

**CURRICULUM VITAE**  
**Samuel Sheng-Hung Wang, Ph.D.**

**Born:** May 4, 1967  
**Address:** Neuroscience Institute, Princeton University, Princeton, NJ 08544  
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**Research interests**

- 1) Data problems in politics, elections, and public policy
- 2) Neuroscience – integrative role of the cerebellum in sensory learning and autism
- 3) Optical methods for observing and manipulating living brain tissue

**Education**

1980-1982 Riverside Poly High School, Riverside, California  
1982-1986 B.S. with honor, Physics, California Institute of Technology  
1986-1993 Ph.D., Neurosciences, Stanford University (advisor: Stuart H. Thompson)

**Professional positions**

1994-1995, 1996-1997 Postdoctoral fellow, Duke University (with George J. Augustine)  
1995-1996 Congressional Science Fellow, Senate Committee on Labor and Human Resources (with Senator Edward M. Kennedy)  
1997-1999 Postdoctoral Member of Technical Staff, Biological Computation Res. Dept., Bell Labs Lucent Technologies (with David W. Tank and Winfried Denk)  
2000-2006 Assistant Professor, Department of Molecular Biology, Princeton University  
2006-2015 Associate Professor, Department of Molecular Biology and Princeton Neuroscience Institute, Princeton University  
2013-present Faculty associate, Princeton Program in Law and Public Affairs  
2014-present Faculty affiliate, Cognitive Science  
2015- Professor, Princeton Neuroscience Institute

**Honors and awards**

1986 Tau Beta Pi, national engineering honor fraternity  
1993 Grass Fellow, Marine Biological Laboratory, Woods Hole, Massachusetts  
2000-2002 Alfred P. Sloan Research Fellowship  
2000-2002 Rita Allen Foundation Scholar  
2004-2009 W.M. Keck Distinguished Young Scholar in Medical Research  
2004-2009 National Science Foundation Career Development Award  
2009 AAAS/Subaru SB&F Prize for Excellence in Science Books  
2012 Eden Autism Services – Emily Cavaliere Puzio and Frank Mauro Puzio Fellow  
2012 Washington Post “Wonky” award – Best Election Modeler, 2012

**Professional society memberships**

1986- Society for Neuroscience, member

### **UNIVERSITY SERVICE**

2001-2002 Fellow, Rockefeller College  
2003-2007 Adviser, Forbes College  
2005-2008 University Committee on Committees  
2006-2010 University Committee on Public Lectures, chair  
2006-2008 Curriculum Committee, Undergraduate Certificate in Neuroscience program  
2007-present Fellow, Forbes College  
2010 Freshman address speaker, Class of 2014  
2008-2011 Institutional Animal Care and Use Committee, chair  
2009-2011 Fellow, Old Dominion  
2013, Fall University Committee on Committees (one term only, vacancy substitution)  
2014 Animal Research Communications Working Group, Office of Dean for Research  
2014, Fall University Committee on Committees (one term only, vacancy substitution)

### **MAJOR EXTERNAL ADVISORY BOARDS AND SERVICE**

2010-present Rita Allen Foundation, Board of Directors  
2015 New Jersey Governor's Council for Medical Research and Treatment of Autism  
2007-present NIH standing study section and ad hoc grant review

Journal peer reviewing: *Biophysical Journal*, *Brain Behavior and Evolution*, *Brain Research*, *The Cerebellum*, *Chemical Biology*, *Current Biology*, *eLife*, *Frontiers in Neuroscience*, *J. Cell Biology*, *J. Comparative Neurology*, *J. Neurophysiology*, *J. Neuroscience*, *J. Neuroscience Methods*, *J. Physiology*, *Mol. Cell. Neuroscience*, *Nature*, *Nature Biotechnology*, *Nature Communications*, *Nature Methods*, *Nature Neuroscience*, *Nature Reviews Neuroscience*, *NeuroImage*, *Neuron*, *PLoS ONE*, *PNAS*, *Phil. Trans. Roy. Soc. B*, *Science*.

### **ADDITIONAL EXPERIENCE AND ACTIVITIES**

1995-1996 *Legislative assistant, Rep. Lloyd Doggett (D-TX)*. Advised on matters coming before the House Science Committee; energy; and environment issues.

1996 *Legislative fellow, Senator Edward M. Kennedy (D-MA)*. Advised Senate Committee on Labor and Human Resources on higher education, research policy, and K-12 education technology issues. Reauthorization of the National Science Foundation and coordination of NetDay96, a day of wiring Massachusetts schools to the Internet.

### **GENERAL-INTEREST WRITINGS**

Princeton Election Consortium, <http://election.princeton.edu>. 2004-2015.

Sandra Aamodt and Sam Wang: Exercise on the brain. *New York Times*, November 8, 2007, page A33 (op-ed). (#1/day, #1/7 days)

Sandra Aamodt and Sam Wang: Ten amazing facts about your brain. *London Times*, March 28, 2008.

Sandra Aamodt and Sam Wang: Tighten your belt, strengthen your mind. *New York Times*, April 2, 2008, page A27 (op-ed). (#1/day, #1/7 days)

Sam Wang: Autism myth lives on. *USA Today*, April 16, 2008.

Sam Wang and Sandra Aamodt: Your brain lies to you. *New York Times*, June 27, 2008, page A19 (op-ed). (#1/day, #1/7 days)

Sam Wang and Sandra Aamodt: A vast left-handed conspiracy. *Washington Post*, July 6, 2008, page B02.

Sam Wang and Sandra Aamodt: How unscrupulous campaign strategists are taking advantage of a quirk in our brains – and what reporters can do to stop helping them (commentary). *Nieman Watchdog* online, August 25, 2008.

Sam Wang and Joshua Gold: Your brain's secret ballot. *New York Times*, October 28, 2008, page A23 (op-ed).

Sam Wang: Obama, don't fear secret racism - the Bradley effect is history. *New York Daily News* online, November 3, 2008.

Sam Wang and Sandra Aamodt: Guest columnist for The Wild Side (<http://judson.blogs.nytimes.com/>), Olivia Judson's weblog at the *New York Times*. March 2009.

Sam Wang and Sandra Aamodt: Mugged by our genes? *International Herald-Tribune*, March 28-29, 2009, page 6 (op-ed).

