BIOENGINEERING
Spring 2021 Seminar

Date: **Thursday, February 25, 2021**
Time: **12:00 pm - 1:00pm**
Location: **Virtual**
Join Zoom Meeting
https://gmu.zoom.us/j/98805494005?pwd=M1A2R1BaSEdqa2hhOUltTE5YeWxtdz09

Meeting ID: 988 0549 4005 Passcode: 454698

Nathan Crook, Ph.D.

Biography: Dr. Crook received his B.S. in Chemical Engineering from the California Institute of Technology in 2009, and his Ph.D. in Chemical Engineering from the University of Texas at Austin in 2014, studying under Dr. Hal Alper. He pursued postdoctoral studies in Pathology and Immunology at Washington University in Saint Louis School Medicine from 2014-2017 in the laboratory of Dr. Gautam Dantas. Dr. Crook joined the department of Chemical and Biomolecular Engineering at NCSU in January 2018. To engineer microbial communities, the Crook Lab develops and applies novel high-throughput engineering and genomic analysis methods. We currently study colonization and gene expression in probiotic microbes and apply this knowledge to the delivery of additional gene functions to the human body. Our interests include engineering both commensal fungi (the "mycobiome") as well as bacteria. We are also excited to investigate and control the evolutionary forces which shape genomes within microbial communities

Title: Engineering the *In Vivo* Residence Times and Biomolecule Production Capacities of Probiotics

Abstract: The human large intestine plays a significant role in health. It is the site of several important cancers, infections, and inflammatory disorders, and is also populated by a dense microbial community (the "gut microbiota") that anaerobically ferments dietary fiber into short-chain fatty acids. Due to its importance to health and ability to support robust microbial growth, there has been rising interest in genetically engineering the gut microbiota to convert undigested material into therapeutic molecules. To move microbiota engineering from a series of demonstrations toward a quantitative method, we are interested in deeply understanding the behavior of engineered microbes in the gut. In this work, we investigated the long-term evolutionary fate of a probiotic bacterium (*E. coli* Nissle) and developed the first engineering toolkit for a commensal eukaryote (*S. boulardii*). In the process, we developed an engineered strain of *E. coli* Nissle that degrades excess dietary phenylalanine and a strain of *S. boulardii* that produces the vitamin A precursor β-carotene in the gut.