Curriculum Vitae

Name
Chii-Shen Yang, PhD

Current Position
Professor
Department of Biochemical Science & Technology
National Taiwan University

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Education & Professional Experiences (Times New Roman, 11 point)

Post-doctoral:	Center for Membrane Biology, U. of Texas Health Science Center at Houston
Post-doctoral:	Department of Biochemistry & Molecular Biology, U. of Texas-Houston
PhD:	Department of Physiology & Biophysics, University of Illinois at Chicago
Master:	Department of Physiology, National Taiwan University
Bachelor:	Department of Biology, National Cheng Kung University

Research Interests (Times New Roman, 11 point)
Structural Biology, Human Physiology, Microbiology, Membrane Protein Science

Selected Publications (※3-5 major papers)

1. L-N Ko, G Z Lim, J-C Chen, T. Ko, G-Y Li and **C-S Yang** (2025). Middle Rhodopsin from *Haloquadratum walsbyi* is a Light-driven Magnesium Transporter. Nature Communications (2025) 16:4472
2. C-H Yu, H-Yu Wu, H-S Lin, and **C-S Yang**. (2022). A conserved Trp residue in HwBR contributes to its unique tolerance toward acidic environments. Biophysical Journal (Cell Press). 121 (16): 3136-3145.
3. L-N Ko, G Z Lim, X-R Chen, C-J Cai, K-T Liu, and **C-S Yang**. (2022) HwMR is a novel magnesium-associated protein. Biophysical Journal (Cell Press). 121 (14): 2781-2793
4. X-R Chen, Y-C Huang Y-C, HP Yi, **C-S Yang**. (2016). A Unique Light-Driven Proton Transportation Signal in Halorhodopsin from *Natronomonas pharaonis*. Biophysical Journal (Cell Press). 111(12): 2600-2607
5. M-F Hsu, H-Y Fu, C-J Cai, HP Yi, **C-S Yang*,** A-H Wang* (2015). Structural and Functional Studies of a Newly Grouped *Haloquadratum walsbyi* Bacteriorhodopsin Reveal the Acid-resistant Light-driven Proton Pumping Activity. Journal of Biological Chemistry; 290(49): 29567-29577.

Lecture Title
Structural Insights of Light-Driven Magnesium Transportation and Retinal Re-isomerization in Microbial Rhodopsins

Abstract (500 words maximum)
Microbial rhodopsins respond to different wavelengths of light by mediating ion transport and phototactic sensory functions. Unlike most eukaryotic rhodopsins, they possess enzymatic activity that re-isomerizes light-activated retinal, restoring it to the ground state and enabling repeated activation. In this work, we investigated both the functionality and enzymatic activity of microbial rhodopsins using X-ray diffraction. We resolved the atomic structures of the

wild-type and a functionally impaired rhodopsin from *Haloquadratum walsbyi* (HwMR). Together with dedicated ITO-based ion transport assays and photocycle analyses, these structures revealed the detailed molecular mechanism underlying HwMR's unique role as a light-driven magnesium transporter. In addition, time-resolved X-ray diffraction experiments were performed on the HwBR, a light-driven outward proton pump from *Haloquadratum walsbyi*, using a green laser synchronized with the X-ray shutter. Diffraction data spanning six seconds with 8-ms intervals captured structural transitions and identified specific residues responsible for retinal re-isomerization. These results provide the first direct visualization of the molecular basis of retinal re-isomerization in microbial rhodopsins.