Sam Wang: Postcards from the brain. *Physics World*, July 2009.

Sandra Aamodt and Sam Wang: The sun is the best optometrist. *New York Times*, June 21, 2011, page A27 (op-ed). (#1/day, #1/7 days, #6/30 days)

Sandra Aamodt and Sam Wang: Five myths about your child's brain. *New York Post*, September 18, 2011, page 25.

Sam Wang and Sandra Aamodt: Delay kindergarten at your child's peril. *New York Times*, September 25, 2011, page SR6 (Sunday Review). (#1/day, #1/7 days, #5/30 days)

Sandra Aamodt and Sam Wang: Building children's minds, the American way. *New York Times*, February 19, 2012, page SR5 (Sunday Review). (#1/day, #5/7 days, #12/30 days)

Sam Wang and Sandra Aamodt: The mother matters more than the milk. *Bloomberg View*, July 2, 2012.

Sam Wang and Sandra Aamodt: Play, stress, and the learning brain. *Cerebrum*, September 2012.

Sandra Aamodt and Sam Wang: Bloomberg invests in growing minds. *New York Post*, October 7, 2012.

Sam Wang: The election prediction game: The winners and the losers (op-ed). *Los Angeles Times*, November 11, 2012.

Sam Wang: The great gerrymander of 2012. *New York Times*, February 3, 2013, page SR1 (Sunday Review). (#11/day)

Sam Wang and Benjamin C. Campbell: Mr. Bayes goes to Washington: a review of *The Signal and The Noise* by Nate Silver. *Science*, February 15, 2013, 339:758-759.

Sam Wang: How to think about the risk of autism. *New York Times*, March 30, 2014, page SR6-SR7 (Sunday Review). (#4/day and #16/7 days e-mailed, #8/day Facebook)

Sam Wang: The war of the Senate models. *Politico*, May 27, 2014.

Sam Wang: Election commentary in *The New Yorker* online, 2014.

Sam Wang: Election commentary in *The New Republic* online, 2014-2015.

Sam Wang: One Reason the Democrats Lost So Big in Midterms: Exceptionally Low Voter Turnout. *The American Prospect*, November 9, 2014.

## **Books**

Sandra Aamodt and Sam Wang: *Welcome To Your Brain: Why You Lose Your Car Keys but Never Forget How to Drive and Other Puzzles of Everyday Life*. Bloomsbury USA. In US English (March 2008), paperback, and 24 international translations.

Sandra Aamodt and Sam Wang: *Welcome To Your Child's Brain: How The Mind Grows From Conception To College*. Bloomsbury USA. In US English (September 2011), paperback, and 15 international translations.

## **Media appearances (selected)**

- 2001 National Public Radio, *Morning Edition*, interview with Joe Palca on brain evolution.
- 2004 Fox News, October 31, 2004, on meta-analysis of polls for the 2004 Presidential race.
- 2008 *Coast to Coast AM*, February 25, 2008, with George Noory on the brain.
- 2008 XM Satellite Radio, *Oprah and Friends*, April 7, 2008, with Dr. Mehmet Oz and Lisa Oz.
- 2008 National Public Radio, *Talk Of The Nation*, interview with Neal Conan on willpower.
- 2008 National Public Radio, *All Things Considered*, interview with Rick Kleffel on Welcome To Your Brain.
- 2008 BBC, *World Service NewsHour*, interview with Lyse Doucet on false beliefs.
- 2009 ABC, *Good Morning America Weekend*, January 25, 2009, on left-handed presidents.
- 2009 CNN, *Situation Room*, February 18, 2009, on left-handed presidents.
- 2009 Big Think, <http://bigthink.com>, May 2009.
- 2009 National Public Radio, *Talk Of The Nation*, interview with Neal Conan on false beliefs about Barack Obama's citizenship.
- 2010 *New York Times*, question and answer with Claudia Dreifus, February 9, 2010.
- 2011 National Public Radio, *Fresh Air*, interview with Terry Gross on child brain development, September 14, 2011.
- 2011 KPCC, *The Madeleine Brand Show*, on child brain development, November 2011.
- 2012 Bloomberg EDU, Sirius XM radio, with Jane Williams on child brain development, April 2012.
- 2012 CNNI, BBC, KPCC, NPR, Sirius XM radio, and other venues on political poll analysis, October-November 2012.
- 2012 National Public Radio, *Science Friday*, interview with Flora Lichtman and Nate Silver on analysis of political polls, October 2012.
- 2013 MSNBC, discussion with Melissa Harris-Perry on the BRAIN Initiative, April 2013.
- 2013 MSNBC, discussion with Karen Finney and E.J. Dionne on the U.S. 2014 Congressional elections, October 2013.
- 2014-2015 Multiple appearances on MSNBC (Melissa Harris-Perry, Steve Kornacki, Lawrence O'Donnell), CNN with Michael Smerconish, BBC World Service, KCRW *To the Point* with Warren Olney, National Public Radio.
- 2014 CNN, *State Of the Union* with Candy Crowley (other guests: A.B. Stoddard, Stephanie Cutter, and Newt Gingrich) on the midterm Congressional and state elections, October 26, 2014.

## **RESEARCH PUBLICATIONS (74 IN TOTAL)**

S.S. Wang, G.A. Ricaurte, and S.J. Peroutka (1987)  $^3\text{H}$ -3,4-methylenedioxymethamphetamine (MDMA; "Ecstasy") interactions with brain membranes and glass fiber filter paper. *European Journal of Pharmacology* 138:439-443.

S.S.-H. Wang, C.A. Mathis, and S.J. Peroutka (1988) R-2,5-Dimethoxy-4- $^{77}\text{Br}$ -bromoamphetamine ( $^{77}\text{Br}$ -R(-)-DOB), a novel radioligand [that] labels a 5-HT binding site subtype. *Psychopharmacology (Berlin)* 94:431-432.

S.J. Peroutka, A. Hamik, M.A. Harrington, C.A. Mathis, P.A. Pierce, and S.S.-H. Wang (1988) R-2,5-dimethoxy-4- $^{77}\text{Br}$ -bromoamphetamine [ $^{77}\text{Br}$ -R(-)DOB] labels a novel 5-hydroxytryptamine binding site in brain membranes. *Molecular Pharmacology* 34:537-542.

