SBHSE SEMINAR

School of Biological and Health Systems Engineering

Building Genome, Epigenome, and Transcriptome Sensing and Editing Technologies Towards Smart Gene Therapeutics

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Bio Sketch

Dr. Albert Cheng obtained his BSc in Biochemistry and MPhil in Biology from Hong Kong University of Science and Technology, and his PhD in Computational & Systems Biology from MIT, and is currently an assistant professor at The Jackson Laboratory for Genomic Medicine (JAX-GM) and University of Connecticut Health Center. Cheng laboratory develops and applies technology based on engineered DNA and RNA binding proteins to edit and sense genome, epigenome and transcriptome for studying gene regulation and developing novel therapeutics. In addition to bioengineering, Cheng has broad expertise in bioinformatics, next-generation sequencing and single-cell technologies, and has studied gene regulatory mechanisms underlying somatic cell reprogramming, differentiation, erythropoiesis and cancer metastasis.

Abstract

CRISPR/Cas has revolutionized precision medicine by providing means for precisely editing genetic sequence. Through creative engineering, we and others have diversified the functionalities of CRISPR/Cas systems for modulating the epigenome. Recently, we have engineered a multi-tasking molecular "operating system" for the (epi)genome called "Casilio" for combinatorial control of gene networks. In another research direction, we are engineering tools for modulating RNA, extending our reach to the control of post-transcriptional regulation. To make these editors "smarter", we have started engineering sensors that will allow synthetic gene circuits to response to sequence and expression states. Our ultimate goal is to couple sensors and editors to build "smart precision gene therapy" amenable to personalization.