



School of Life Sciences
The Chinese University of Hong Kong

生命科學學院

Jointly organized by
New Asia College, CUHK
School of Life Sciences, CUHK

第七屆 新亞書院 合辦
生命科學學院

任國榮先生 生命科學講座

Yen Kwo Yung Lecture in Life Sciences

由任國榮先生紀念基金永久贊助
Endowed by The Mr. Yen Kwo Yung Memorial Fund

主講
Speaker

蔡明道教授
Professor TSAI Ming Daw

台灣中央研究院生物化學研究所客座講座
Distinguished Visiting Chair, Institute of Biological Chemistry,
Academia Sinica, Taiwan

香港中文大學 新亞書院 生命科學學院 合辦



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網上報名及詳情
Online registration & details

Professor TSAI Ming Daw

Distinguished Visiting Chair, Institute of Biological Chemistry,
Academia Sinica, Taiwan



第一講 英語主講/ in English
1st Lecture

生命科學研究：過去50年的重要
發展與未來的重大挑戰

Life science research:
Important developments in the past 50 years
and major challenges ahead

主持/ 香港中文大學新亞書院院長陳新安教授
日期/ 2023年4月12日(星期三)
時間/ 晚上6時30分至晚上8時正
地點/ 香港中文大學邵逸夫堂

Moderator/ Professor CHAN Sun On
Head, New Asia College, CUHK
Date/ 12 April 2023 (Wednesday)
Time/ 6:30 p.m. - 8:00 p.m.
Venue/ Sir Run Run Shaw Hall, CUHK

第二講 英語主講/ in English
2nd Lecture

結構生物學前沿：從快照到流程

Frontiers in structural biology: from snapshots
to processes

主持/ 香港中文大學生命科學學院院長黃錦波教授
日期/ 2023年4月13日(星期四)
時間/ 下午3時正至下午4時正
地點/ 香港中文大學科學館L4演講廳

Moderator/ Professor WONG Kam Bo
Director, School of Life Sciences, CUHK
Date/ 13 April 2023 (Thursday)
Time/ 3:00 p.m. - 4:00 p.m.
Venue/ L4 Science Centre, CUHK

第三講 英語主講/ in English
3rd Lecture

蛋白質的微觀世界

The Microscopic World of Proteins

本講座與香港科學館合辦
This talk is jointly organized with Hong Kong Science Museum



主持/ 香港中文大學生物化學課程主任邵鵬柱教授
日期/ 2023年4月15日(星期六)
時間/ 下午2時30分至下午4時正
地點/ 香港科學館演講廳

Moderator/ Professor SHAW Pang Chui
Director, Biochemistry Programme, CUHK
Date/ 15 April 2023 (Saturday)
Time/ 2:30 p.m. - 4:00 p.m.
Venue/ Lecture Hall, Hong Kong Science Museum

以上講座以實體及網上形式進行，座位有限，先到先得。
All lectures will be conducted in person and online. Seats are limited.

查詢 3943 1361 / 3943 7603
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edithmok@cuhk.edu.hk

Biography of Professor Tsai Ming Daw

Dr. Tsai was born in Taiwan in 1950. He received bachelor's degree in chemistry in 1972 from Taiwan University, and received Ph.D. in medicinal chemistry from Purdue University (1978) from the lab of Prof. Heinz G. Floss. He was a faculty member in the Department of Chemistry and Biochemistry at The Ohio State University in 1981-2006. Subsequently he moved to the Institute of Biological Chemistry of Academia Sinica, Taiwan, and served as director during 2006-14. He is also a professor at the Institute of Biochemical Sciences, National Taiwan University. He was elected to Fellow, American Association for the Advancement of Science (1992), Academician, Academia Sinica (2012), and Fellow, The World Academy of Science (2014).

Dr. Tsai's research subjects in the past 40 years have been in the interface between chemistry and biology. At the center of his interest is the mechanism of specificity of enzymatic reactions and protein functions, and he probes these problems by applying emerging methodologies in structural biology, including nuclear magnetic resonance (NMR), X-ray crystallography and recently cryo-EM and X-ray free electron laser (XFEL). He has made significant contributions in the mechanisms and structures of phospholipases, DNA polymerases, kinases, ankyrin-repeat proteins, and FHA domain proteins. Many of these proteins are relevant to DNA damage, DNA repair, and cancer signaling, as described in nearly 300 research papers.