S.S. Wang and S.J. Peroutka (1989) Historical perspectives. In *The Serotonin Receptors*. (Ed. E. Sanders-Bush). Humana Press, pp. 3-20.

S.S.-H. Wang and S. Thompson (1992) A-type potassium channel clusters revealed using a new statistical analysis of loose patch data. *Biophysical Journal*, 63:1018-1025.

C.A. Mathes, S.S.-H. Wang, H.M. Vargas, and S.H. Thompson (1992) Intracellular calcium release in N1E-115 neuroblastoma cells is mediated by the M1 muscarinic receptor subtype and is antagonized by McN-A-343. *Brain Research* 585:307-310.

S.S.-H. Wang, C.A. Mathes, and S.H. Thompson (1993) Membrane toxicity of the protein kinase C inhibitor calphostin A by a free-radical mechanism. *Neuroscience Letters*, 157:25-28. (published in error a second time as 156:145-148)

S.S.-H. Wang (1993) Modeling the apparent diffusion constant of calcium ions emanating from a channel: implications for calcium wave propagation. *Biological Bulletin*, 185:297-298.

S.S.-H. Wang and S.H. Thompson (1994) Measurement of changes in muscarinic and histaminergic receptor density in single neuroblastoma cells using calcium release desensitization. *Cell Calcium*, 15:483-496.

S.S.-H. Wang, A.A. Alousi, and S.H. Thompson (1995) The lifetime of inositol 1,4,5-trisphosphate in single cells. *Journal of General Physiology*, 105:149-171.

S.S.-H. Wang and S.H. Thompson (1995) Local positive feedback by calcium in the propagation of intracellular calcium waves. *Biophysical Journal*, 69:1683-1697.

DeBello, W.M., V. O'Connor, T. Dresbach, S.W. Whiteheart, S.S.-H. Wang, F.E. Schweizer, H. Betz, J.E. Rothman, and G.J. Augustine (1995) SNAP-mediated protein-protein interactions essential for neurotransmitter release. *Nature*, 373:626-630.

S.S.-H. Wang and G.J. Augustine (1995) Confocal imaging and local photolysis of caged compounds: dual probes of synaptic function. *Neuron*, 15:755-760.

M.E. Burns, S.A. Beushausen, G.J. Chin, D. Tang, W.M. DeBello, T. Dresbach, V. O'Connor, F.E. Schweizer, S.S.-H. Wang, S.W. Whiteheart, H. Betz, J.E. Rothman, and G.J. Augustine (1995) Proteins involved in synaptic vesicle docking and fusion. *Cold Spring Harb. Symp. Quant. Biol.* 60:337-348.

G.J. Augustine, H. Betz, K. Bommert, M.P. Charlton, W.M. DeBello, T. Dresbach, J.M. Hunt, V. O'Connor, F.E. Schweizer, S.S.-H. Wang, and S.W. Whiteheart (1996) Molecular mechanisms of neurotransmitter secretion: functional studies at the squid giant synapse. In *Basic*

- neuroscience in invertebrates*. (Ed. H. Koike, Y. Kidokoro, K. Takahashi, T. Kanaseki) Japan Scientific Societies Press.
- R. Kupferman, P.P. Mitra, P.C. Hohenberg, and S.S.-H. Wang (1997) Analytical calculation of intracellular calcium wave characteristics. *Biophysical Journal*, 72:2430-2444.
- A.E. Schivell, S.S.-H. Wang, and S.H. Thompson (1997) Behavioral modes arise from a random process in the nudibranch *Melibe*. *Biological Bulletin*, 192:418-425.
- D.L. Pettit\*, S.S.-H. Wang\*, K.R. Gee, and G.J. Augustine (1997) Chemical two-photon uncaging: a novel approach to mapping glutamate receptors. *Neuron*, 19:465-471.
- G.J. Augustine, E.A. Finch, and S.S.-H. Wang (1998) The spatial range of dendritic signals for cerebellar long-term depression: studies with local photolysis of caged compounds. In *Integrative aspects of calcium signalling*. (Ed. A. Verkhratsky and E.C. Toescu). Plenum Press.
- T. Furuta, S.S.-H. Wang, J.L. Dantzker, T.M. Dore, W.J. Bybee, E.M. Callaway, W. Denk, and R.Y. Tsien (1999) Brominated 7-hydroxycoumarin-4-ylmethyls: novel photolabile protecting groups with biologically useful cross-sections for two photon photolysis. *Proc. Natl. Acad. Sci. USA*, 96:1193-1200.
- S.S.-H. Wang and G.J. Augustine (1999) Calcium signaling in neurons: a case study in cellular compartmentalization. In *Calcium as a cellular regulator*. (Ed. E. Carafoli and C.B. Klee) Oxford University Press, pp. 545-566.
- G.J. Augustine, D.L. Pettit, and S.S.-H. Wang (1999) Spatially resolved flash photolysis via chemical two-photon uncaging. In *Imaging: a laboratory manual*. (Eds. R. Yuste, F. Lanni, A. Konnerth) Cold Spring Harbor Press.
- S.S.-H. Wang, L. Khiroug, and G.J. Augustine (2000) Quantification of spread of cerebellar long-term depression with chemical two-photon uncaging of glutamate. *Proc. Natl. Acad. Sci. USA*, 97:8635-8640.
- S.S.-H. Wang, W. Denk, and M. Häusser (2000) Coincidence detection in single dendritic spines mediated by calcium release. *Nature Neuroscience*, 3:1266-1273.
- D.A. Clark, P.P. Mitra, and S.S.-H. Wang (2001) Scalable architecture in mammalian brains. *Nature*, 411:189-193 (also see News & Views by Kaas and Collins, 411:141-142).
- S.S.-H. Wang, P.P. Mitra, and D.A. Clark (2002) How did brains evolve? *Nature*, 415:135 (also see Communications Arising by Sultan and Barton, 415:133-135).
- K.H. Harrison, P.R. Hof, and S.S.-H. Wang (2002) Scaling laws in the mammalian neocortex: does form provide clues to function? *Journal of Neurocytology*, 30:289-298.
- J. DeFelipe, G.N. Elston, I. Fujita, J. Fuster, K.H. Harrison, P.R. Hof, Y. Kawaguachi, K.A.C. Martin, K.S. Rockland, A.M. Thomson, S.S.-H. Wang, E.L. White, and R. Yuste (2002) Neocortical circuits: Evolutionary aspects and specificity versus non-specificity of synaptic connections. Remarks, main conclusions and general comments and discussion. *Journal of Neurocytology*, 30:387-416.
- S.S.-H. Wang and G. Major (2003) Integrating over time with dendritic wave-fronts. *Nature Neuroscience*, 6:906-908.

