

题目：Discovery and Applications of Synthetic DNA Molecules with Catalytic and Binding Properties

报告人：Yingfu Li (Professor in the Department of Biochemistry and Biomedical Sciences at McMaster University)

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Abstract: DNA in its double stranded form has been widely known as the blueprint of life on earth. However, in its single stranded form, DNA possesses other talents, including the ability to function as catalysts (DNAzymes) and molecular receptors (DNA aptamers). For the past 20 years, my research group at McMaster University has been interested in searching for, from random-sequence DNA pools, DNA aptamers and DNAzymes, characterizing their structural and functional properties, and exploiting them for various applications. For example, we have discovered multiple RNA-cleaving DNAzymes with intriguing 3-way, 4-way and 5-way junction based secondary structures as well as ligand-responsive RNA-cleaving DNAzymes that can be activated by a specific species or strain of bacterium. We have also been pursuing practical applications of these functional DNA molecules. For example, we have developed ultrasensitive detection systems through coupling the action of a DNA aptamer or a DNAzyme with isothermal DNA amplification. More recently, we have been working on developing litmus paper-like paper sensors printed with specially formulated DNA aptamer or DNAzyme ink that is reactive with a target of choice. In this presentation I will discuss these efforts.

Brief bio: Yingfu Li is a Professor in the Department of Biochemistry and Biomedical Sciences at McMaster University. He earned a PhD in Biochemistry from Simon Fraser University in 1997, where he discovered a DNA molecule that catalyzes porphyrin metalation, which won him Governor General Academic Gold Medal and Natural Sciences and Engineering Research Council of Canada Doctoral Prize, both in 1998. He was awarded a Medical Research Council of Canada postdoctoral fellow in 1999 and carried out his postdoctoral research at Yale University between 1997-1999, where he studied a series of catalytic DNA molecules for DNA phosphorylation, DNA capping and DNA ligation. In November 1999, he joined McMaster University as an Assistant Professor in the Department of Biochemistry and Biomedical Sciences, was promoted to Associate Professor in 2005 and Full Professor in 2010. At McMaster, he has established a research group focusing on artificial nucleic acid molecules with catalytic and/or binding properties. He has published extensively in the fields of chemistry, biochemistry and molecular evolution of nucleic acids, including ~190 research and review articles, ~20 book chapters, 1 book, and filed over 20 patents. He also serves as an Associate Editor of Journal of Molecular Evolution and as a member of editorial board of Scientific Reports. He has received several recognitions, including Canada Research Chair, New Investigator Award from the Canadian Institute of Health Research, Premier Research Excellent Award from Ontario Government, McBryde Medal from Canadian Society of Chemistry.

