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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 develop extensive imaging-based membrane assays for studying complex systems on membranes, especially those involved in cellular signal transduction. This is best represented by a series of experiments, combining membrane reconstitution, single-molecule imaging, and kinetic modeling, to resolve Ras GTPase activation in receptor tyrosine kinase signaling (*Science* 2019; *PNAS* 2021; *PNAS* 2016; *PNAS* 2024). These efforts broadly impact our understanding of how receptor signaling occurs, with the overarching goal of formulating the design principles underlying biochemical reactions in living systems.

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: Toward total reconstitution of intracellular 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

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 (twice)

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.** **2024**, 121, e2319491121. (# = corresponding authors)
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.
See also: *Perspectives*: Dwelling at membranes promotes decisive signaling. *Science*, 2019, 363:1036-1037.
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.

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

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| 2024/02 | 68 th 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 University – talk |
| 2022/03 | Science Circle Seminar, Dept. of Chemical and Systems Biology, Stanford University – talk |
| 2022/02 | 66 th Annual Biophysical Society (BPS) Meeting, San Francisco Moscone Center – talk |
| 2021/05 | Science Circle Seminar, Dept. of Chemical and Systems Biology, Stanford University – talk (virtual) |
| 2020/05 | Think Tank Seminar, Dept. of Chemical and Systems Biology, Stanford University – talk (virtual) |
| 2020/02 | Symposium on Intrinsically Disordered Proteins, LKS Center, Stanford University – attendee |
| 2019/01 | GRC Stochastic Physics in Biology, Four Points Sheraton at Ventura – poster |
| 2018/02 | 62 th 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 | 5 th International RASopathies Symposium, Renaissance Orlando – invited talk |
| 2017/06 | Single-Cell Biophysics, Academia Sinica, Taiwan (hosted by BPS) – poster |
| 2017/01 | 9 th Biennial Workshop on Single Molecule Biophysics, Aspen Center of Physics (ACP) – poster |
| 2016/12 | 56 th Annual Am. Soc. for Cell Biol. (ASCB) Meeting, San Francisco Moscone Center – poster |
| 2016/03 | 60 th Annual Biophysical Society (BPS) Meeting, Los Angeles Convention Center – poster |
| 2016/01 | 17 th Annual Statistical Mechanics Meeting, UC Berkeley – poster |
| 2015/11 | Membrane Supergroup Seminar, Dept. of Molecular and Cell Biology, UC Berkeley – talk |
| 2014/02 | 58 th 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 University – poster |

Professional Services

Ad-hoc reviewer for *Biophysical Journal*, *Journal of Molecular Biology*

Co-reviewer with advisors for *Science*, *Nature*, *PNAS*, *Biophysical Journal*, *Journal of Biological Chemistry*, *Development*

Teaching Experiences

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)

References

James E. Ferrell, M.D., Ph.D. – postdoctoral advisor
Professor, Department of Chemical and Systems Biology, Stanford University
james.ferrell@stanford.edu

Jay T. Groves, Ph.D. – doctoral advisor; thesis committee; instructor of the GSI courses
Professor, Department of Chemistry, University of California, Berkeley
jtgroves@lbl.gov

John Kuriyan, Ph.D. – collaborator; thesis committee
Professor, Department of Biochemistry, Vanderbilt University
john.kuriyan@vanderbilt.edu

Michael K. Rosen, Ph.D. – collaborator; HHMI Summer Institute
Professor, Department of Biophysics, University of Texas Southwestern Medical Center
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Ronald D. Vale, Ph.D. – collaborator; HHMI Summer Institute
Executive Director, HHMI Janelia Research Campus
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Steven G. Boxer, Ph.D. – collaborator
Professor, Department of Chemistry, Stanford University
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