- M.J. Burish, H.Y. Kueh, and S.S.-H. Wang (2004) Brain architecture and social complexity in modern and ancient birds. *Brain, Behavior and Evolution*, 63:107-124.
- K.D. Wyatt, P. Tanapat, and S.S.-H. Wang (2005) Speed limits in the cerebellum: constraints from myelinated and unmyelinated parallel fibers. *European Journal of Neuroscience*, 31:2285-2290.
- D.H. O'Connor, G.M. Wittenberg, and S.S.-H. Wang (2005) Initiation of graded bidirectional synaptic plasticity by step-like unitary events. *Proc. Natl. Acad. Sci. USA*, 102:9679-9684. doi:10.1073/pnas.0502332102.
- D.H. O'Connor, G.M. Wittenberg, and S.S.-H. Wang (2005) Dissection of bidirectional synaptic plasticity into saturable unidirectional processes. *Journal of Neurophysiology*, 94:1564-1572. doi:10.1152/jn.00047.2005.
- M.R. Sullivan, A. Nimmerjahn, D.V. Sarkisov, F. Helmchen, and S.S.-H. Wang (2005) *In vivo* calcium imaging of circuit activity in cerebellar cortex. *Journal of Neurophysiology*, 94:1635-1643. doi:10.1152/jn.01013.2004.
- S. Shoham\*, D.H. O'Connor\*, D.V. Sarkisov, and S.S.-H. Wang (2005) Rapid neurotransmitter uncaging in spatially defined patterns. *Nature Methods*, 3:837-843. doi:10.1038/NMETH793.
- S.M. Thompson, J.P.Y. Kao, R.H. Kramer, K.E. Poskanzer, R.A. Silver, D. Digregorio, and S.S.-H. Wang (2005) Flashy science: controlling neural function with light (Mini-symposium review). *Journal of Neuroscience*, 25:10358-10365.
- G.M. Wittenberg and S.S.-H. Wang (2006) Malleability of spike-timing-dependent plasticity at the CA3-CA1 synapse. *Journal of Neuroscience*, 26:6610-6617. doi:10.1523/JNEUROSCI.5388-05.2006.
- D.V. Sarkisov and S.S.-H. Wang (2006) Alignment and calibration of a focal neurotransmitter uncaging system. *Nature Protocols*, 2:828-832. doi: 10.1038/nprot.2006.124.
- D.H. O'Connor, G.M. Wittenberg, and S.S.-H. Wang (2007) Timing and contributions of pre-synaptic and post-synaptic parameter changes during unitary plasticity events at CA3-CA1 synapses. *Synapse*, 61:664-678.
- D.V. Sarkisov, S.E. Gelber, J.W. Walker, and S.S.-H. Wang (2007) Synapse-specificity of calcium release probed by chemical two-photon uncaging of IP<sub>3</sub>. *Journal of Biological Chemistry*, 282:25517-25526.
- D.V. Sarkisov and S.S.-H. Wang (2007) Uncaging techniques combined with patch clamp recordings. In *Patch clamp methods: Advanced Techniques (Neuromethods)*, 2<sup>nd</sup> edition. Editor: W. Walz. Humana Press.
- G.M. Wittenberg and S.S.-H. Wang (2007) Evolution and scaling of dendrites. In *Dendrites*, 2<sup>nd</sup> edition. Editors: M. Häusser, N. Spruston and G. Stuart. Oxford University Press.
- N.J. Kaslow, A.M. Bollini, B. Druss, L.R. Goldfrank, A.M. La Greca, S.S.-H. Wang, R.L. Glueckauf, K.J. Kelleher, R.E. Varela, L. Weinreb, and L. Zeltzer (2007) Health care for the whole person: Research update. *Professional Psychology - Research And Practice*, 38:278-289.
- D.V. Sarkisov and S.S.-H. Wang (2008) Order-dependent coincidence detection in cerebellar Purkinje neurons at the inositol trisphosphate receptor. *Journal of Neuroscience*, 28:133-142.

S.S.-H. Wang, J.R. Shultz, M.J. Burish, K.H. Harrison, P.R. Hof, L.C. Towns, M.W. Wagers, and K.D. Wyatt (2008) Functional trade-offs in white matter axonal scaling. *Journal of Neuroscience*, 28:4047-4056.

I. Ozden\*, H.M. Lee\*, M.R. Sullivan, and S.S.-H. Wang (2008) Identification and clustering of event patterns from *in vivo* multiphoton optical recordings of neuronal ensembles. *Journal of Neurophysiology*, 100:495-503.

S.S.-H. Wang (2008) Functional tradeoffs in axonal scaling: implications for brain function. *Brain, Behavior and Evolution*, 72:159-167.

F. Helmchen, S.S.-H. Wang, and W. Denk (2009) Multiphoton imaging in neuroscience. In *Biomedical Optical Imaging*. Editors: J.G. Fujimoto and D. Farkas. Oxford University Press.

T.M. Hoogland\*, B. Kuhn\*, W. Göbel, W. Huang, J. Nakai, F. Helmchen, S.J. Flint, and S.S.-H. Wang (2009) Radially expanding transglial calcium waves in the intact cerebellum. *Proc. Natl. Acad. Sci. USA*, 106:3496-3501.

I. Ozden\*, M.R. Sullivan\*, H.M. Lee, and S.S.-H. Wang (2009) Reliable coding emerges from coactivation of climbing fibers in microbands of cerebellar Purkinje neurons. *Journal of Neuroscience*, 29:10463-10473.

A.E. Granstedt, M.L. Szpara, B. Kuhn, S.S.-H. Wang, and L.W. Enquist (2009) Fluorescence-based monitoring of activity in virally traced neural circuits. *PLoS ONE*, 9:e6923.

