

SMS Spring 2024 O'Keeffe Lecture

Friday February 23 | 3:00 pm | Biodesign Auditorium

Nucleic Acid Chemical Biology

I will present our efforts to design and develop molecular probes that can selectively label nucleic acids in vitro and inside cells. These probes allow RNA secondary structure mapping, profiling single-stranded DNA for active transcription annotation, mapping RNA-RNA interactions inside cells, and covalent targeting of nucleic acids. I will also present our recent studies on RNA modifications. Over 150 types of post-transcriptional RNA modifications have been identified in all kingdoms of life. We have discovered RNA demethylation and characterized proteins that selectively recognize m⁶A-modified mRNA and affect the translation status and lifetime of the target RNA. I will present our recent advances on developing chemical and biochemical methods to sequence various RNA modifications.

Chuan He, PhD

Professor, University of Chicago

Chuan He is the John T. Wilson Distinguished Service Professor in the Department of Chemistry and Department of Biochemistry and Molecular Biology at the University of Chicago. He was born in February 1972. He received his Bachelor of Science degree in 1994 from the University of Science and Technology of China and his Ph.D. in chemistry from the Massachusetts Institute of Technology in 2000, studying under Professor Stephen J. Lippard. After training as a Damon-Runyon postdoctoral fellow with Professor Gregory L. Verdine at Harvard University, he joined the University of Chicago as an Assistant Professor, rising to Associate Professor in 2008 and Full Professor in 2010. He was the Director of the Institute for Biophysical Dynamics at the University of Chicago from 2012-2017, and the inaugural Director of the Synthetic and Functional Biomolecules Center (SFBC) at Peking University from 2011 to 2020. He was selected as an investigator of the Howard Hughes Medical Institute in 2013. Dr. He's research spans a broad range of fields including chemical biology, RNA biology, epigenetics, biochemistry, and genomics. His recent research concerns reversible RNA and DNA methylation in biological regulation. In 2011, his group discovered reversible RNA methylation as a new mechanism of gene expression regulation. His laboratory characterized the RNA m⁶A methyltransferase complex and several key reader proteins that bind preferentially to m⁶A-modified RNA and regulate their stability and translation. In 2020, Dr. He's laboratory reported prevalent m⁶A methylation on chromatin-associated regulatory RNAs (carRNAs), which regulates chromatin state and global transcription. The reversible methylation of carRNA controls mammalian and plant development. His laboratory also spearheaded the development of enabling chemical biology technologies to study RNA and DNA modifications as well as gene expression regulation. Professor He's research has been recognized with a number of awards that include American Chemical Society Cope Scholar Award (2015), Paul Marks Prize in Cancer Research (2017), ACS Chemical Biology Lectureship (2019), Ray Wu Award (2022), Wolf Prize in Chemistry (2023), Tetrahedron Prize for Creativity in Bioorganic and Medicinal Chemistry (2023), and Falling Walls Science Breakthrough of the Year, Life Sciences (2023). Professor He is the current Editor-in-Chief for *ACS Chemical Biology*.

