

William Yuan-Chi Huang, Ph.D.

Assistant Professor

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Personal Statement

I have a broad background in biophysics, systems biology, and physical chemistry, and a longstanding interest in biochemical reaction systems at the cell membrane. My laboratory integrates physical and biological methods to establish an experimental foundation for studying complex systems on membranes, especially those involved in cellular signal transduction. This is best represented by a series of imaging-based membrane assays, combining membrane reconstitution, single-molecule imaging, and kinetic modeling, to resolve Ras GTPase activation in receptor signaling (*Science* 2019; *PNAS* 2021; *PNAS* 2016; *PNAS* 2024). These efforts are defining a quantitative, dynamic view of how signal transduction occurs at the cell membrane.

Appointments

2024/03— Assistant Professor, Department of Biophysics, Johns Hopkins University

Education

2018/11—2024/02 **Stanford University**
Postdoctoral Scholar, Department of Chemical and Systems Biology
Advisor: James E. Ferrell
Topic: The roles of cytoplasmic organization in cell signaling

2011/08—2018/09 **University of California, Berkeley**
2016/12 Ph.D. Ph.D. Chemistry (physical/biophysical division), GPA 4.0/4.0
Advisor: Jay T. Groves
Dissertation: “Statistical analysis of small-scale membrane signaling reactions: the role of membrane recruitment and catalysis in signal transduction”

2006/09—2010/06 **National Taiwan University**
B.S. Chemistry, GPA 3.9/4.0
Advisor: Jerry C. C. Chan
Thesis: “Molecular structure study of prion fibrils by molecular dynamics simulations”

Honors & Awards

2025 **Searle Scholar**, Kinship Foundation

2022 **Mansour Award**, Stanford University

2022 **K99/R00 Pathway to Independence Award**, National Institutes of Health
(impact score: 10)

2020 **Finalist, Life Sciences Research Foundation Postdoctoral Fellowship**
(unfunded)

2014 – 2016 **Government Scholarship to Study Abroad**, Ministry of Education, Taiwan

2010 **Bernice and Yuan-Tseh Lee Undergraduate Award**, Chemical Society located in Taipei

2010 **Dean’s List**, National Taiwan University

2010 **Ming-Chen Dai Scholarship**, National Taiwan University

2009 – 2010 **Research Grant for Undergraduate Students**, National Science Council, Taiwan