S. Wang (2009) Research highlight: a neuroscientist explores the energetic efficiency of the brain. *Nature*, 461:851.

A.E. Granstedt, B. Kuhn, S.S.-H. Wang, and L.W. Enquist (2010) Calcium imaging of neuronal circuits *in vivo* using a circuit-tracing pseudorabies virus. *Cold Spring Harbor Protocols*, 2010(4):pdb.prot5410.

H.Z. Shouval, S.S.-H. Wang, and G.M. Wittenberg (2010) Spike timing dependent plasticity: a consequence of more fundamental learning rules. Invited review, special issue on spike timing dependent plasticity, *Frontiers in Neuroscience* 4:19, ed. H. Markram, P.J. Sjöström, W. Gerstner. doi:10.3389/fncom.2010.00019

B. Kuhn, T.M. Hoogland, and S.S.-H. Wang (2011) *In vivo* calcium imaging of cerebellar glia with synthetic and genetic indicators. In *Imaging in neuroscience: a laboratory manual*. (Eds. F. Helmchen, A. Konnerth) Cold Spring Harbor Press. (published in *CSH Protocols* as <http://pubmed.gov/21969619>, <http://pubmed.gov/21969620>, and <http://pubmed.gov/21969621>)

E.F. Civillico, S. Shoham, D.V. Sarkisov, and S.S.-H. Wang (2011) Acousto-optical detector-based patterned ultraviolet-uncaging of neurotransmitter for the study of neuronal integration. In *Imaging in neuroscience: a laboratory manual*. (Eds. F. Helmchen, A. Konnerth) Cold Spring Harbor Press. In press.

E.F. Civillico, J.P. Rickgauer, and S.S.-H. Wang (2011) Targeting and excitation of photoactivatable molecules: design considerations for neurophysiology experiments. In *Photosensitive molecules for controlling biological function*. Editors: J.J. Chambers and R.H. Kramer. New York: Humana Press.



B.C. Campbell and S.S.-H. Wang (2012) Familial linkage between neuropsychiatric disorders and intellectual interests. *PLoS ONE*, 7(1):e30405. doi:10.1371/journal.pone.0030405 (#4 most-viewed in 30 days)

X.R. Sun, A. Giovannucci, A.E. Sgro, and S.S.-H. Wang (2012) SnapShot: Optical control and imaging of brain activity. *Cell*, 149:1650-1652. doi:10.1016/j.cell.2012.06.009

\*B. Kuhn, \*I. Ozden, Y. Lampi, M.T. Hasan, and S.S.-H. Wang (2012) An amplified promoter system for targeted expression of calcium indicator proteins in the cerebellar cortex. *Frontiers in Neural Circuits*, 6:49, doi:10.3389/fncir.2012.00049.

\*I. Ozden, \*D.A. Dombeck, T.M. Hoogland, D.W. Tank, and S.S.-H. Wang (2012) Widespread state-dependent shifts in cerebellar activity in locomoting mice. *PLoS ONE*, 7(8):e42650. doi:10.1371/journal.pone.0042650

\*J. Akerboom, \*T.-W. Chen, T.J. Wardill, L. Tian, J.S. Marvin, S. Mutlu, N. Carreras Calderón, F. Esposti, B.G. Borghuis, X.R. Sun, A. Gordus, M.B. Orger, R. Portugues, F. Engert, J.J. Macklin, A. Filosa, A. Aggarwal, R. Kerr, R. Takagi, S. Kracun, E. Shigetomi, B.S. Khakh, H. Baier, L. Lagnado, S.S.-H. Wang, C.I. Bargmann, B.E. Kimmel, V. Jayaraman, K. Svoboda, D.S. Kim, E.R. Schreier, L.L. Looger (2012) Optimization of a GCaMP calcium indicator for neural activity imaging. *Journal of Neuroscience*, 32:13819-13840.

E.R. Schneider, E.F. Civillico, S.S.-H. Wang (2013) Regulation of calcium-based dendritic excitability in the deep cerebellar nuclei. *Journal of Neurophysiology*, 109:2282-2292.

\*X.R. Sun, \*A. Badura, D. A. Pacheco, L.A. Lynch, E.R. Schneider, M.P. Taylor, I.B. Hogue, L.W. Enquist, M. Murthy, S.S.-H. Wang (2013) Fast GCaMPs for improved tracking of neuronal activity. *Nature Communications*, 4:2170. doi:10.1038/ncomms3170.

D.D. Shi, F.F. Trigo, M.F. Semmelhack, S.S.-H. Wang (2014) Synthesis and biological properties of *bis*-CNB-GABA, a photoactivatable neurotransmitter with low receptor interference and chemical two-photon uncaging properties. *Journal of the American Chemical Society*, 36:1976-1981. doi:10.1021/ja411082f.

\*F. Najafi, \*A. Giovannucci, S.S.-H. Wang, J.F. Medina (2014) Analog stimulus encoding in individual Purkinje cell dendrites of awake mice. *Cell Reports*, 6:1-7.

S.S.-H. Wang, A.D. Kloth, and A. Badura (2014) The cerebellum, sensitive periods, and autism (Perspective). *Neuron*, 83:518-532. doi:10.1016/j.neuron.2014.07/016

F. Najafi, A. Giovannucci, S.S.-H. Wang, and J.F. Medina (2014) Coding of stimulus strength via analog calcium signals in Purkinje cell dendrites of awake mice. *eLife*, 3:e03663. doi:10.7554/eLife.03663

A. Badura, X.R. Sun, A. Giovannucci, L.A. Lynch, and S.S.-H. Wang (2014). Fast calcium sensor proteins for monitoring neural activity. *Neurophotonics*, 1(2):025008.

T. Schoenfeld, A.D. Kloth, B. Hsueh, M.B. Runkle, S.S.-H. Wang, and E. Gould (2014). Gap junctions in the ventral hippocampal-medial prefrontal pathway are involved in anxiety regulation. *Journal of Neuroscience*, 34:15679-15688.

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A.E. Ambrosini, G.M. Wittenberg, and S.S.-H. Wang (2015) Evolution and scaling of dendrites. In *Dendrites*, 3<sup>rd</sup> edition. Editors: M. Häusser, N. Spruston and G. Stuart. Oxford University Press. In press.

