NUS National University of Singapore | Department of Biological Sciences, Faculty of Science

SEMINAR

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Hosted by Assoc Prof Lu Gan

Visual biochemical studies of nucleosome in chromatin function

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In eukaryotes, DNA encoding genetic information is packaged into chromatin, which is a dynamic structure that serves both as a packaging mechanism for DNA and as a platform for epigenetically regulating access to genetic information. The nucleosome is a fundamental unit, in which histones H2A, H2B, H3, and H4 form a histone octamer, consisting of two sets of H2A-H2B dimers and H3-H4 dimers. The DNA wraps around the histone octamer approximately 1.7 times, encompassing about 145-147 base pairs per nucleosome. The nucleosomes are connected by linker DNA and form a "beads-on-a-string" architecture when the chromatin fiber is most relaxed. Recent research has provided insights into how nucleosomes function in gene regulation. For instance, studies have shown how certain transcription factors can recognize and bind to DNA that is wrapped around a nucleosome, how chromatin remodelers can reposition nucleosomes to make regulatory regions of DNA available, and how histone chaperones can disassemble and reassemble nucleosomes for genomic DNA function. To study how nucleosomes function in the genome, we have established methods to visualize the intermediate chromatin structures complexed with transacting machinery using cryo-electron microscopy. I will present our "Visual Biochemistry" approach and discuss our current results regarding the mechanisms by which the nucleosome functions as an epigenetic regulator.

About the Speaker

Hitoshi Kurumizaka went on to Saitama University to obtain a Ph.D degree in 1995. He then started his postdoctoral training at NIH in the USA, in the laboratory of Molecular Embryology (Alan Wolffe Lab), where he began chromatin research. In 1997, he entered RIKEN institute in Japan as a research scientist before joining Waseda University firstly as an associate professor and then as a full professor in molecular and structural biology. In 2018, he moved to the University of Tokyo pursuing as a professor. His research interests are in chromatin structure-based, regulatory mechanisms.