

SMS Spring 2023 Seminar Series

Friday Apr 7 | 3pm | Biodesign Auditorium

Harnessing evolution to discover functional molecules and mechanisms

Non-covalent interactions between biomolecules such as proteins and nucleic acids coordinate all cellular processes through changes in proximity. Tools that perturb, control, or reprogram these interactions have and will continue to be highly valuable for basic and translational scientific endeavors. Evolution, nature's design philosophy, is not only a powerful method for optimizing molecular function but can also lead to the de novo discovery of novel mechanisms of activity of molecules. However, focusing Darwinian evolution on specific functions of molecules of interest is challenging. Here, I will present our groups work toward developing continuous in vivo evolution platforms to solve complex biophysical puzzles dealing with biomolecular interactions. I will describe our group's proximity-dependent split RNAP biosensing technology, which when combined with Phage-Assisted Continuous Evolution (PACE), allows us to perform deep-mutational scanning experiments of biomolecular interfaces, to reprogram the specificity between biomolecular interfaces using evolution, to evolve "molecular glues" that drive biomolecular interactions, to evolve biocatalysts, and finally, to evolve selective inhibitors of target biomolecular interactions. Collectively, our work highlights how advances in synthetic biology can lead to novel functional molecules that provide solutions to challenges in biotechnology and medicine.

Bryan Dickinson, PhD

Professor, University of Chicago

Bryan Dickinson earned his B.S. in Biochemistry from the University of Maryland and his Ph.D. in Chemistry from the University of California at Berkeley for work performed with Professor Christopher Chang. After a Jane Coffin Childs Memorial postdoctoral fellowship with Professor David Liu at Harvard University, he joined the faculty at the University of Chicago in the Department of Chemistry in the Summer of 2014, was promoted to Associate Professor in 2019, and Professor in 2023. The Dickinson Group employs synthetic organic chemistry, molecular evolution, and protein design to develop molecular technologies to study and control chemistry in living systems. The group's current primary research interests include: 1) how lipid modifications on proteins are controlled and regulate cell signaling, 2) developing new evolution technologies to reprogram and control biomolecular interactions, and 3) engineering RNA-targeting biotechnologies as new therapeutic platforms. The motivating principle of the Dickinson Group is that our ability as chemists to create functional molecules through both rational and evolutionary approaches will lead to new breakthroughs in biology and biotechnology.



More info at: <https://www.dickinsonlab.uchicago.edu/>

*ZOOM option available: <https://asu.zoom.us/j/89234740626>