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Y. Shulgina, D.C. Pinto, and S.S.H. Wang. Shared heritable mechanisms between neuropsychiatric disorders and normal-range personality traits. In preparation.

A.D. Kloth, B.C. Campbell, R.D. Jones, and S.S.-H. Wang. Bayesian learning in a cerebellar conditioning task. In preparation.

K.N. Vodrahalli, Y. Shulgina, Y.L. Kim, T. Kuhn, and S.S.-H. Wang. Machine learning-based classification of intellectual phenotypes. In preparation.

S.S.-H. Wang. A three-prong standard for practical evaluation of partisan gerrymandering. In preparation.

\*The first two authors contributed equally to these works.

### **PATENT APPLICATION**

Double-caged GABA: a novel light-activated probe as a neuroscience research tool. US serial number 61/968,018 filed March 20, 2014 and US serial number 61/993,092, filed May 14, 2014. D.D. Shi, M.F. Semmelhack, and S.S.-H. Wang.

### **GRANT AND FELLOWSHIP SUPPORT**

1990	Lerner-Gray Grant in Marine Zoology
1989, 1991	Earl and Ethel Myers Fellowship in Marine Biology
1991-1993	NIH predoctoral National Research Service Award
1995-1996	Congressional Science and Engineering Fellow, American Association for the Advancement of Science (AAAS)
1994-1997	NIH postdoctoral National Research Service Award
2001-2004	Whitehall Foundation grant
2003-2005	National Association for Autism Research predoctoral support for Megan Sullivan
2006	Writing residency at Rockefeller Foundation Study Center, Bellagio, Italy
2005-2007	New Jersey Governor's Council on Autism Pilot Grant

- 2004-2008 Human Frontier Science Project grant (Principal Investigator)
- 2004-2009 National Science Foundation Career Development Award
- 2008-2010 Autism Speaks postdoctoral support for Ilker Ozden
- 2010 NIH shared instrumentation grant for multiphoton microscope (Principal Investigator).
- 2009-2011 NIH Challenge Grant (Co-investigator; PI Lynn Enquist)
- 2009-2011 NIH Challenge Grant (Co-investigator; PI David Tank)
- 2011-2012 Simons Foundation Autism Research Initiative (SFARI) Explorer grant
- 2012-2013 David A. Gardner '69 Magic Project, Princeton Council of the Humanities
- 2012-2015 McKnight Technological Innovations in Neuroscience award
- 2012-2015 Nancy Lurie Marks Family Foundation grant for autism research (Co-investigator with Mustafa Sahin and Wade Regehr; 2015-2017 renewal pending)
- 2014-2017 NIH U01 NS090541BRAIN Initiative grant (Co-investigator; PI Carlos Brody)
- 2015-2017 NIH R21 NS092320: Transcending dynamic and kinetic limits for neuronal calcium sensing
- 2002-2019 NIH R01 NS045193: Synaptic learning rules in the mammalian cerebellum
- 2015-2017 NIH R21 EY026434-01: Use of calcium indicator proteins in spike counting mode

**INVITED SEMINARS**

**Invited scientific meetings (talk given unless otherwise indicated)**

- 1997 Southern California Optical Biology Users Group, University of California, Irvine, CA.
- 2000 Neural Information and Coding Meeting, Grindelwald, *Switzerland*.
- 2001 Gordon Research Conference on Calcium Signaling, Oxford University, Oxford, *England*.
- 2002 Workshop on Single Cell Computation, University College London, London, *England*.
- 2003 Workshop on Constraints in Neural Systems Design, Computational Neuroscience (CNS 2003) Meeting, Alicante, *Spain*.
- 2003 Banbury Workshop, Optimization and Constraints in the Evolution of Brain Design, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY.
- 2003 Keck Foundation/National Academy of Sciences Futures Initiative, Decisions, Signals and Meaning in Biology, Chemistry, Physics and Engineering, Beckman Center, Irvine, CA. (no talk)
- 2004 Monte Verità Workshop on Spike-Timing Dependent Plasticity (STDP), Monte Verità, Ascona, *Switzerland*.
- 2004 Third Astrobiology Science Conference, NASA Ames Research Center, Moffett Field, CA.
- 2004 Symposium on Optical Methods in Neuroscience, Microscopy and Microanalysis meeting, Savannah, GA.
- 2004 Workshop on Optimization and Neural Coding, Institute for Theoretical Physics, Santa Barbara, CA.
- 2004 Meeting on Brain Development, National Alliance for Autism Research, Fort Lauderdale, FL. (no talk)
- 2005 Keck Foundation Annual Meeting, Los Angeles, CA. (also 2007, 2008, 2009, 2010)
- 2005 Invited retreat speaker, Department of Neurobiology, University of California, Los Angeles, CA.
- 2005 Mini-symposium on controlling neural function with light. Chair, Scott M. Thompson. Society for Neuroscience meeting, Washington, DC.
- 2005 Session moderator, Gordon Research Conference on Neuroethology. Chairs, Nicholas Strausfeld and Catherine Carr. Magdalen College, Oxford University, Oxford, *England*.
- 2005 US National Academy of Science Frontier of Science Symposium. Principles of Brain Design. Beckman Center, University of California, Irvine, CA.
- 2006 Rita Allen Foundation 30<sup>th</sup> Anniversary Symposium, Institute for Advanced Study, Princeton NJ.

