognized with notable recent awards, including an Outstanding Young Investigator Award from the NIH (MIRA R35), a Discovery Award from the DoD, the NARSAD Young Investigator Award from the Brain & Behavior Research Foundation, and a Scialog Fellow in Advanced Bioimaging award.