

Stanford



Xinnan Wang

Professor of Neurosurgery

CONTACT INFORMATION

- **Alternate Contact**

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Bio

ACADEMIC APPOINTMENTS

- Professor, Neurosurgery
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Faculty Fellow, Sarafan ChEM-H
- Member, Wu Tsai Neurosciences Institute

ADMINISTRATIVE APPOINTMENTS

- Professor, Stanford University School of Medicine, (2024- present)
- Associate Professor, Stanford University School of Medicine, (2019-2024)
- Assistant Professor, Stanford University School of Medicine, (2012-2019)

HONORS AND AWARDS

- McCormick and Gabilan Faculty Award, Stanford University (2018-2020)
- Parkinson's seed grant, Stanford (2018-2019)
- The Archer Award, The Archer Foundation (2016-2018)
- Biology V, California Institute of Regenerative Medicine (2014-2017)
- Mechanisms of Illness, Chronic Fatigue Initiative (2014-2015)
- Klingenstein Fellowship in Neuroscience, Klingenstein Foundation (2013-2018)
- Michael J. Fox Foundation Grant Target Validation Spring 2013, Michael J. Fox Foundation (2013-2014)
- Gabilan Junior Faculty Fellow, Stanford University (2012-now)
- Alfred P. Sloan Research Fellow 2012, Alfred P. Sloan Foundation (2012-2016)
- William and Bernice E Bumpus Foundation Innovation Award, William and Bernice E Bumpus Foundation (2011-2014)
- NIH Pathway to Independence (K99/R00), NINDS (2009-2014)

PROFESSIONAL EDUCATION

- Ph.D, University of Cambridge , Genetics, Neurobiology (2007)
- M.D/MSc., China Medical University , Clinical Medicine and Genetics (2003)

PATENTS

- Xinnan Wang. "United States Patent 23-1115-US-PRO Compositions and methods for treating glioblastoma", Stanford University
- Xinnan Wang. "United States Patent AU2020343009A1 Methods and compounds modifying mitochondrial function", Stanford University
- Xinnan Wang. "United States Patent US2022/041930 A Small Molecule Therapeutic for Friedreich's Ataxia and Tauopathy", Stanford University
- Xinnan Wang. "United States Patent US63/228,505 T-Type Calcium Channel Antagonists and Uses Thereof", Stanford University
- Xinnan Wang. "United States Patent WO2021046322A1 A small molecule therapeutic for Parkinson's disease paired with a biomarker of therapeutic activity", Stanford University
- Xinnan Wang. "United States Miro1-binding compounds for treating neurodegenerative and neoplastic diseases", Leland Stanford Junior University

LINKS

- <http://xinnanwanglab.stanford.edu>: <http://xinnanwanglab.stanford.edu>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Mitochondria move and undergo fission and fusion in all eukaryotic cells. The accurate allocation of mitochondria in neurons is particularly critical due to the significance of mitochondria for ATP supply, Ca⁺⁺ homeostasis and apoptosis and the importance of these functions to the distal extremities of neurons. In addition, defective mitochondria, which can be highly deleterious to a cell because of their output of reactive oxygen species, need to be repaired by fusing with healthy mitochondria or cleared from the cell. Thus mitochondrial cell biology poses critical questions for all cells, but especially for neurons: how the cell sets up an adequate distribution of the organelle; how it sustains mitochondria in the periphery; and how mitochondria are removed after damage. The goal of my research is to understand the regulatory mechanisms controlling mitochondrial dynamics and function and the mechanisms by which even subtle perturbations of these processes may contribute to neurodegenerative disorders.

Teaching

STANFORD ADVISEES

Med Scholar Project Advisor

Tumi Akeke

Postdoctoral Faculty Sponsor

Chulhwan Kwak, Alva Sainz

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Cross-species transcriptomic integration reveals a MIRO1-mediated macrophage-T cell axis in glioma.** *Life science alliance*
Du, Z., Li, M., Bergsneider, B. H., Tsai, A. P., Cho, K. B., Kim, L. H., Choi, J., Li, G., Wyss-Coray, T., Lim, M., Wang, X.
2026; 9 (8)

