

# Gordon X. Wang

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## Education

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- 2000 – 2005 Ph.D. University of California, Berkeley (Molecular and Cell Biology-Neurobiology)  
1994 – 1999 B.A. University of California, Davis (Comparative Literature)  
1994 – 1999 B.S. University of California, Davis (Genetics)  
1994 – 1999 Minor University of California, Davis (Psychology)

## Employment

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- 05/22 – now **Clinical Associate Professor**, *Major Laboratories and Clinical & Translational Neurosciences Incubator, Department of Psychiatry and Behavioral Sciences, School of Medicine, Stanford University*
- 02/21 – now **Director**, Wu Tsai Neuroscience Microscopy Service, Stanford University
- 04/19 – 05/22 **Clinical Assistant Professor**, *Major Laboratories and Clinical & Translational Neurosciences Incubator, Department of Psychiatry and Behavioral Sciences, School of Medicine, Stanford University*
- 03/15 – now **Senior Consulting Scientist**, Aratome LLC.
- 02/22 – 08/23 **Consultant**, Switch Pharmaceuticals
- 03/16 – 06/19 **Fellow**, MIRECC/CoE VA Advanced Fellowship in Mental Illness Research and Treatment
- 11/12 – 03/16 **Research Scientist**, Stanford University School of Medicine, Psychiatry and Behavioral Sciences
- 05/05 – 10/12 **Postdoctoral Fellow**, Stanford University School of Medicine, Molecular and Cell Physiology – Advisor: Stephen Smith – Project: Array Tomography and Two Photon Analysis of Synapse Dynamics and Physiology.
- 09/00 – 06/05 **Graduate Student**, University of California, Berkeley, Molecular and Cellular Biology. – Advisor: Dr. Mu-ming Poo – Project: The Essential Role of TRP Channels in Axon Guidance by Chemotrophic Factors.
- 06/99 – 12/99 **Analyst**, Japanese Information Access Project –Economic think tank – Washington D.C.
- 09/98 – 05/99 **Research Assistant**, University of California, Davis, Psychology – Advisor: Stanley Sue – Project: Epidemiological Study of Asian American Mental Health.
- 09/96 – 05/98 **Design Director**, The California Aggie. UC Davis School Newspaper

09/96 – 05/98 **Research Assistant**, *University of California, Davis, Agronomy and Range* – Advisor:  
Jorge Dubcovsky – Project: Genetic Analysis of Pest Resistance in Wheat

## **Publications & Patents**

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### **Original Publications**

#### **Published**

Duncan L.E., Li T., Salem M., Li W., Mortazavi L., Senturk H., Shargh N., Vesuna S., Shen H., Yoon J., **Wang G.X.**, Ballon J., Tan L., Pruett B.S., Knutson B., Deisseroth K., Giardino W.J. “*Mapping the Cellular Etiology of Schizophrenia and Diverse Brain Phenotypes*”, **Nature Neuroscience**, (Accepted)

Ichimura K., Boehm M., Andruska A., Zhang F., Schimmel K., Bonham S., Kabiri A., Kheifets V., Ichimura S., Reddy S., Mao Y., Zhang T., **Wang G.X.**, Santana E., Tian X., Essafri I., Vinh R., Tian W., Nicolls M., Yajima S., Shudo Y., MacArthur J., Woo Y., Metzger R., Spiekerkoetter E., (2024) “*3D Imaging Reveals Complex Microvascular Remodeling in the right ventricle in pulmonary hypertension.*” **Circulation Research**, May 21. PMID: 38770652

Coulson R., Frattini V., Moyer C., Hodges J., Mourrain P., Zuo Y., **Wang G.X.**, (2024) “*Translational modulator ISRIB alleviates synaptic and behavioral abnormalities in Fragile X Syndrome.*” **iScience**, Feb 16; 27(4):109259. PMID: 38510125