- 2006 Human Frontier Science Project Awardees Annual Meeting, Institut Pasteur, Paris, *France*.  
(poster)
- 2007 Karger Workshop on brain evolution, Society for Neuroscience meeting, San Diego, CA.
- 2008 Mini-School and Workshop on Multiple Time Scales in the Dynamics of the Nervous System, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, *Italy*.
- 2008 Conference on Perceptual Learning, Motor Learning, and Automaticity, Netherlands Institute for Neuroscience, Amsterdam, *Netherlands*. (commemoration of the 200<sup>th</sup> anniversary of the Royal Netherlands Academy of Sciences)
- 2009 Banbury meeting on Searching for Principles Underlying Memory in Biological Systems, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY.
- 2009 Meeting on Computational Cell Biology, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY.
- 2009 Psi Chi Invited Speaker, Midwestern Psychological Association meeting, Chicago, IL.
- 2009 Society for Research on the Cerebellum, second annual meeting, Chicago, IL.
- 2010 McGovern Institute for Brain Research Symposium: Cells, circuits & behavior, MIT, Cambridge, MA.
- 2010 Symposium on Photons and Neurons, University of Rochester, Rochester, NY.
- 2010 Symposium on in vivo cerebellar imaging, Federation of European Neuroscience Societies, Amsterdam, *Netherlands*.
- 2010 Barcelona Cognition, Brain and Technology summer school, Barcelona, *Spain*.
- 2011 W.M. Keck Foundation Scholars Program final meeting, Beckman Center, Irvine, CA (co-organizer).
- 2011 Gordon Research Conference on Dendrites, Ventura Marriott, Ventura, CA.
- 2011 First Gordon Research Conference on the Cerebellum, Colby-Sawyer College, New London, NH.
- 2011 Boston Club meeting on cerebellum and autism, Nancy Lurie Marks Fdn., Wellesley, MA.
- 2012 Conference, Dendrites: Substrates for Information Processing, Janelia Conference, Ashburn, VA.
- 2012 Eden Foundation 18<sup>th</sup> Annual Princeton Lecture Series (keynote address), Princeton, NJ.
- 2012 Conference, Fluorescent Proteins and Biological Sensors III, Janelia Conference, Ashburn, VA (attendance cancelled due to Hurricane Sandy).
- 2013 National Academy of Sciences, 150<sup>th</sup> Annual Meeting, break-out session on The New Science Of Elections, Washington, DC (chair: Douglas Massey).
- 2013 McKnight Foundation Annual Meeting, Aspen, CO.
- 2013 Opening symposium, Quantitative Collaborative program, College of Arts and Sciences, University of Virginia, Charlottesville, VA.
- 2013 Annual research symposium (keynote speaker), Delaware chapter, Society for Neuroscience, Newark, DE.
- 2014 McKnight Foundation Annual Meeting, Aspen, CO.
- 2014 Conference, Fluorescent Proteins and Biological Sensors IV, Janelia Conference, Ashburn, VA.
- 2014 Society for Neuroscience nanosymposium on cerebellum and autism (speaker and chair), Washington, DC.
- 2015 Keystone Conference on Pathways of Neurodevelopmental Disorders, Tahoe City, CA.

**Invited talks (Research departments)**

- 1994 Department of Physiology, University of Colorado Health Sciences Center, Denver, CO.
- 1995 Department of Theoretical Physics, AT&T Bell Laboratories, Murray Hill, NJ.
- 1995 Laboratory of Theoretical and Physical Biology, National Institutes of Health, Bethesda, MD.
- 1999 Department of Neurobiology, Duke University Medical Center, Durham, NC.
- 1999 Department of Biomedical Engineering, Boston University, Boston, MA.
- 1999 Department of Developmental and Cell Biology, University of California, Irvine, CA.
- 1999 Department of Molecular Biology, Princeton University, Princeton, NJ.
- 1999 Department of Neurobiology and Behavior, University of California, Irvine, CA.

2000 Department of Neurology, Stanford University Medical Center, Stanford, CA.  
 2000 Department of Physiology, University College, London, *England*.  
 2000 Division of Neurophysiology, National Institute for Medical Research, London, *England*.  
 2000 Department of Biology, Morehouse College, Atlanta, GA.  
 2000 Max Planck Institute for Medical Research, Dept. Biomedical Optics, Heidelberg, *Germany*.  
 2000 Karolinska Institutet, Stockholm, *Sweden*.  
 2001 Sloan Center for Theoretical Neurobiology, Caltech, Pasadena, CA.  
 2001 Program in Neuroscience, Columbia University, New York, NY.  
 2001 Wyeth-Ayerst Research Laboratories, Princeton, NJ.  
 2002 Center for Neurobiology, Mount Sinai School of Medicine, New York, NY.  
 2002 Systems neuroscience seminar, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY.  
 2002 Department of Physiology, New York Medical College, Albany, NY.  
 2003 Department of Physiology and Biophysics, University of Washington, Seattle, WA.  
 2003 Center for Cognitive Neuroscience, Duke University, Durham, NC.  
 2004 Baylor Medical College, Houston, TX. (Distinguished Neuroscientist Lecture Series)  
 2004 Max Planck Institute for Medical Research, Dept. Cell Physiology, Heidelberg, *Germany*.  
 2004 University of California, San Diego, CA.  
 2004 Salk Institute for Biological Studies, La Jolla, CA.  
 2004 Mathematical Biosciences Institute, Ohio State University, Columbus, OH.  
 2004 Neuroscience Program, University of Michigan, Ann Arbor, MI.  
 2004 Rowland Institute for Physics, Harvard University, Cambridge, MA.  
 2004 Department of Molecular and Cell Biology, Harvard University, Cambridge, MA.  
 2005 Center for Statistics in the Social Sciences, University of Washington, Seattle, WA.  
 2005 Department of Physiology and Biophysics, University of Washington, Seattle, WA.  
 2005 Department of Brain and Cognitive Sciences, MIT, Cambridge, MA.  
 2005 Learning and Memory Seminar, Dept. Neurobiology, University of California, Los Angeles, CA.  
 2005 Redwood Neuroscience Institute, Menlo Park, CA.  
 2005 Department of Neurobiology, Stanford University School of Medicine, Stanford, CA.  
 2005 Hopkins Marine Station, Stanford University, Pacific Grove, CA.  
 2005 Neuroscience Colloquium, Brown University, Providence, RI.  
 2005 CIMA, University of Navarra, Pamplona, *Spain*.  
 2006 Biological Chemistry Seminar Series, University of Pennsylvania, Philadelphia, PA.  
 2006 Vollum Institute, Oregon Health Sciences University, Portland, OR.  
 2006 Interdepartmental science seminar series, Delaware State University, Dover, DE.  
 2006 Department of Physiology, Anatomy and Genetics, Oxford University, Oxford, *England*.  
 2006 Instituto de Neurociencias de Alicante, Universidad Miguel Hernandez, Alicante, *Spain*.  
 2006 Max Planck Institute for Medical Research, Dept. Cell Physiology, Heidelberg, *Germany*.  
 2006 Mahoney Institute of Neurological Sciences colloquium, Univ. Pennsylvania, Philadelphia, PA.  
 2006 Translational Neuroscience Seminar Series, Mount Sinai School of Medicine, New York, NY.  
 2007 Neuroscience program, University of California San Diego, San Diego, CA.  
 2007 Biophysics seminar series, Rockefeller University, New York, NY.  
 2007 Keynote speaker, Robert Wood Johnson MD/PhD program retreat, UMDNJ, Piscataway, NJ.  
 2007 Seminars in Neuroscience series, West Virginia University, Morgantown, WV.  
 2008 Janelia Farm, Howard Hughes Medical Institute, Ashburn, VA.  
 2008 Department of Physiology, University College, London, *England*.  
 2009 Origins Institute, McMaster University, Toronto, *Canada*.  
 2009 Neuroscience Graduate Program seminar, McMaster University, Toronto, *Canada*.  
 2009 SUNY Downstate Medical Center, Brooklyn, NY.  
 2009 Department of Neuroscience, Johns Hopkins University School of Medicine, Baltimore, MD.  
 2010 Department of Neurobiology, University of Chicago, Chicago, IL.  
 2011 University of Paris Descartes, Paris, *France*.  
 2011 Department of Neurology, University of Texas Southwestern Medical Center, Dallas, TX.

