

## Curriculum Vitae

### Samuel Andrew Hires

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## Education

Ph.D. : Graduate Program in Neurosciences (Sept 2001-Nov 2007)  
University of California – San Diego, La Jolla, CA  
Thesis Advisor – Prof. Roger Tsien

B.S. : Brain & Cognitive Science (Sept 1997-June 2001)  
Massachusetts Institute of Technology, Cambridge, MA ; Minor: Biology

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## Research experience

Postdoctoral Associate (with Dr. Karel Svoboda) (Dec 2008-present)  
Janelia Farm Research Campus

Postdoctoral Associate (with Dr. Loren Looger) (Dec 2007-Dec 2008)  
Janelia Farm Research Campus

Graduate Student (with Prof. Roger Tsien) (Sept 2002-Nov 2007)  
Graduate Program in Neurosciences, UC San Diego

Visiting Scientist (with Dr. Atsushi Miyawaki) (July-Aug 2002)  
RIKEN Brain Science Institute, Tokyo, Japan

Graduate Rotations (Profs. Roger Tsien, Marla Feller, Charles Zuker) (Sept 2001-Sept 2002)  
Graduate Program in Neurosciences, UC San Diego

Undergraduate Researcher (with Prof. Guosong Liu) (Feb 2000-Aug 2001)  
Picower Center for Learning and Memory, MIT

Undergraduate Researcher (with Prof. Richard Wurtman) (Jan-June 1999)  
Clinical Research Center, MIT

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## Publications

O'Connor DH\*, **Hires SA\***, Guo ZV, Li N, Yu J, Sun QQ, Huber D, Svoboda K; Neural coding during active somatosensation revealed using illusory touch. Nature Neuroscience 2013 Jun 2

**Hires SA**, Efros A, Svoboda K. Whisker dynamics underlying tactile exploration. J Neuroscience 2013 Jun 5;33(23):9576-91.

Talantova M\*, Sanz-Blasco S\*, Zhang X\*, Xia P\*, Akhtar MW, Okamoto S, Dziejczapolski G, Nakamura T, Cao G, Pratt AE, Kang YJ, Tu S, Molokanova E, McKercher SR, **Hires SA**, Wolosker H, Sason H, Solomon J, Powers ET, Kelly JW, Roberts AJ, Tong G, Zhang D, Nakanishi N, Chen HSV, Michael S, Masliah E, Heinemann SF, Piña-Crespo JC, Lipton SA. A $\beta$  induces astrocytic glutamate release, extrasynaptic NMDA receptor activation, and synaptic loss Proc Natl Acad Sci U S A 2013 June 17

Pammer L\*, O'Connor, DH\*, **Hires SA**, Efros AL, Clack N, Huber D, Myers EW, Svoboda K. The mechanical variables underlying object localization along the axis of the whisker. J

Neuroscience 2013 Apr 17;33(16):6726-41

Marvin JS, Borghuis BG, Tian L, Cichon J, Harnett MT, Akerboom J, Gordus A, Renninger S, Chen TW, Bargmann CI, Orger MB, Schreiter ER, Demb JB, Gan W, Magee JC, **Hires SA**, Looger LL. An optimized fluorescent probe for visualizing glutamate neurotransmission. Nature Methods. 2013 Feb;10(2):162-70.

Clack NG, O'Connor DH, Huber D, Petreanu L, **Hires SA**, Peron S, Svoboda K, Myers EW. Automated tracking of whiskers in videos of head fixed rodents. PLoS Comput Biol. 2012 Jul;8(7)

Tian L, **Hires SA**, Looger LL. Imaging neuronal activity with genetically encoded calcium indicators. Cold Spring Harb Protoc. 2012 Jun 1;2012(6):647-56.

Li H, Foss SM, Dobry YL, Park CK, **Hires SA**, Shaner NC, Tsien RY, Osborne LC, Voglmaier SM. Concurrent imaging of synaptic vesicle recycling and calcium dynamics. Front Mol Neurosci. 2011;4:34. Epub 2011 Nov 2.