Nernekli K., Mangarova D.B., Shi Y., Varniab Z.S., Chang E., Tikenogullari O.Z., Pisani L., Tikhomirov G., Wang G.X., Daldrup-Link H.E., (2024) “*Two-Photon Intravital Microscopy of Glioblastoma in a Murin Model.*” **J Vis. Exp.**, Mar 1; (205). PMID: 38497657

Coulson R., Mourrain P., **Wang G.X.**, (2024) “*The Intersection of sleep and synaptic translation in synaptic plasticity deficits in neurodevelopmental disorders.*” **J. Comp. Physiology B**, Feb 24. PMID: 38396062

Coulson R., Mourrain P., **Wang G.X.**, (2022) “*Sleep deficiency as a driver of cellular stress and damage in neurological disorders.*” **Sleep Med. Rev.**, Jun; 63:101616. PMID: 35381445

Li S, Damonte VM, Chen C, **Wang G.X.**, Kebschull J.M, Yamaguchi H, Bian W., Purmann C., Pattni R., Urban A.E., Mourrain P, Kauer JA, Scherrer G., de Lecea L., (2022) “*Altered arousal circuits cause sleep/wake instability during aging.*” **Science**, Feb 25;375(6583). PMID: 35201886

Jaggard J.B., **Wang G.X.**, Mourrain P., (2021) “*Non-REM and REM/paradoxical sleep dynamics across phylogeny.*” **Curr. Opin. Neurobiology.**, Dec; 71:44-51. PMID: 34583217

Mourrain P. and **Wang G.X.** (2019) “*Sleep: DNA repair function for better neuronal aging?*” **Current Biology**. Jun 17; 29(12): R585-R588. PMID: 31211981

Leung L.C., **Wang G.X.**, Madelaine R., Skariah G., Kawakami K., Deisseroth K, Urban A.E., and Mourrain P. (2019) "Neural signatures of sleep in zebrafish." **Nature**. Jul;571(7764):198-204. PMID: 31292557.

Chiou, S.H., Risca, V.I., **Wang, G.X.**, Yang, D., Grüner, B.M., Kathiria, A.S., Ma, R.K., Vaka, D., Chu, P., Kozak, M, Castellini, L., Graves, E.E., Kim, G.E., Mourrain, P., Koong, A.C., Giaccia, A.J., Winslow, M.M. (2017) "Blimp1 induces transient metastatic heterogeneity in pancreatic cancer." **Cancer Discovery**. Aug. 8. Pii: CD-17-0250. PMID: 28790031.

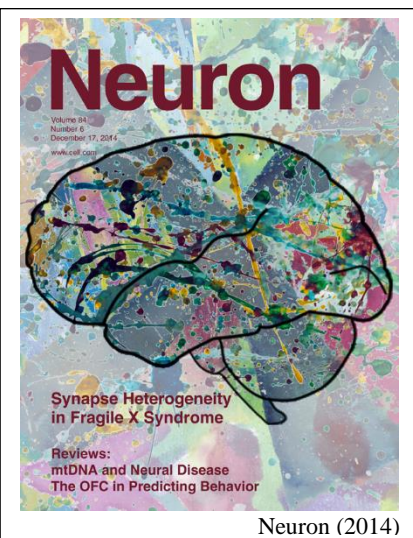
**Wang, G.X.**, Smith, S.J., Mourrain P. (2016) "Sub-synaptic, multiplexed analysis of proteins reveals Fragile X related protein 2 is mislocalized in Fmr1 KO synapse." **eLife**. Oct. 22; 5. (Corresponding Author). PMID: 27770568

Elbaz I., Zada D., Tovin A., Braun T., Lerer-Goldshtein T., **Wang G.X.**, Mourrain P., Appelbaum L. (2016). "Sleep-Dependent Structural Synaptic Plasticity of Inhibitory Synapses in the Dendrites of Hypocretin/Orexin Neurons." **Molecular Neurobiology**. Oct 12. PMID: 27734337.

