

The 8th Lecture Series by Academia Sinica Academicians

第八屆中央研究院院士講座系列

Jointly Organized by School of Life Sciences and Office of Academic Links (China)

Speaker: Professor Ming-Daw Tsai, Division of Life Sciences, AS

中央研究院生命科學組 蔡明道院士

Title: New Horizon in Enzymology from Cryo-EM and X-ray Free-

electron Laser (XFEL)

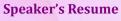
冷凍電子顯微鏡與X光自由電子雷射帶給酵素學的新視野

Date: Wednesday, 27 March 2019

Time: 16:30 - 17:30

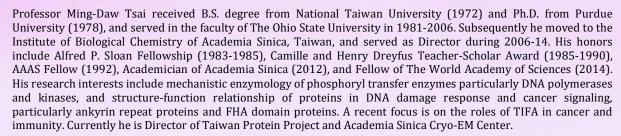
Venue: Lecture Theatre 1, Mong Man Wai Building

Registration: http://www.cuhk.edu.hk/oalc/as_2019/



Language: Mandarin / English

講者簡歷



察明道教授於 1972 年取得國立臺灣大學學士學位,1978 年取得美國普渡大學博士學位,1981-2006 年任教於美國俄亥俄州立大學,2006-2014 年應聘回到臺灣中央研究院生物化學研究所擔任所長一職。至今獲頒的學術榮譽有美國 Alfred P. Sloan 基金會獎(1983-1985)、美國 Camille and Henry Dreyfus 基金會教師學者獎(1985-1990)、美國 AAAS 科學促進會會士(1992)、中央研究院院士(2012)、及 TWAS 世界科學院院士(2014)等。蔡教授的研究興趣包含:磷酸基轉化酵素的機制酵素學,尤其是 DNA 聚合酶與激酶;DNA 損傷反應及癌症訊息相關的蛋白質結構與功能關係,特別是 ankyrin 蛋白與 FHA domain 蛋白。近期則著重於研究 TIFA 在癌症與免疫上所扮演的角色。目前,他也是臺灣蛋白質計畫及中研院冷凍電子顯微鏡中心的總主持人。

Lecture: New Horizon in Enzymology from Cryo-EM and X-ray Free-electron Laser (XFEL) 講座:冷凍電子顯微鏡與x光自由電子雷射帶給酵素學的新視野

Structural determination of enzymes has been an integral part of mechanistic enzymology. However, the two common approaches, X-ray crystallography and nuclear magnetic resonance (NMR), can only be obtained at specific conditions, whereas mechanistic analysis often covers a broad range of conditions. These limitations are being overcome by two emerging structural biology techniques: Cryo-EM can facilitate structural determination at multiple solution conditions with various intermediate complexes, while XFEL allows determination of multiple intermediate structures at ultrashort time intervals. In this lecture I will illustrate applications of the conventional X-ray crystallography and NMR to the study of DNA polymerases, the modern high-resolution cryo-EM to the mechanism of ketol-acid reductoisomerase (KARI), and the emerging XFEL to the photoreduction mechanism of a DNA photolyase.

酵素結構一直以來都是機制酵素學不可或缺的內容,但X光晶體學與核磁共振(NMR)這兩種常用的研究方法皆受限於特定的實驗條件,而反應機制分析往往包含廣泛的實驗條件。這些限制因著兩個新興結構生物學技術的發展將得以突破,一是冷凍電顯技術,可在多項液態條件下解出複合物結構;另一是XFEL,可在極短時間內解出酵素結構。此次演講中,我將分別以DNA聚合酶為例闡釋傳統X光晶體學與NMR的應用、以酮醇酸還原異構酶(KARI)機制為例闡釋冷凍電顯技術的應用、並以DNA光裂合酶的光還原機制為例,闡釋XFEL的應用。

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