Hooks BM, **Hires SA**, Zhang YX, Huber D, Petreanu L, Svoboda K, Shepherd GM. Laminar analysis of excitatory local circuits in vibrissal motor and sensory cortical areas. PLoS Biol. 2011 Jan 4;9(1):e1000572.

Tian L, **Hires SA**, Mao T, Huber D, Chiappe ME, Chalasani SH, Petreanu L, Akerboom J, McKinney SA, Schreiter ER, Bargmann CI, Jayaraman V, Svoboda K, Looger LL. Imaging neural activity in worms, flies and mice with improved GCaMP calcium indicators. Nat Methods. 2009 Dec;6(12):875-81. Epub 2009 Nov 8.

Akerboom J, Rivera JD, Guilbe MM, Malavé EC, Hernandez HH, Tian L, **Hires SA**, Marvin JS, Looger LL, Schreiter ER. Crystal structures of the GCaMP calcium sensor reveal the mechanism of fluorescence signal change and aid rational design. J Biol Chem. 2009 Mar 6;284(10):6455-64. Epub 2008 Dec 18.

**Hires SA**, Tian L, Loren Looger. Neural Activity Reporting with Genetically Encoded Calcium Indicators. Brain Cell Biology 2008 Aug;36(1-4):69-86

**Hires SA**, Zhu Y, and Tsien RY. Optical measurement of synaptic glutamate spillover and reuptake by linker optimized glutamate-sensitive fluorescent reporters. Proc Natl Acad Sci U S A. 2008 Mar 18;105(11):4411-6

Palmer AE, Giacomello M, Kortemme T, **Hires SA**, Lev-Ram V, Baker D, and Tsien RY. 2006. Ca<sup>2+</sup> Indicators based on computationally redesigned calmodulin-peptide pairs. Chemistry & Biology 13, 521–530

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## Manuscripts

**Hires SA**, O'Connor DH, Gutnisky D, Svoboda K; Encoding task-related variables in the mouse barrel cortex during whisker-based object localization (in prep)

**Hires SA\***, Efos A\*, Svoboda K. Whisker dynamics underlying tactile exploration (in prep)

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## Invited talks

“Cortical coding of touch during active and virtual tactile sensation.” Dynamics of cortical and cortical-subcortical circuits : Janelia Farm Research Campus. June 10-14, 2013

“Encoding and decoding of touch sensation and perception in cortical circuits” University of Southern California, March 21<sup>th</sup>, 2013

“Encoding and decoding of touch sensation and perception in cortical circuits” Caltech, March 12<sup>th</sup>, 2013

“Encoding and decoding of touch perception in cortical circuits” Naval Research Lab, February 26<sup>th</sup>, 2013.

“Encoding whisker-related variables in the mouse barrel cortex during object localization” BARRELS XXV, October 11-12, 2012

“The science of free will” Unitarian Universalist congregation of Columbus, Indiana, March 22<sup>nd</sup> 2008.

“Fluorescent protein indicators for glutamate and long-range protein-protein interaction” Fluorescent Proteins and Biological Sensors: Janelia Farm Research Campus. October 28-31, 2007. (shared talk)

“Measuring glutamate spillover and uptake with GluSnFRs.” Imaging Neurons and Neural Activity: New Methods, New Results. Cold Spring Harbor Labs, March 2007.

“Direct visualization of synaptic release plasticity with novel, genetically-encoded, glutamate-sensitive fluorescent reporters.” UCSD Neuroscience Graduate Program Spring Retreat, April 2005.