Hiu T., Farzampour Z., Paz J.T., Wang E.H., Badgely C., Olson A., Micheva K.D., **Wang G.X.**, Lemmens R., Tran K.V., Nishiyama Y., Liang X., Hamilton S.A., O'Rourke N., Smith S.J., Huguénard J.R., Bliss T.M., Steinberg G.K. (2016) "Enhanced phasic GABA inhibition during the repair phase of stroke: a novel therapeutic target." **Brain**. Feb; 139 (Pt 2): 468-80. PMID: 26685158.

**Wang G.X.**, Smith S.J., Mourrain P. (2014) "Fmr1 KO and fenobam treatment differentially impact distinct synapse populations of mouse neocortex" **Neuron** 84(6):1273-86. (Corresponding Author; Cover). PMID: 25521380

Leung L.C., **Wang G.X.**, Mourrain P. (2013) "Imaging zebrafish neural circuitry from whole brain to synapse." **Frontiers in Neural Circuits**. 01/2013:7:76. PMID: 23630470



Chung W.S., Clark L.E., **Wang G.X.**, Stafford B.K., Sher A., Chakraborty C., Joung J., Foo L.C., Thompson A., Chen C., Smith S.J and Barres B.A., (2013) "Astrocytes mediate synapse elimination through MEGF10 and MERTK phagocytic pathways" **Nature** 504(7480):394-400. PMID: 24270812.

Yu X., **Wang G.X.**, Fu M., and Zuo Y., (2013) "Accelerated experience-dependent pruning of cortical synapses in ephrin-A2 knockout mice" **Neuron** 80(1): 64-71. PMID: 24094103

**Wang G.X.** and Smith, S.J, (2012) "Sub-diffraction Limit localization of Proteins in Volume Metric Space using Bayesian Restoration of Fluorescence Images from Ultrathin Specimens" **PLoS**

**Computational Biology.** 8(8):e1002671 (Featured in **Nature Methods** 9, 1049 (2012), “Attention to detail”). PMID: 22956902

Allen N.J., Howe M.L., Foo L.C., **Wang G.X.**, Chakraborty C., Smith S.J, Barres B.A. (2012) “Astrocyte-derived glypicans 4 and 6 promote formation of excitatory synapses via GluA1 AMPA receptor” **Nature** 486, 410–414. PMID: 22722203

Lee H.Y., Ge W., Huang W., He Y., **Wang G.X.**, Rowson-Baldwin A., Smith S.J, Jan Y.N., Jan L.Y., (2011) “Bidirectional Regulation of Kv4.2 Voltage-gated Potassium Channels on Neuronal Dendrites by Fragile X Mental Retardation Protein (FMRP).” **Neuron** 72(4): 630-642. PMID: 22099464

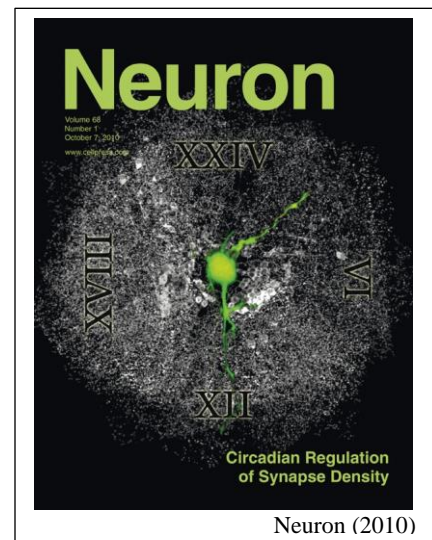
**Wang G.X.**, Grone B., Colas D., Appelbaum L., and Mourrain P. (2011) “Synaptic Plasticity in Sleep: Learning, Homeostasis and Disease.” **Trends in Neuroscience.** 34(9):452-63 (Corresponding Author). PMID: 21840068

Henle S.J., **Wang G.X.**, Liang E., Wu M., Poo M.M., Henley J.R. (2011) “Asymmetric PI(3,4,5)P3 and Akt Signaling Mediates Chemotaxis of Axonal Growth Cones.” **J Neurosci.** 31(19):7016-27. (Cover). PMID: 21562263