Dr. Tsai has trained over 60 Ph. D. students and over 40 postdoctoral fellows, some of them have become highly successful researchers. In addition, he has been actively involved in developing infrastructures and services. During his tenure at the Ohio State University, he has established a chemistry-biology training program and served as director for 8 years, and also served as director of the Campus Chemical Instrument Center for 14 years, overseeing the operation of NMR and mass spectrometry. In Academia Sinica he led the Taiwan Protein Project to establish the Academia Sinica Cryo-EM Facility, and to develop a program to use X-ray free electron laser (XFEL) to determine reaction intermediates of DNA photolyase at ultrafast time scales.

蔡明道教授

蔡博士於 1950 年在台灣出生。他於 1972 年在台灣大學化學系畢業，並於 1978 年獲得美國普渡大學藥物化學博士學位。1981 年至 2006 年，他是美國俄亥俄州立大學化學與生物化學系的教授。隨後，他搬到了台灣中央研究院生物化學研究所擔任特聘研究員，並在 2006-14 年度擔任所長。他也是台灣大學生物化學研究所的教授。他當選為美國科學促進會 (AAAS) 會士(1992) ，中央研究院院士 (2012)，及世界科學院(TWAS) 院士。

蔡博士過去 40 年的研究課題一直是在化學和生物學之間的界面。他最感興趣的中心是酶反應和蛋白質功能的特異性機制，他應用結構生物學中新興方法論來探這些問題，包括核磁共振 (NMR) 和 X 射線晶體學 以及最近的冷凍電子顯微鏡和 X 射線自由電子激光 (XFEL)。他在磷脂酶，DNA 聚合酶，激酶，錨蛋白重複蛋白，和 FHA 結構域蛋白的機制和結構方面做出了重要貢獻。正如近 300 篇研究論文所述，這些蛋白質中許多與 DNA 損傷，DNA 修復和癌症信號傳導有關。

蔡博士已培訓了 60 多名博士研究生和 40 多名博士後研究員，其中一些人已成為非常成功的研究人員。此外，他還積極參與研究基礎設施和訓練的開發。在俄亥俄州立大學任職期間，他建立了化學-生物學訓練課程，並擔任了 8 年的主任，還擔任了全校貴重化學儀器中心 14 年的主任，負責監督 NMR 和質譜的操作。在台灣他帶領台灣蛋白質計劃建立中央研究院冷凍電子顯微鏡中心，並建立了一個國際團隊，使用 X 射線自由電子激光 (XFEL) 在超快的時間尺度上確定 DNA 光裂解酶的反應中間體。

Abstract of the Lectures

First Lecture:

Important developments in the past 50 years and major challenges ahead

Moderator: Professor Chan Sun On, Head, New Asia College, CUHK

In the past 50 years, major breakthrough in life science research has occurred in many subjects, including genomics, proteomics, structural biology, precision medicine, etc. These developments were the results of advancements in the basic research in chemical and physical sciences. Even so, the advancement in the development of new drugs and new vaccines are not fast enough, as we have witnessed in the fight against SARS CoV-2. In this lecture I will explain how basic sciences contributed to the developments in life sciences in the past half century, and suggest how young students can be prepared in science to face the new challenges facing human beings in your life time.

Second Lecture:

Frontiers in structural biology: from snapshots to processes

Moderator: Professor Wong Kam Bo, Director, School of Life Sciences, CUHK

In the past 5-10 years, breakthrough in structural biology has occurred not only in cryo-EM, but also in X-ray free electron laser (XFEL). Both techniques have broken new grounds in the solution of high-resolution structures of macromolecular complexes. What is less known is their applications in the dynamic processes of enzyme catalysis (1). The goal of this lecture is to illustrate these applications by a story in cryo-EM and one in XFEL. The first story involves ketol-acid reductoisomerase (KARI) from archaea *Sulfolobus solfataricus*. Structures of both the Mg²⁺-form (KARI:2Mg²⁺) and its ternary complex (KARI:2Mg²⁺:NADH:inhibitor) were solved at six temperatures from 4-70 °C, leading to intermediates of the temperature-induced conformational change (2). In the second story, we determined the structural mechanism of photolyase-catalyzed repair of a cyclobutane pyrimidine dimer (CPD) lesion at atomic resolutions via time-resolved serial femtosecond X-ray crystallography (TR-SFX). A total of 18 snapshots were obtained at different time points from picoseconds to microseconds. These data describe the complete molecular mechanism of the widespread DNA repair mechanism, and importantly, chemistry and enzyme catalysis at work in real time and at atomic resolution (3).

