Curriculum Vitae

Name
Yu-Chun Lin(林玉俊)

Current Position
Distinguished Professor, Institute of Molecular Medicine, National Tsing Hua University, Taiwan
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Education & Professional Experiences (Times New Roman, 11 point)

2024 Aug-Present:	Director, Biomedical Science and Engineering Center, National Tsing Hua University, Taiwan
2024 Aug-Present:	Distinguished Professor, Institute of Molecular Medicine, National Tsing Hua University, Taiwan
2023 Aug-2024 Jul:	Professor, Institute of Molecular Medicine, National Tsing Hua University, Taiwan
2019 Aug-2023 Jul:	Associate Professor, Institute of Molecular Medicine, National Tsing Hua University, Taiwan
2015 Feb-2019 Jul:	Assistant Professor, Institute of Molecular Medicine, National Tsing Hua University, Taiwan
2011 Aug-2015 Jan:	Research Fellow, Department of Cell Biology, Johns Hopkins University School of Medicine, USA
2009 Jul-2011 Aug:	Postdoctoral Fellow, Institute of Molecular Medicine, National Taiwan University, Taiwan
2004 Aug-2009 Jun:	Ph.D., Department of Life Science, Tunghai University, Taiwan

Research Interests (Times New Roman, 11 point)
Cell biology, synthetic biology, optogenetics, sonogenetics

Selected Publications (※3-5 major papers)

1. Wang HC, Phan TN, Chen TH, Lin Y, Hsu N, Fan CH, Chiang PH, Chen CH, Yeh CK#, **Lin YC#** "Enhancing prestin oligomerization for superior sonogenetics".(2026) ***Theranostics*** 16(7): 3321-3337.
2. Hong SR, Chuang YC, Yang WT, Song CS, Yeh HW, Wu BH, Lin IH, Chou PC, Chen SC, Sharma L, Lu RZ, Li RY, Chang YC, Liao KJ, Cheng HC, Wang WJ, Wang LHC, **Lin YC#** "Glutamylation of centrosome ensures their functions by recruiting microtubule nucleation factors". (2025) ***EMBO J*** 44(10): 2976-2996.
3. Chen SC, Zeng NJ, Liu GY, Wang HC, Lin TY, Tai YL, Chen CY, Fang Y, Chuang YC, Kao CL, Cheng H, Wu BH, Sun PC, Bayansan O, Chiu YT, Shih CH, Chung WH, Yang JB, Wang LHC, Chiang PH, Chen CH, Wagner OI, Wang YC, **Lin YC#**. "Precise control of intracellular trafficking and receptor-mediated endocytosis in living cells and behaving animals" (2024) ***Advanced Science*** e2405568.
4. Liu GY, Chen SC, Lee GH, Shaiv K, Chen PY, Cheng H, Hong SR, Yang WT, Huang SH, Chang YC, Wang HC, Kao CL, Sun PC, Chao MH, Lee YY, Tang MJ, **Lin YC#** "Precise control of microtubule disassembly in living cells". (2022). ***EMBO J*** e110472.

5. Huang YS*, Fan CH*, Hsu N*, Chiu NH, Wu CY, Guo V, Chiang YC, Hsu WC, Chen L, Lai CPK, Yeh CK#, **Lin YC**#. "Sonogenetic modulation of cellular activities using an engineered auditory-sensing protein" (2020) ***Nano Letters*** 20(2):1089-1100.

Lecture Title

From Light to Sound: Engineering Proteins for Non-invasive Control of Deep Brain Circuits

Abstract (500 words maximum)

Microscopy has long driven biological discovery by enabling visualization of cellular structures and dynamics. However, observation alone is insufficient to establish causality. Optogenetics addressed this gap by enabling precise control of cellular activity, but its reliance on light severely limits tissue penetration, particularly in deep brain regions. To overcome this fundamental constraint, we developed sonogenetics, which replaces light with ultrasound as a control signal. Ultrasound offers deep tissue penetration, high spatial and temporal precision, and strong clinical compatibility. However, effective cellular control ultimately depends on genetically encoded ultrasound-sensing proteins that can efficiently convert acoustic energy into defined biological responses. This requirement motivated us to engineer protein-based actuators for ultrasound-driven neuromodulation, beginning with the electromotile motor protein Prestin, which is essential for mammalian high-frequency hearing. Guided by comparative genomics of echolocating species, we introduced evolutionarily enriched mutations that promote higher-order Prestin oligomerization at the plasma membrane. These engineered assemblies amplify ultrasound-induced membrane mechanics and downstream calcium signaling. Using this strategy, we achieved transcranial activation of deep-brain dopaminergic neurons, leading to improved motor behavior in Parkinsonian mice, as well as suppression of seizure activity in epileptic models. Through systematic mutagenesis, we further identified an optimized Prestin variant, Prestin(N548S,V715G), which exhibits enhanced oligomerization efficiency, increased ultrasound sensitivity, and robust neuronal and behavioral responses in mice and C. elegans, without detectable tissue damage. Extending beyond mammalian auditory mechanisms, we also engineered the invertebrate mechanosensitive channel NompC as an alternative ultrasound-sensing actuator. Notably, its ultrasound sensitivity surpasses that of all previously reported ultrasound-responsive proteins, resulting in strong cellular and behavioral activation. Together, these findings establish general protein-engineering principles for ultrasound-sensing actuators and position sonogenetics as a versatile, scalable, and minimally invasive platform for cell-type–specific control of deep biological systems and future neuromodulation therapies.