Appelbaum L., **Wang G.X.**, Yokogawa T., Skariah G., Smith S.J, Mourrain P., Mignot E., (2010) “Circadian and Homeostatic Regulation of Structural Synaptic Plasticity in Hypocretin Neurons.” **Neuron** 68(1): 87-98 (Co-First Author; Cover). PMID: 20920793

Appelbaum L., **Wang G.X.**, Maro G., Mori R., Tovin A., Marin W., Yokogawa T., Kawakami K., Gothilf Y., Smith S.J, Mignot E., Mourrain P., (2009) “Sleep-wake regulation and hypocretin-melatonin interaction in zebrafish.” **PNAS** 106(51):21942-7. PMID: 19966231

**Wang G.X.** and Poo M.M. (2005) “Requirement of TRPC channels in netrin-1-induced chemotropic turning of nerve growth cones.” **Nature** 434(7035): 898-904. (News and Views in **Nature** 434, 835-838 (2005), “Channels for pathfinding”). PMID: 15758951



Neuron (2010)

### Books

**Wang, G.X.**, Mourrain P. (2020) “Sleep-dependent cellular chemical changes in the aging brain” *Handbook of Mental Health and Aging*, pgs.71-80

**Wang, G.X.** (2004) “Who Am I?” *Asian American X*. University of Michigan Press: pgs.222-226.

**Patents**

**Wang, G.X.** (primary inventor) “Molecular detection using ligation amplification.” PCT WO 2018/112422 A1 (US 2020, Europe 2021)

**Wang, G.X.** (primary inventor) “Labeling method for high-resolution imaging of hundreds of tissue antigens.” Publication #: 20170307627

**Research Support**

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**Current**

*P50 HD10986101* 09/2022 – 08/2027

Project Title: Sleep in Autism Spectrum Disorder

Role: Co-I Stanford University

*U24 NS124026* 05/2022 – 05/2027

Project Title: A Shared Neuroscience Platform for National Dissemination and Training in Brain Organogenesis, Behavioral and Brain Disease Models, Viral Vectors, and Imaging Technologies

Role: PI Stanford University

*cShARP Instrumentation Grant* 07/2022 – 07/2023

Project Title: STARmap: single cell transcriptomics in tissue

Role: PI Stanford University

*NICHD P50 HD109861* 06/2022 – 05/2027

Project Title: Sleep in Autism Spectrum Disorder

Role: Co-Investigator (PI: Hallmayer) Stanford University

*NIA R01 AG071787* 03/2021 – 02/2026

Project Title: Identifying signatures of brain aging through heterochronic blood exchange

Role: Co-Investigator (PI: Zuo) University of California, Santa Cruz

*FRAXA Foundation* 09/2021 – 09/2023

Project Title: Screening combinatorial pharmacological therapies for Fragile X syndrome

Role: Principal Investigator Stanford University

*Brain and Behavior Research Foundation Young Investigator Award* 01/2021 – 09/2023

Project Title: Deciphering core synaptic endophenotypes of autism

Role: Principal Investigator Stanford University

**Completed**

*SUMS Seed Funding Grant* 04/2021 – 04/2022

## Curriculum Vitae

Project Title: Profiling the nascent transcriptome after pharmacological intervention in FXS fibroblasts

Role: Principal Investigator Stanford University

*NINDS R01 NS104950* 03/2018 – 02/2022

Project Title: Impact of sleep-wake circuits on cortical synapse plasticity during motor learning

Role: Co-Investigator (PI: Mourrain) Stanford University

*NIA K01 AG061230* 05/2019 - 02/2024

Project Title: Non-REM (NREM) on synapse plasticity and beta amyloid ( $\alpha\beta$ ) accumulation in mice: impact on aging and Alzheimer's

Role: Principal Investigator Stanford University

*NEI Vision Core grant funding* 11/2018-11/2019

Project Title: Deep Multiplexed Detection of Retinal Cell Types

Role: Co-Investigator (PI: Goldberg) Stanford University

*Simons Foundation – Pilot Grant* 08/2017-08/2020

Project Title: Autism synaptic endophenotypes and candidate drug rescue

Role: Co-Investigator (PI: Mourrain) Stanford University

*John Merck Fund* 06/16-06/2020

Project Title: Pharmacological and genetic solutions for FXS and related intellectual disabilities

Role: Co-Investigator (PI: Mourrain) Stanford University

*SBIR – NIH (1R43NS092180-01)* 03/2015-03/2017

Project Title: Labeling method for high-resolution imaging of hundreds of tissue antigens

Role: Principal Investigator Stanford University

*Grass Fellowship* 06/2011-09/2011

Trans-synaptic delivery of transcription factors for in vivo circuit dissection.