Third Lecture:

The Microscopic World of Proteins

Moderator: Professor Shaw Pang Chui, Director, Biochemistry Programme, CUHK

Proteins are vitally important to living organisms. Malfunction of protein molecules, which perform most of the functions in our bodies, often leads to serious diseases. In addition, infection of microorganisms to human also involves protein molecules. For example, COVID-19 is the disease caused by a new coronavirus. Its infection pathway involves binding of the spike protein on the viral surface to the human receptor protein. So what do protein molecules look like, and how do they perform specific functions? The speaker will share with us the breakthroughs in biochemical research over the last few years, how we observe protein molecules at the nanometer scale and their functions at the nanosecond time scale.

講座大綱

第一講

生命科學研究：過去 50 年的重要發展與未來的重大挑戰

主持: 香港中文大學新亞書院院長陳新安教授

50 年來，生命科學研究在基因組學、蛋白質組學、結構生物學、精準醫療等諸多學科領域取得了重大突破，這些發展多是化學和物理科學基礎研究進步的結果。即便如此，正如我們在對抗 SARS CoV-2 的過程中所見證的，新藥和新疫苗的研發進展還不夠快。在本次講座中，我將解釋基礎科學在過去半個世紀中如何為生命科學的發展做出貢獻，並建議年輕學生如何在科學方面做好準備，以應對人生中將面臨的人類新挑戰。

第二講

結構生物學前沿：從快照到流程

主持: 香港中文大學生命科學學院院長黃錦波教授

在過去 5 到 10 年裡，結構生物學不僅在冷凍電鏡領域有了突破，在 X 射線自由電子激光 (XFEL) 領域也有了重要發展。這兩種技術都在解決大分子複合物的高分辨率結構方面開闢了新天地。鮮為人知的是它們在酶催化動態過程中的應用。本講座的目的是通過一個 cryo-EM 的故事和一個 XFEL 的故事來說明這些應用。第一個故事涉及古細菌硫化葉硫葉菌中的酮醇酸還原異構酶 (KARI)。我們在 4-70 °C 的六個溫度下了解析 Mg^{2+} 形式 (KARI:2 Mg^{2+}) 及其三元複合物 (KARI:2 Mg^{2+} :NADH:inhibitor) 的結構，導致溫度誘導的結構變化的中間體。在第二個故事中，我們通過時間分辨連續飛秒 X 射線晶體學 (TR-SFX) 確定了原子分辨率下光裂合酶催化修復環丁烷嘧啶二聚體 (CPD) 損傷的結構機制。在從皮秒到微秒的不同時間點總共獲得了 18 個快照。這些數據描述了廣泛存在的 DNA 修復機制的完整分子機制，及更重要的實時和原子分辨率下的化學反應和酶催化作用。

第三講

蛋白質的微觀世界

主持: 香港中文大學生物化學課程主任邵鵬柱教授

蛋白質對生物非常重要。我們體內有很多的功能都需要蛋白分子來運作，如果這些分子功能失常，就會導致嚴重的疾病。此外，微生物感染人體細胞的過程，亦常會涉及蛋白分子。例如，2019 冠狀病毒病是由新型冠狀病毒引起，感染過程涉及病毒表面的刺突蛋白與人類受體蛋白結合。那麼蛋白分子是甚麼模樣？它們如何執行特定的功能？講者會介紹近年在生物化學的研究取得突破下，我們如何觀察納米尺寸的蛋白分子，及它們於納秒時間內進行的工作。

新亞書院簡介

Introduction of New Asia College

新亞書院創立於1949年，由已故國學大師錢穆先生及一群來自內地之學者，在極艱難窮困的環境中創辦，其宗旨是保存及發揚中國文化，為社會培育優秀人才。

作為中國文化理想的荷負者，新亞書院多年來積極推動各項學術文化活動，讓中國文化得以承傳。每年舉辦之文化講座、研修班及培訓班概列如下：

• 學術文化講座

1. 錢賓四先生學術文化講座

創立於1978年，旨在發揚學術風氣及培養文化風格。此講座獲海內外學術界重視，先後蒞臨之講者共二十多位，包括創辦人錢賓四先生、英國劍橋大學李約瑟教授、美國哈佛大學歷史及哲學講座教授杜維明教授等。