- 2011 University of Southern California, Los Angeles, CA.
- 2012 Google Research, Mountain View, CA.
- 2012 Hopkins Marine Station, Stanford University, Pacific Grove, CA.
- 2012 Seaver Autism Research Center, Mount Sinai School of Medicine, New York, NY.
- 2013 Dept. Neuroscience, Robert Wood Johnson Medical School, UMDNJ, Piscataway, NJ.
- 2013 Roundtable on elections and public opinion, CENTRA Technology, Arlington, VA.
- 2013 Physics colloquium, Rutgers University, New Brunswick, NJ.
- 2014 Department of Neurology, University of California Los Angeles, Los Angeles, CA.
- 2014 Dept. Biochemistry and Molecular Medicine, George Washington University, Washington, DC.
- 2014 Neuroscience seminar series, Indiana University, Bloomington, IN.
- 2014 Progress in Neuroscience series, Brain and Mind Research Institute, Weill Cornell Medical College, New York, NY.
- 2015 Neuroscience and Medicine series, Department of Neuroscience, Pasteur Institute, Paris, *France*.
- 2015 Okinawa Institute of Science and Technology, Okinawa, *Japan*. (visit postponed)

### **Invited public talks**

- 1997 National Association of Graduate-Professional Students, 12<sup>th</sup> annual meeting, New Orleans, LA.
- 2001 World Congress of Science Producers, Washington, DC.
- 2002 Policy Fellows' retreat, American Association for the Advancement of Science, Washington DC.
- 2002 Science on Saturdays lecture, Princeton Plasma Physics Laboratory, Princeton, NJ.
- 2004 Phi Beta Kappa induction dinner, Princeton University.
- 2005 Nassau Club, Princeton, NJ.
- 2005 Discussion panelist. Blurry vision: bridging the gap between science and the public. Princeton Dept. Molecular Biology and New York Academy of Sciences meeting. November 8, 2005.
- 2006 Princeton Alumni Council outreach trip, Seattle, WA.
- 2006 Princeton Tiger Talk for high school students, Princeton, NJ.
- 2007 Discussant, panel on career development, Society for Neuroscience, San Diego, CA.
- 2007 Princeton Alumni Council outreach trip, Los Angeles, CA.
- 2008 Smithsonian Associates, Washington, DC.
- 2008 Princeton Alumni Council outreach trip, Hong Kong, China.
- 2008 Brainwave series, discussion of creativity and the brain with Sandra Aamodt and director Julie Taymor, Rubin Museum of Art, New York, NY.
- 2008 authors@google, Mountain View, CA.
- 2008 Panel discussion on science writing: "Crystals, Quarks, Biomes and Genomes: How to Make Complex Science Compelling." Princeton University, Princeton, NJ.
- 2008 Conference on Learning and the Brain, MIT, Cambridge, MA.
- 2008 Panel discussion on the Challenges of the Brain, sponsored by *Discover* magazine/NSF/Franklin Institute. Philadelphia, PA.
- 2008 Renaissance Weekend, Charleston, SC.
- 2009 Princeton Regional Chamber of Commerce, Princeton, NJ.
- 2009 Brainwave series, discussion of science and Buddhism with Donald S. Lopez Jr., Rubin Museum of Art, New York, NY.
- 2009 Adventures of the Mind mentoring summit, Institute for Advanced Study, Princeton, NJ.
- 2009 TEDxSF talk, San Francisco, CA. [www.tedxsf.org](http://www.tedxsf.org).
- 2010 Speaker, freshman address, Princeton University.
- 2011 Annual David Wilkinson Lecture, Harold R. Medina Seminar for State and Federal Judges, Princeton, NJ.
- 2011 Adventures of the Mind mentoring summit, Missoula, MT.
- 2012 Conference on Learning and the Brain (keynote address), Columbia University, New York, NY.

- 2012 Annual David Wilkinson Lecture, Harold R. Medina Seminar for State and Federal Judges, Princeton, NJ.
- 2012 Common Ground (local K-12 schools consortium), Princeton, NJ.
- 2013 Parents and Science lecture series, Rockefeller University, New York, NY.
- 2013 Riverside Elementary School, Princeton, NJ.
- 2013 Annual David Wilkinson Lecture, Harold R. Medina Seminar for State and Federal Judges, Princeton, NJ.
- 2013 AAAS Science and Technology Fellowship Year-End Summit, Silver Spring, MD.
- 2013 Conference on Active, Engaged Minds (Learning And the Brain), Boston, MA.
- 2014 The Science Behind The Science Behind The News, discussion of neuroscience with Joe Palca, Smithsonian Institution, Washington, DC.
- 2014 Understanding Autism, SciCafe, American Museum of Natural History, New York, NY.
- 2014 Invited panelist, Society for Neuroscience Professional Development Workshop on Teaching Neuroscience.