



Mark J. Schnitzer

Anne T. and Robert M. Bass Professor in the School of Humanities and Sciences and Professor of Biology, of Applied Physics and of Neurosurgery

 Curriculum Vitae available Online

CONTACT INFORMATION

- **Alternate Contact**

Annette Lewis

Email Annettel@stanford.edu

Bio

ACADEMIC APPOINTMENTS

- Professor, Biology
- Professor, Applied Physics
- Professor, Neurosurgery
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- National Academy of Sciences, Committee on Biological Physics, A Decadal Survey, National Academy of Sciences (2019-present)
- Scientific Advisory Council, Allen Institute for Brain Science, MindScope Project, Allen Institute for Brain Science (2019-2020)
- 2019 Method of the Year, Nature Methods, awarded to the miniature fluorescence microscope, Cell Press (2019)
- Course Lecturer, "Functional, Structural, & Molecular Imaging", Soc. for Neuroscience Annual Meeting, Society for Neuroscience (2018)
- Course Lecturer, FENS Cajal Neuroscience Training Course, "Interacting with Neural Circuits", Federation of European Neuroscience Societies (2017)
- Editorial Board, Neuron, Cell Press, Cell Press (2016-present)
- Scientific Advisory Board, NSF National Center for Brain Mapping, National Science Foundation (2016-present)
- Co-Organizer, DECODE Summit, Neural Circuits and Brain Disease, Inscopix, Inc. (2016)
- Caltech, Wiersma Visiting Professor, California Institute of Technology (2015)
- Co-Organizer, Cell Press Symposium, "Engineering the Brain", Cell Press (2015)
- Invited Speaker, White House Office of Science & Technology, BRAIN Initiative Meeting, United States BRAIN Initiative (2015)
- Issue Editor, Current Opinion in Neurobiology, Current Opinion in Neurobiology (2015)
- NIH BRAIN Initiative Multi-Council Working Group, which oversees the BRAIN Initiative, National Institutes of Health (2014-17)
- NIH National Institute on Drug Abuse (NIDA), National Advisory Council, Ad hoc member, National Institutes of Health (2014-17)
- Milken Institute Global Conference, Invited Panelist, Milken Institute (2014)
- NIMH Director's Innovation Speaker, National Institutes of Health (2014)