2006, 2010 **Presidential Award**, National Taiwan University

Publications

† = highlights; * = equal contributions

19. J.-H. Huang*, Y. Chen*, **W. Y. C. Huang**, S. Tabatabaee, and J. E. Ferrell. Robust trigger wave speed in *Xenopus* cytoplasmic extracts. **Nature Communications** **2024**, 15, 5782.
18. †**W. Y. C. Huang**[#], S. G. Boxer, and J. E. Ferrell[#]. Membrane localization accelerates association under conditions relevant to cellular signaling. **Proc. Natl. Acad. Sci. U.S.A.** **2024**, 121, e2319491121. (# = corresponding authors)
 - Cited in the textbook, *Cell Signaling* by W. Lim and B. Mayer (p.165)
17. **W. Y. C. Huang**, J. E. Ferrell, X. Cheng. Measuring molecular diffusion in self-organizing *Xenopus* extracts by fluorescence correlation spectroscopy. **Methods in Molecular Biology** **2024**, 2740, 107-115.
16. **W. Y. C. Huang**, X. Cheng, and J. E. Ferrell. Cytoplasmic organization promotes protein diffusion in *Xenopus* extracts. **Nature Communications** **2022**, 13, 5599.
15. A. A. Lee, **W. Y. C. Huang**, S. D. Hansen, N. H. Kim, S. Alvarez, and J. T. Groves. Stochasticity and positive feedback enable enzyme kinetics at the membrane to sense reaction size. **Proc. Natl. Acad. Sci. U.S.A.** **2021**, 118, e2103626118.
14. **W. Y. C. Huang**, S. Alvarez, Y. Kondo, J. Kuriyan, and J. T. Groves. Relating cellular signaling timescales to single-molecule kinetics: a first-passage time analysis of Ras activation by SOS. **Proc. Natl. Acad. Sci. U.S.A.** **2021**, 118, e2103598118.
13. J. K. Chung*, **W. Y. C. Huang***, C. B. Carbone, A. N. Parikh, R. D. Vale, and J. T. Groves. Coupled membrane lipid miscibility and phosphotyrosine-driven protein condensation phase transitions. **Biophysical Journal** **2021**, 120, 1257-1265.
12. S. D. Hansen, **W. Y. C. Huang**, Y. K. Lee, P. Bieling, S. M. Christensen, and J. T. Groves. Stochastic geometry sensing and polarization in a lipid kinase-phosphatase competitive reaction. **Proc. Natl. Acad. Sci. U.S.A.** **2019**, 116, 15013-15022.
11. †**W. Y. C. Huang**, S. Alvarez*, Y. Kondo*, Y. K. Lee, J. K. Chung, H. Y. M. Lam, K. H. Biswas, J. Kuriyan, and J. T. Groves. A molecular assembly phase transition and kinetic proofreading modulate Ras activation by SOS. **Science** **2019**, 363, 1098-1103.
 - *Perspectives*: Dwelling at membranes promotes decisive signaling. *Science*, 2019, 363, 1036.
 - *Research Highlight*, *Nature Reviews Molecular Cell Biology*, 2019, 20:263.
 - LBNL News Center, April 1, 2019.
 - Recommended by the Faculty of 1000.
10. K. A. Rauen, L. Schoyer, L. Schill, B. Stronach, J. Albeck, B. S. Andresen, H. Cavé, M. Ellis, S. M. Fruchtman, B. Gelb, C. Gibson, K. Gripp, E. Hefner, **W. Y. C. Huang**, M. Itkin, B. Kerr, C. Linardic, M. McMahon, B. Oberlander, E. Perlstein, N. Ratner, L. Rogers, A. Schenck, S. Shankar, S. Shvartsman, D. Stevenson, E. Stites, P. Stork, C. Sun, M. Therrien, E. Ullian, B. Widemann, E. Yeh, G. Zampino, M. Zenker, W. Timmer, and F. McCormick. Proceedings of the 5th international RASopathies symposium: when development and cancer intersect. **American Journal of Medical Genetics Part A** **2018**, 176, 2924-2929.
9. **W. Y. C. Huang***, J. Ditlev*, H.-K. Chiang, M. K. Rosen, and J. T. Groves. Allosteric modulation of Grb2 recruitment to the intrinsically disordered scaffold protein, LAT, by remote site phosphorylation. **Journal of the American Chemical Society** **2017**, 139, 18009-18015.
8. **W. Y. C. Huang**, H.-K. Chiang, and J. T. Groves. Dynamic scaling analysis of molecular motion within the LAT:Grb2:SOS protein network on membranes. **Biophysical Journal** **2017**, 113, 1807-1813.
7. Y.-H. Hwang Fu, **W. Y. C. Huang**, K. Shen, J. T. Groves, T. Millers, and S. Shan. Two-step membrane binding by the bacterial SRP receptor enable efficient and accurate co-translational protein targeting. **eLife** **2017**, 6, e25885.
6. †**W. Y. C. Huang**, Q. Yan, W.-C. Lin, J. K. Chung, S. D. Hansen, S. M. Christensen, H.-L. Tu, J. Kuriyan, and J. T. Groves. Phosphotyrosine-mediated LAT assembly on membranes drives kinetic bifurcation in recruitment dynamics of the Ras activator SOS. **Proc. Natl. Acad. Sci. U.S.A.** **2016**, 113, 8218-8223.

- Cited in the textbook, *Cell Signaling* by W. Lim and B. Mayer (pp.125-126, 128)
- 5. K. H. Biswas*, K. L. Hartman*, C.-H. Yu, O. J. Harrison, H. Song, A. W. Smith, **W. Y. C. Huang**, W.-C. Lin, Z. Guo, A. Padmanabhan, S. M. Troyanovsky, M. L. Dustin, L. Shapiro, B. Honig, R. Zaidel-Bar, and J. T. Groves. E-cadherin junction formation involves an active kinetic nucleation process. *Proc. Natl. Acad. Sci. U.S.A.* **2015**, 112, 10932-10937.
- 4. A. R. Lowe*, J. H. Tang*, J. Yassif, M. Graf, **W. Y. C. Huang**, J. T. Groves, K. Weis, and J. T. Liphardt. Importin- β modulates the permeability of the nuclear pore complex in a Ran-dependent manner. *eLife* **2015**, 4, e04052.
- 3. W.-C. Lin*, L. Iversen*, H.-L. Tu, C. Rhodes, S. M. Christensen, J. S. Iwig, S. D. Hansen, **W. Y. C. Huang**, and J. T. Groves. H-Ras forms dimers on membrane surfaces via a protein-protein interface. *Proc. Natl. Acad. Sci. U.S.A.* **2014**, 111, 2996-3001.
- 2. H.-M. Cheng, **W. Y. C. Huang**, T. W. T. Tsai, Y. Mou, and J. C. C. Chan. Depletion of water molecules near the end stage of steric zipper formation. *Journal of the Chinese Chemical Society* **2013**, 60, 784-800.
- 1. H.-M. Cheng, T. W. T. Tsai, **W. Y. C. Huang**, H.-K. Lee, H.-Y. Lian, F.-C. Chou, Y. Mou, and J. C. C. Chan. Steric zipper formed by hydrophobic peptide fragment of Syrian hamster prion protein. *Biochemistry* **2011**, 50, 6815-6823.