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### **Selected abstracts and submitted talks**

Hires, S. A., O'Connor, D., Gutnisky, D., Svoboda K. Encoding whisking-related variables in the mouse barrel cortex during object localization Soc. Neurosci. Abstr., Vol. 42 (2012)

O'Connor, D.,\* Hires,\* S. A., Guo Z., Sun Q.Q., Svoboda K. Neural coding for object location revealed using synthetic touch Soc. Neurosci. Abstr., Vol. 42 (2012)

Golomb D, Hires SA, Svoboda K, Whisker shape changes induced by touch Soc. Neurosci. Abstr., Vol. 42 (2012)

Hires, S. A., O'Connor, D., Gutnisky, D., Svoboda K.. Encoding of vibrissal sensory input and task-related variables in the mouse barrel cortex during whisker-based object localization Soc. Neurosci. Abstr., Vol. 41 (2011)

Li, H., Foss, S. M., Dobryy, Y., Kevin, P., Hires, A., Shaner, N. S., Osborne, L. C., Tsien, R. Y., Voglmaier, S. M. Two color imaging of synaptic vesicle recycling and calcium dynamics Soc. Neurosci. Abstr., Vol. 41 (2011)

Tian, L., Hires, S. A., Mao, T., et al. Imaging neural activity with genetically encoded calcium indicators Soc. Neurosci. Abstr., Vol. 40 (2010)

Hires, S. A., O'Connor, D., Clack, N., et al. Encoding of vibrissal sensory input in the mouse

- barrel cortex during whisker-based object localization Soc. Neurosci. Abstr., Vol. 40 (2010)
- Hooks, B. M., Hires, S. A., Svoboda, K., et al. Local excitatory circuits in mouse vM1, vS1, and S2 cortex Soc. Neurosci. Abstr., Vol. 39 (2009)
- Viswanathan, S., Tian, L., Hires, A., et al. Improved genetically encoded calcium indicators (GECIs) by rational protein engineering Soc. Neurosci. Abstr., Vol. 38 (2008)
- L. Tian, T. Mao, S.A. Hires, D. Huber, K. Svoboda, L.L. Looger An improved genetically-encoded calcium indicator for recording neural activity. Soc. Neurosci. Abstr., Vol. 34 693.7, 2008
- J. Akerboom, L. Tian, S. Viswanathan, S. A. Hires, J. S. Marvin, E. R. Schreiter, L. L. Looger Crystal structure of the genetically encoded calcium indicator gcamp2. Soc. Neurosci. Abstr., Vol. 34 597.17, 2008
- “Optical measurements of presynaptic strength with novel, genetically-encoded glutamate sensitive fluorescent reporters.” Washington, DC: Society for Neuroscience, 2005.
- “Direct visualization of synaptic release plasticity with novel, genetically-encoded, glutamate-sensitive fluorescent reporters.” Imaging Neurons and Neural Activity: New Methods, New Results. Cold Spring Harbor Labs, March 2005.
- “Exploring neuronal activity with genetically-encoded, glutamate-sensitive fluorescent reporters” UCSD All-Grad Research Symposium, January 2005.
- S.A. Hires, Y. Zhu, C.F. Stevens, R.Y. Tsien. Dynamic optical mapping of synaptic glutamate release with genetically encoded, glutamate-sensitive fluorescent reporters. Soc. Neurosci. Abstr., Vol. 30 952.13, 2004
- S.A. Hires, C. Zuker. DNA shuffling of mammalian taste receptors RIKEN Summer Program 2002
- X. Zhao, A. Hires, G. Liu. Activation of pre- and post-synaptic metabotropic glutamate receptors is crucial for the formation of glutamatergic synapses. Soc. Neurosci. Abstr., Vol. 27, (2001).

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### **Teaching**

TA – Structural Biochemistry, BIBC100 Fall 2002 – UCSD

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### **Awards**

2010 – Best expert-level research blog (researchblogging.org)  
2007 – Ion channel physiology : Cold Spring Harbor summer program attendee  
2004 – Best student abstract, Fine Science Tools, Meeting of the Society for Neuroscience  
2002 – Seeing the Brain in Action : RIKEN BSI summer program attendee  
2001 – Merck Pre-doctoral Fellowship

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### **Professional Experience**

Application Developer, Cummins Inc. (Summers 1997, 1998)

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## References

Dr. Karel Svoboda  
Group Leader – Janelia Farm Research Campus of Howard Hughes Medical Institute  
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Dr. Roger Y. Tsien  
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