- White House BRAIN Conference, Invited Panelist, United States BRAIN Initiative (2014)
- NIH, Parkinson Disease Basic Science Working Group, National Institutes of Health (2013-14)
- United States BRAIN Initiative NIH Director's Advisory Committee, which authored "BRAIN 2025", National Institutes of Health (2013-14)
- 14th Distinguished Kavli Lecture, Kavli Institute for Systems Neuroscience, NTNU, Trondheim, Norway (2013)
- Finalist (on behalf of Inscopix, for our lab's miniature microscope), Israel Brain Prize, Tel Aviv (2013)
- Top Innovation of 2013 (miniature fluorescence microscope), The Scientist (2013)
- Ellison Senior Scholar Award, Ellison Foundation (2012)
- National Academy Keck Futures Initiative Award, W.M. Keck Foundation (2011)
- Allen Distinguished Investigator Award, Paul G. Allen Family Foundation (2010)
- Michael & Kate Bárány Young Investigator Award, Biophysical Society (2010)
- HHMI Investigator, Howard Hughes Medical Institute (2008)
- Best Techniques Paper, Co-Author, American Society of Biomechanics (2007)
- NIH Director's Pioneer Award, National Institutes of Health (2007)
- The Brilliant 10, Top ten brilliant scientists under age 40, Popular Science Magazine (2007)
- W.M. Keck Foundation, Medical Research Program grant, W.M. Keck Foundation (2007)
- Terman Fellow, Stanford University (2006)
- Alfred P. Sloan Foundation Research Fellow, Alfred P. Sloan Foundation (2005)
- Beckman Interdisciplinary Translational Research Program Award, Stanford University (2005)
- Fellowship in Science & Engineering, David & Lucille Packard Foundation (2005)
- Klingenstein Fellowship in the Neurosciences, Klingenstein Foundation (2004)
- Presidential Early Career Award in Science and Engineering 2004, Presented at the White House on June 13, 2005 (2004)
- Young Investigator Award, Office of Naval Research, Cognitive & Neural Division (2004)
- Young Investigator Award, Beckman Foundation (2004)
- Cutting Edge Basic Research Award (CEBRA) Science, National Institutes of Health (2003)
- Member of TR100, World's Top 100 Innovators under age 35, Technology Review Magazine (2003)
- Young Investigator Award (with #1 world ranking), Human Frontiers in Science Program (2002)
- McKnight Technological Innovations in Neuroscience Award, McKnight Foundation (2000)
- Burroughs Wellcome Fellowship, Program in Mathematics and Molecular Biology (1998-1999)
- Charlotte Elizabeth Procter Honorary Fellowship, Princeton University (1997-1998)
- Predoctoral Fellowship, American Heart Association (1996-1998)
- Predoctoral Fellowship, NSF (1993-1996)
- Winston Churchill Fellowship, Winston Churchill Foundation of the United States (1992-1993)
- Junior Phi Beta Kappa for top 12 Junior men, Harvard University (1991)
- Barry Goldwater Fellowship for Excellence in Science, United States, Barry Goldwater Fellowship for Excellence in Science, United States (1990)
- John Harvard Scholarships, John Harvard Scholarships (1989-1991)
- Detur Scholar, Harvard University (1989)
- United States Physics Team, International Physics Olympiad, Bad Ischl, Austria (1988)

LINKS

- Schnitzer Lab Web Site: <http://pyramidal.stanford.edu/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

The long-term goal of our research is to advance experimental paradigms for understanding normal cognitive and disease processes at the level of neural circuits, with emphasis on learning and memory processes. By contrast, much current research on learning and memory concentrates on levels of organization in the nervous system that are either more macroscopic (e.g. in cognitive psychology) or more microscopic (e.g. in synaptic physiology).

Our approach combines behavioral, electrophysiological, and computational methodologies with high-resolution fluorescence optical imaging that is capable of resolving individual neurons and dendrites. By necessity, we aim to advance imaging methods so that we can examine dynamics of neuronal populations or of dendritic compartments in behaving animals. En route, we are also performing experiments on circuit properties in anesthetized animals, such as the studies that use our newly invented fluorescence endoscopes for examining hippocampal cells and dendrites in vivo.

We seek explanations that span different levels of organization, from cells to entire circuits. We work with both genetic model organisms, mice and fruit flies, and human subjects. Our research emphasizes understanding the control and learning of motor behaviors, as well as the potential application of our newly developed imaging techniques to clinical use in humans.

Teaching

COURSES

2025-26

- Advanced Imaging Lab in Biophysics: APPPHYS 232, BIO 132, BIO 232, BIOE 232, BIOPHYS 232, GENE 232 (Spr)
- Introduction to Biophysics: APPPHYS 205, BIO 126, BIO 226 (Win)

2024-25

- Advanced Imaging Lab in Biophysics: APPPHYS 232, BIO 132, BIO 232, BIOE 232, BIOPHYS 232, GENE 232 (Spr)
- Introduction to Biophysics: APPPHYS 205, BIO 126, BIO 226 (Win)

2023-24

- Advanced Imaging Lab in Biophysics: APPPHYS 232, BIO 132, BIO 232, BIOE 232, BIOPHYS 232, GENE 232 (Spr)
- Introduction to Biophysics: APPPHYS 205, BIO 126, BIO 226 (Win)

2022-23

- Advanced Imaging Lab in Biophysics: APPPHYS 232, BIO 132, BIO 232, BIOPHYS 232, GENE 232 (Spr)
- Introduction to Biophysics: APPPHYS 205, BIO 126, BIO 226 (Win)