- **Chemical modulation of Miro1 alleviates cell-type-specific vulnerabilities in Friedreich's ataxia.** *Cell chemical biology*
Chandra, S., Kwak, C. S., Du, Z., Barisano, G., Nguyen, K. T., Vinogradov, V., Wang, X.
2026
- **Optogenetic Proximity Labeling Maps Spatially Resolved Mitochondrial Surface Proteomes and a Locally Regulated Ribosome Pool.** *bioRxiv : the preprint server for biology*
Kwak, C. S., Du, Z., Creery, J. S., Wilkerson, E. M., Major, M. B., Elias, J. E., Wang, X.
2025
- **Sensing within: Mitochondrial inside-out signal transduction.** *Cell chemical biology*
Sainz, A. G., Oflaz, F. E., Wang, X.
2025
- **Mitochondrial Complex I and ROS control neuromuscular function through opposing pre- and postsynaptic mechanisms.** *PLoS biology*
Mallik, B., Bhat, S. A., Wang, X., Frank, C. A.
2025; 23 (9): e3003388
- **Human stem cell-specific epigenetic signatures control transgene expression.** *Biochimica et biophysica acta. Gene regulatory mechanisms*
Kwak, C. S., Oflaz, F. E., Qiu, J., Wang, X.
2024: 195063
- **Mitochondrial calcium transport during autophagy initiation** *Mitochondrial Communications*
Chandra, S., Katiyar, P., Durairaj, A. S., Wang, X.
2024; 2 (2): 14-20
- **A mitochondrial inside-out iron-calcium signal reveals drug targets for Parkinson's disease.** *Cell reports*
Bharat, V., Durairaj, A. S., Vanhauwaert, R., Li, L., Muir, C. M., Chandra, S., Kwak, C. S., Le Guen, Y., Nandakishore, P., Hsieh, C. H., Rensi, S. E., Altman, R. B., Greicius, et al
2023; 42 (12): 113544
- **Mitochondrial heterogeneity and homeostasis through the lens of a neuron.** *Nature metabolism*
Pekkurnaz, G., Wang, X.
2022; 4 (7): 802-812
- **A mitochondrial membrane-bridging machinery mediates signal transduction of intramitochondrial oxidation.** *Nature metabolism*
Li, L., Conradson, D. M., Bharat, V., Kim, M. J., Hsieh, C., Minhas, P. S., Papakyrikos, A. M., Durairaj, A. S., Ludlam, A., Andreasson, K. I., Partridge, L., Cianfrocco, M. A., Wang, et al
2021
- **Miro1 Impairment in a Parkinson's At-Risk Cohort.** *Frontiers in molecular neuroscience*
Nguyen, D., Bharat, V., Conradson, D. M., Nandakishore, P., Wang, X.
2021; 14: 734273
- **Metaxins are core components of mitochondrial transport adaptor complexes.** *Nature communications*
Zhao, Y., Song, E., Wang, W., Hsieh, C., Wang, X., Feng, W., Wang, X., Shen, K.
2021; 12 (1): 83
- **Mitochondrial Defects in Fibroblasts of Pathogenic MAPT Patients.** *Frontiers in cell and developmental biology*
Bharat, V., Hsieh, C. H., Wang, X.
2021; 9: 765408
- **Precision Neurology for Parkinson's Disease: Coupling Miro1-Based Diagnosis with Drug Discovery.** *Movement disorders : official journal of the Movement Disorder Society*
Bharat, V., Wang, X.
2020
- **Drosophila VCP/p97 Mediates Dynein-Dependent Retrograde Mitochondrial Motility in Axons.** *Frontiers in cell and developmental biology*
Gonzalez, A. E., Wang, X. n.
2020; 8: 256