Role: Principal Investigator Stanford University

*FRAXA Foundation* 10/2008-09/2010

The composition and localization of dendritic mRNAs in Fragile X Syndrome: A quantitative study by Array Tomographic Florescent InSitu Hybridization.

Role: Principal Investigator Stanford University

*National Science Foundation* 09/2001-08/2004

Analysis of Working Memory Using Procedural Tasks in functional magnetic resonance imaging

Role: Principal Investigator University of California, Berkeley

### **Scientific Committees and Editorial Boards**

<i>Stanford Advanced Techniques in Neuroscience Workshop (Director/Organizer)</i> Wu Tsai Neuroscience Institute, Stanford University	05/2022 – now
<i>Andrew Olson Imaging Biennial (Director/Organizer)</i> Stanford Neuroscience Microscopy Service, Stanford University	02/2022 – now
<i>Editorial Board – Rejuvenation Research</i> Mary Ann Liebert Publishers	02/2022 – now
<i>Faculty advisory board</i> Wu Tsai Neuroscience Sandbox, Stanford University	07/2021 – now
<i>William C. Dement Lecture Series Faculty Committee</i> Center for Sleep and Circadian Sciences, Stanford University	09/2021 – now
<i>Chairman’s Annual Awards Committee</i> Psychiatry and Behavioral Sciences, Stanford University	08/2021 – now
<i>Stanford Center for Artificial Intelligence in Medicine and Imaging</i> Stanford AIMI, Stanford University	08/2018 – now
<i>Stanford AIMI-HAL – AI in Medicine and Health – Grant Review Committee</i> Stanford AIMI, Stanford University	07/2021

### **Awards**

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<i>Young Investigator Award</i> Brain and Behavior Research Foundation	05/2021
<i>Chair’s Award for Advancing Science</i> Department of Psychiatry and Behavioral Sciences, Stanford School of Medicine	04/2020
<i>ThermoFisher Innovation Day</i> Project Title: DNA labeled antibodies for highly multiplexed, high throughput screening and imaging ThermoFisher	10/2015 Semi-Finalist
<i>Judy and Patrick Young Fellowship</i> California Alumni Association, University of California, Berkeley	09/1999-09/2001 Type: Predoctoral Fellowship

### **Teaching**

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Fall 2022 - now	Instructor, MCP 222, CSB 222, BIO 152 <i>Imaging: Biological Light Microscopy</i>
Fall 2021 - now	Instructor, NEPR 288

- Stanford Neuroscience Bootcamp*
- Fall 2023 - now    Guest Lecturer, NEPR 205-01  
*Neuroscience Anatomy Core*
- Spring 2023        Guest Lecturer, Psy20Q  
*Human vs. Machine: Artificial intelligence through the lens of human cognition*
- Spring 2019        Guest Lecturer, Bio 149/249 and HB 161  
*The Neurobiology of Sleep, Stanford University*
- Spring 2002        Teaching Assistant, MCB 160L  
*Neurobiology Laboratory, University of California, Berkeley*
- Winter 2001        Teaching Assistant, MCB 64  
*Introduction to Neuroscience, University of California, Berkeley*

## **Invited Presentations**

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### ***Invited Local Talks***