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Marta Blanco Pozo, Xiaochun Cai, Iason Keramidis, Hansol Lim, Christopher Miranda, Michelle Redinbaugh, Xiaochen Sun, Lun Wang, Zhaoqiang Wang, Peiyi Zhang

Doctoral Dissertation Advisor (AC)

Katie Brown, Omer Hazon, Yiqi Jiang, Yuxi Ke, Vasily Kruzhilin, Yang Li, Henry Pan, Elijah Paul, Aditya Srinivasan, Cameron Sylber, Benny Weng, Zhengji Zhang

Doctoral (Program)

Areeq Hasan, Yang Li, Victor Wei, Xin Wei

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)
- Biophysics (Phd Program)
- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Wide-field fluorescence lifetime imaging of neuron spiking and subthreshold activity in vivo.** *Science (New York, N.Y.)*
Bowman, A. J., Huang, C., Schnitzer, M. J., Kasevich, M. A.
2023; 380 (6651): 1270-1275
- **An approximate line attractor in the hypothalamus encodes an aggressive state.** *Cell*
Nair, A., Karigo, T., Yang, B., Ganguli, S., Schnitzer, M. J., Linderman, S. W., Anderson, D. J., Kennedy, A.
2023; 186 (1): 178
- **Dual-polarity voltage imaging of the concurrent dynamics of multiple neuron types.** *Science (New York, N.Y.)*
Kannan, M., Vasan, G., Haziza, S., Huang, C., Chrapkiewicz, R., Luo, J., Cardin, J. A., Schnitzer, M. J., Pieribone, V. A.
2022; 378 (6619): eabm8797
- **Noise correlations in neural ensemble activity limit the accuracy of hippocampal spatial representations.** *Nature communications*
Hazon, O., Mincses, V. H., Tomas, D. P., Ganguli, S., Schnitzer, M. J., Jercog, P. E.
2022; 13 (1): 4276
- **Emergent reliability in sensory cortical coding and inter-area communication.** *Nature*
Ebrahimi, S., Lecoq, J., Rumyantsev, O., Tasci, T., Zhang, Y., Irimia, C., Li, J., Ganguli, S., Schnitzer, M. J.
2022
- **Fluorescence imaging of large-scale neural ensemble dynamics.** *Cell*
Kim, T. H., Schnitzer, M. J.
2022; 185 (1): 9-41
- **A neural circuit state change underlying skilled movements.** *Cell*
Wagner, M. J., Savall, J., Hernandez, O., Mel, G., Inan, H., Rumyantsev, O., Lecoq, J., Kim, T. H., Li, J. Z., Ramakrishnan, C., Deisseroth, K., Luo, L., Ganguli, et al
2021
- **The relationship between birth timing, circuit wiring, and physiological response properties of cerebellar granule cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Shuster, S., Wagner, M. J., Pan-Doh, N., Ren, J., Grutzner, S. M., Beier, K. T., Kim, T., Schnitzer, M. J., Luo, L.
2021; 118 (23)
- **The relationship between birth timing, circuit wiring, and physiological response properties of cerebellar granule cells.** *Proceedings of the National Academy of Sciences of the United States of America*
Shuster, S. A., Wagner, M. J., Pan-Doh, N., Ren, J., Grutzner, S. M., Beier, K. T., Kim, T. H., Schnitzer, M. J., Luo, L.
2021; 118 (23)
- **Supramammillary regulation of locomotion and hippocampal activity.** *Science (New York, N.Y.)*
Farrell, J. S., Lovett-Barron, M., Klein, P. M., Sparks, F. T., Gschwind, T., Ortiz, A. L., Ahanonu, B., Bradbury, S., Terada, S., Oijala, M., Hwaun, E., Dudok, B., Szabo, et al
2021; 374 (6574): 1492-1496
- **Olfactory landmarks and path integration converge to form a cognitive spatial map.** *Neuron*
Fischler-Ruiz, W., Clark, D. G., Joshi, N., Devi-Chou, V., Kitch, L., Schnitzer, M., Abbott, L. F., Axel, R.
2021