2. 余英時先生歷史講座

由新亞書院及崇基學院於2007年創立，中大歷史系為協辦單位，旨在促進學術文化交流及推動歷史研究。

3. 新亞當代中國講座

創立於2012年，旨在激發本院師生及社會人士對當代中國國情的認識，以至對當前面對之挑戰作深入探討。

4. 新亞儒學講座

創立於2013年，目的在於弘揚儒學，同時探討儒家思想對個人、社會以至中國未來發展的意義。

5. 任國榮先生生命科學講座

創立於2015年，由新亞書院及生命科學學院合辦，旨在令社會大眾及學生加深對生命科學的認識、意義，以及生命科學在現今社會的價值及應用。

6. 新亞書院文化講座

創立於1950年，由多位書院老師擔任講者，當中包括錢穆、唐君毅與張丕介等從內地來的著名學者，以鼓勵大眾認識中國文化與世界學術，以及關心人類前途。新亞書院與新亞校友會於2014年正式復辦此講座，每年舉辦三至四場講座。

- 研修班 / 培訓班

1. 中華傳統文化研修班

自2000年起，新亞書院與中華傳統文化研修會、中國教育學會高中教育專業委員會及台灣素書樓文教基金每年於暑假期間舉辦，旨在促進兩岸四地中學老師對中華傳統文化的認識，並冀學員在參與培訓班後，回到自己所屬的教學單位，把所見所學推廣給同儕及學生。

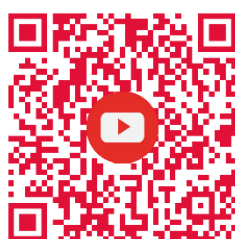
2. 中華美德教育行動師資培訓班

為弘揚中華美德，提升青少年道德素養，新亞書院與北京東方道德研究所於2002年起合辦此培訓班。參加的學員來自內地各個省市學校的校長及老師。

除了期盼學生能認識國家歷史文化、掌握當代中國發展情況，我們同時希望學生具備國際視野，以肩負起弘揚中國文化的使命。因此，書院致力為學生提供多元化的學習機會，包括舉辦「新亞青年學人計劃」、「湖南大學暑期交流計劃」及「暑期北京普通話課程」等，致力培育他們成為學德俱備、關心國家及勇於承擔的優秀人才。

另一方面，新亞學生團體積極推廣中國文化，如歷史悠久的「新亞國樂會」及「新亞國術會」便一直致力發揚中國音樂及弘揚國術；本院學生亦透過成立及參與社會服務團，積極投入社會服務，以服務社會為職志，當中包括「新亞書院扶輪青年服務團」等。此外，我們以資助及獎學金的形式鼓勵及支持學生探求中國文化，讓新亞精神能夠薪火相傳下去。

如您想了解更多我們在中國文化推廣方面的工作，請瀏覽新亞書院的網頁 www.na.cuhk.edu.hk。若您希望定時收到我們的最新消息及活動預告，歡迎將聯絡資料電郵至 nac@cuhk.edu.hk。



Introduction of School of Life Sciences

The School of Life Sciences was established in 2010 under the Faculty of Science by merging the Departments of Biochemistry and Biology, which are among the oldest departments in CUHK. Our School offers five major programmes: Biochemistry, Biology, Cell & Molecular Biology, Food & Nutritional Science, and Molecular Biotechnology, which have trained over 8500 alumni over the years. Our curriculum is designed to meet the diverse interests of life science students. The students will receive training in fundamental knowledge in life sciences in their junior years, before they specialize into one of the five programmes in their senior years.

In addition to quality teaching, we also strive for excellence in research. For example, three research projects “Plant and Agricultural Biotechnology”, “Centre for Organelle Biogenesis and Function” and “Center for Genomic Studies on Plant-Environment Interaction for Sustainable Agriculture and Food Security” led by our school have been selected by the University Grants Committee as one of the Areas-of-Excellence in Hong Kong. We believe that the best way to train future generation of scientists is to inspire the students and give them the opportunities to take part in cutting-edge research themselves. To this end, we have the SMART (Young Scientist Mentorship And Research Training) and DREAM (Dedicated Research Exchange And Mentorship) programs to allow motivated students to engage in research in local and overseas laboratories. To equip our students with a global perspective and enhance their learning experience in a world-renowned university, we have introduced a Berkeley Biosciences Study Abroad (BBSA) Programme, which enables our students to spend a semester in UC Berkeley.

Research Centres/Units under the School of Life Sciences:

UGC-AoE Centre for Plant and Agricultural Biotechnology

RGC-AoE Centre for Organelle Biogenesis and Function

Centre for Cell and Developmental Biology

Centre for Novel Biomaterials

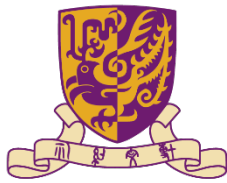
Centre for Protein Science and Crystallography

Food Research Centre

Shiu-Ying Hu Herbarium

Simon F S Li Marine Science Laboratory

Notes



生命科學學院