- 17 Jan. 2024        Wu Tsai Neurosciences Community Labs Lunch and Learn – Stanford University, CA
- 23 May 2022        Wu Tsai Institute Retreat: “Community Labs Panel Discussion” – Chaminade Resort & Spa, Santa Cruz, CA
- 16 Dec. 2020        MIRECC Translational Core VTEL: “How Basic, Translational, Neuroscience, Data Scientists, Clinical and Health Service Researchers can work together to improve VA Mental Health” – Palo Alto VA, Palo Alto, CA
- 19 Nov. 2018        Geriatric Psychiatry and Neuroscience Grand Rounds: “Synaptic Intersection of Sleep and Aging” – Stanford University, Stanford, CA
- 12 Oct. 2017        Autism Work Group: “Neuroscience from Molecules to Function” – Stanford University, Stanford, CA

### ***Invited Regional Talks***

- 17 Apr. 2024        Advanced Techniques in NeuroImaging: “Array Tomography – Into the Synaptome” – University of California Santa Cruz, Santa Cruz, CA
- 26 Jan. 2024        Imaging Symposium: “Analysis of Synaptic Proteome with Sub-Synaptic Resolution.” – CZ Biohub, San Francisco, CA
- 16 May 2014        Neuroscience department seminar “Synaptic Drug Profiling Using Deep Single Synapse Analysis” – Genentech, South San Francisco, CA
- 21 Apr. 2014        MIND Center Research Seminar Series: “Understanding Synaptic Deficits in Fragile X Syndrome” – University of California Davis, Davis
- 18 Jan. 2012        Neuroclub Seminar Series: “How Deep Proteomic Imaging Impacts Our Understanding of the Brain” – University of California Santa Cruz, Santa Cruz, CA

**Invited Institutional Talk**

- 22 Jul. 2022      Fragile X Syndrome Awareness Day: “Fragile X Syndrome: Innovative Approaches to Finding a Cure” – WuXi AppTec, Virtual Meeting
- 09 Jun. 2016      Gordon Research Conference: “Single-Synapse Analysis of Fmr1 KO and its Pharmacological Rescue” – Fragile X and Autism-Related Disorders, Dover, Vermont

**Poster Presentations**

- Wang, G.X.**, Mourrain, P., Smith, S.J. (March 2014) “*Fmr1 KO and fenobam treatment differentially impact distinct synapse populations of mouse neocortex*” **Gordon Conference**, Mt. Snow, Vermont
- Leung, L., **Wang, G.X.**, Madelaine, R., Halluin, C., Skariah, G., Martineau, P., Mourrain, P. (May 2014) “*Toward imaging zebrafish sleep neurocircuitry from whole brain to synapse*” **Bio-X conferences**, Stanford, CA
- Wang, G.X.**, Leung, L., Applebaum, L., Mourrain, P. (March 2012) “*Analysis of sleep mediated synapse changes in zebrafish.*” **Gordon Conference on Sleep Regulation**, Galveston, Texas
- Wang, G.X.**, Micheva, K.D., Smith, S.J. (October 2010) “*Proteomic Imaging of Mouse Cortex Reveals Changes in Synaptic Proteins in Disease States.*” **National Academies Keck Futures Initiative**, Irvine, CA.
- Wang, G.X.**, Micheva, K.D., Smith, S.J. (May 2010) “*Spatial Proteomic Analysis of Cortical Tissue in Fragile X Syndrome with Array Tomography.*” **FRAXA**. Durham, NH
- Buchanan, J., **Wang, G.X.**, Pungor, J., Ghori, N., Micheva, K.D., Smith, S.J. (October 2009) “*New Methods for Obtaining Molecular Information from LR White Sections Prepared for Array Tomography.*” **Society of Neuroscience**, Washington D.C.
- Wang, G.X.**, Micheva, K.D., Smith, S.J. (September 2008) “*Subcellular Visualization of RNA Using Array Tomographic Fluorescent In Situ Hybridization.*” **FRAXA**. Durham, NH.
- Weiler, N., Busse, B., **Wang, G.X.**, O’Shea, D.J., O’Rourke, N.O., Micheva, K.D., Smith, S.J. (April 2008) “*Array Tomography for Synaptic Classification and Quantification in Mouse Somatosensory Cortical Columns.*” **BioX**, Stanford, CA.