Presentations & Conferences

- 2025/05 9th Chesapeake Bay Area Single Molecule Biology Meeting, Georgetown Univ. – invited talk
- 2024/11 Seminar, Dept. of Biochemistry and Molecular Biology, Johns Hopkins Univ. – invited talk
- 2024/09 Institute for Biophysical Research (IBR), Johns Hopkins Univ. – invited talk
- 2024/02 68th Annual Biophysical Society (BPS) Meeting, Pennsylvania Convention Center – talk
- 2023/09 Seminar, Institute of Plant and Microbial Biology, Academia Sinica – invited talk
- 2022/10 Annual Retreat, Dept. of Chemical and Systems Biology, Stanford Univ. – talk
- 2022/03 Science Circle Seminar, Dept. of Chemical and Systems Biology, Stanford Univ. – talk
- 2022/02 66th Annual Biophysical Society (BPS) Meeting, San Francisco Moscone Center – talk
- 2021/05 Science Circle Seminar, Dept. of Chemical and Systems Biology, Stanford Univ. – talk (virtual)
- 2020/05 Think Tank Seminar, Dept. of Chemical and Systems Biology, Stanford Univ. – talk (virtual)
- 2020/02 Symposium on Intrinsically Disordered Proteins, LKS Center, Stanford Univ. – attendee
- 2019/01 GRC Stochastic Physics in Biology, Four Points Sheraton at Ventura – poster
- 2018/02 62th Annual Biophysical Society (BPS) Meeting, San Francisco Moscone Center – talk
- 2017/11 Membrane Supergroup Seminar, Dept. of Molecular and Cell Biology, UC Berkeley – talk
- 2017/07 5th International RASopathies Symposium, Renaissance Orlando – talk
- 2017/06 Single-Cell Biophysics, Academia Sinica, Taiwan (hosted by BPS) – poster
- 2017/01 9th Biennial Workshop on Single Molecule Biophysics, Aspen Center of Physics – poster
- 2016/12 56th Annual Am. Soc. for Cell Biol. (ASCB) Meeting, San Francisco Moscone Center – poster
- 2016/03 60th Annual Biophysical Society (BPS) Meeting, Los Angeles Convention Center – poster
- 2016/01 17th Annual Statistical Mechanics Meeting, UC Berkeley – poster
- 2015/11 Membrane Supergroup Seminar, Dept. of Molecular and Cell Biology, UC Berkeley – talk
- 2014/02 58th Annual Biophysical Society (BPS) Meeting, San Francisco Moscone Center – attendee
- 2012/11 Graduate Research Conference, Dept. of Chemistry, UC Berkeley – talk
- 2010/05 Undergraduate Research Conference, Dept. of Chemistry, National Taiwan Univ. – poster

Teaching Experiences

Instructor, Department of Biophysics, Johns Hopkins University
2025 Fall Physical Principles of Signal Transduction (AS.250.406)

Graduate Student Instructor (GSI), Department of Chemistry, UC Berkeley
2016 Spring Biophysical Chemistry (Chem C130 with Jay Groves and Jamie Cate)
2015 Spring Advanced Biophysical Chemistry I & II (Chem 270AB with Jay Groves)
2013 Fall Thermodynamics and Statistical Mechanics (Chem 220A with Phillip Geissler)
2013 Spring Physical Chemistry: Quantum Mechanics (Chem 120A with Martin Head-Gordon)
2011 Fall Chemical Structure and Reactivity (Chem 3B with Peter Vollhardt)
2011 Fall Organic Chemistry Laboratory (Chem 3BL with Peter Vollhardt)

Professional Services

Ad-hoc reviewer for *Proc. Natl. Acad. Sci. U.S.A.*, *Biophysical Journal*, *Journal of Molecular Biology*

References

James E. Ferrell, M.D., Ph.D.

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Jay T. Groves, Ph.D.

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