

How expanded building block chemistry can enable new frontiers for synthetic biology

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The talk: Enabled by a convergence of numerous technical advances over the last two decades, the engineering of microbes at the cellular level has transitioned from a paradigm of centralized biomanufacturing in fermentors to more distributed and innovative applications. Whether microbes serve as chemical factories within or outside of reactors, they have been unable to access the full spectrum of chemical functional groups that are present in the synthetic materials and drugs that society relies on. In my research group, we teach cells to create building block chemistries that are not often found in nature so that a greater share of the molecules that we need can come from biological sources. Additionally, we teach cells to rely on building block chemistries that are not found in nature for their survival so that cells can be deployed outside of reactors with appropriate safeguards to benefit human or environmental health. In this talk, I will summarize our recent work towards these goals and hint at how these technologies can enable new frontiers for the field of synthetic biology.

The speaker: Aditya Kunjapur is an Assistant Professor in Chemical & Biomolecular Engineering at the University of Delaware, where he started in December 2018. He earned a B.S. in Chemical Engineering from the University of Texas at Austin in 2010 and a Ph.D. in Chemical Engineering from the Massachusetts Institute of Technology in 2015. At MIT, he trained with Professor Kristala Prather in metabolic engineering. He then conducted post-doctoral research at Harvard Medical School in the laboratory of Professor George Church. His lab seeks to expand the microbial chemistry repertoire of living systems using a mix of metabolic engineering, non-standard amino acid incorporation, and genome engineering. His work has recently been recognized by the Emerging Leaders in Biosecurity Initiative Fellowship in 2019, the 35 Under 35 Award from the American Institute of Chemical Engineers in 2020, the Langer Prize for Innovation and Entrepreneurial Excellence in 2021, the New Innovator Award from the Foundation for Food and Agriculture Research in 2021, and the Office of Naval Research Young Investigator Award in 2022.