- **Drosophila PTPMT1 Has a Function in Tracheal Air Filling.** *iScience*
Papakyrikos, A. M., Kim, M. J., Wang, X. n.
2020; 23 (7): 101285
- **Surveillance and transportation of mitochondria in neurons** *CURRENT OPINION IN NEUROBIOLOGY*
Vanhouwaert, R., Bharat, V., Wang, X.
2019; 57: 87–93
- **Miro1 Marks Parkinson's Disease Subset and Miro1 Reducer Rescues Neuron Loss in Parkinson's Models.** *Cell metabolism*
Hsieh, C. H., Li, L. n., Vanhouwaert, R. n., Nguyen, K. T., Davis, M. D., Bu, G. n., Wszolek, Z. K., Wang, X. n.
2019
- **Alpha-synuclein delays mitophagy and targeting Miro rescues neuron loss in Parkinson's models.** *Acta neuropathologica*
Shaltouki, A., Hsieh, C., Kim, M. J., Wang, X.
2018
- **PINK1 Phosphorylates MIC60/Mitofilin to Control Structural Plasticity of Mitochondrial Crista Junctions.** *Molecular cell*
Tsai, P. I., Lin, C. H., Hsieh, C. H., Papakyrikos, A. M., Kim, M. J., Napolioni, V. n., Schoor, C. n., Couthouis, J. n., Wu, R. M., Wszolek, Z. K., Winter, D. n., Greicius, M. D., Ross, et al
2018
- **Phosphorylation of MCAD selectively rescues PINK1 deficiencies in behavior and metabolism.** *Molecular biology of the cell*
Course, M. M., Scott, A. I., Schoor, C. n., Hsieh, C. H., Papakyrikos, A. M., Winter, D. n., Cowan, T. M., Wang, X. n.
2018
- **Live Imaging Mitochondrial Transport in Neurons.** *Neuromethods*
Course, M. M., Hsieh, C. H., Tsai, P. I., Coddington-Bui, J. A., Shaltouki, A., Wang, X.
2017; 123: 49-66
- **Drosophila MIC60/Mitofilin Conducts Dual Roles in Mitochondrial Motility and Crista Structure.** *Molecular biology of the cell*
Tsai, P. I., Papakyrikos, A. M., Hsieh, C. H., Wang, X. n.
2017
- **Destructive cellular paths underlying familial and sporadic Parkinson disease converge on mitophagy** *AUTOPHAGY*
Wang, X.
2017; 13 (11): 1998-1999
- **Functional Impairment in Miro Degradation and Mitophagy Is a Shared Feature in Familial and Sporadic Parkinson's Disease.** *Cell stem cell*
Hsieh, C., Shaltouki, A., Gonzalez, A. E., Bettencourt Da Cruz, A., Burbulla, L. F., St Lawrence, E., Schüle, B., Krainc, D., Palmer, T. D., Wang, X.
2016
- **Elevated Energy Production in Chronic Fatigue Syndrome Patients.** *Journal of nature and science*
Lawson, N., Hsieh, C., March, D., Wang, X.
2016; 2 (10)
- **Transporting mitochondria in neurons.** *F1000Research*
Course, M. M., Wang, X.
2016; 5
- **PINK1-mediated phosphorylation of Miro inhibits synaptic growth and protects dopaminergic neurons in Drosophila.** *Scientific reports*
Tsai, P., Course, M. M., Lovas, J. R., Hsieh, C., Babic, M., Zinsmaier, K. E., Wang, X.
2014; 4: 6962-?
- **The meaning of mitochondrial movement to a neuron's life** *BIOCHIMICA ET BIOPHYSICA ACTA-MOLECULAR CELL RESEARCH*
Lovas, J. R., Wang, X.
2013; 1833 (1): 184-194
- **PINK1 and Parkin Target Miro for Phosphorylation and Degradation to Arrest Mitochondrial Motility** *CELL*
Wang, X., Winter, D., Ashrafi, G., Schlehe, J., Wong, Y. L., Selkoe, D., Rice, S., Steen, J., LaVoie, M. J., Schwarz, T. L.
2011; 147 (4): 893-906

- **The Mechanism of Ca²⁺-Dependent Regulation of Kinesin-Mediated Mitochondrial Motility** *CELL*
Wang, X., Schwarz, T. L.
2009; 136 (1): 163-174
- **IMAGING AXONAL TRANSPORT OF MITOCHONDRIA** *METHODS IN ENZYMOLOGY, VOL 457: MITOCHONDRIAL FUNCTION, PART B MITOCHONDRIAL PROTEIN KINASES, PROTEIN PHOSPHATASES AND MITOCHONDRIAL DISEASES*
Wang, X., Schwarz, T. L.
2009; 457: 319-333
- **Drosophila spichthyin inhibits BMP signaling and regulates synaptic growth and axonal microtubules** *NATURE NEUROSCIENCE*
Wang, X., Shaw, R., Tsang, H. T., Reid, E., O'Kane, C. J.
2007; 10 (2): 177-185