- **Cross-hemispheric gamma synchrony between prefrontal parvalbumin interneurons supports behavioral adaptation during rule shift learning.** *Nature neuroscience*
Cho, K. K., Davidson, T. J., Bouvier, G., Marshall, J. D., Schnitzer, M. J., Sohal, V. S.
2020
- **Fundamental bounds on the fidelity of sensory cortical coding.** *Nature*
Rumyantsev, O. I., Lecoq, J. A., Hernandez, O., Zhang, Y., Savall, J., Chrapkiewicz, R., Li, J., Zeng, H., Ganguli, S., Schnitzer, M. J.
2020; 580 (7801): 100-105
- **RecV recombinase system for in vivo targeted optogenomic modifications of single cells or cell populations.** *Nature methods*
Yao, S., Yuan, P., Ouellette, B., Zhou, T., Mortrud, M., Balaram, P., Chatterjee, S., Wang, Y., Daigle, T. L., Tasic, B., Kuang, X., Gong, H., Luo, et al
2020
- **Fundamental bounds on the fidelity of sensory cortical coding** *NATURE*
Rumyantsev, O. I., Lecoq, J. A., Hernandez, O., Zhang, Y., Savall, J., Chrapkiewicz, R., Li, J., Zeng, H., Ganguli, S., Schnitzer, M. J.
2020
- **Microendoscopy detects altered muscular contractile dynamics in a mouse model of amyotrophic lateral sclerosis.** *Scientific reports*
Chen, X., Sanchez, G. N., Schnitzer, M. J., Delp, S. L.
2020; 10 (1): 457
- **Skilled reaching tasks for head-fixed mice using a robotic manipulandum.** *Nature protocols*
Wagner, M. J., Savall, J. n., Kim, T. H., Schnitzer, M. J., Luo, L. n.
2020
- **Ultrafast Two-Photon Imaging of a High-Gain Voltage Indicator in Awake Behaving Mice.** *Cell*
Villette, V., Chavarha, M., Dimov, I. K., Bradley, J., Pradhan, L., Mathieu, B., Evans, S. W., Chamberland, S., Shi, D., Yang, R., Kim, B. B., Ayon, A., Jalil, et al
2019; 179 (7): 1590
- **Amygdala ensembles encode behavioral states** *SCIENCE*
Grundemann, J., Bitterman, Y., Lu, T., Krabbe, S., Grewe, B. F., Schnitzer, M. J., Luthi, A.
2019; 364 (6437): 254-+
- **Amygdala ensembles encode behavioral states.** *Science (New York, N.Y.)*
Grundemann, J., Bitterman, Y., Lu, T., Krabbe, S., Grewe, B. F., Schnitzer, M. J., Luthi, A.
2019; 364 (6437)
- **Shared Cortex-Cerebellum Dynamics in the Execution and Learning of a Motor Task** *CELL*
Wagner, M. J., Kim, T., Kadmon, J., Nguyen, N. D., Ganguli, S., Schnitzer, M. J., Luo, L.
2019; 177 (3): 669-+
- **Shared Cortex-Cerebellum Dynamics in the Execution and Learning of a Motor Task.** *Cell*
Wagner, M. J., Kim, T. H., Kadmon, J., Nguyen, N. D., Ganguli, S., Schnitzer, M. J., Luo, L.
2019
- **An amygdalar neural ensemble that encodes the unpleasantness of pain.** *Science (New York, N.Y.)*
Corder, G., Ahanonu, B., Grewe, B. F., Wang, D., Schnitzer, M. J., Scherrer, G.
2019; 363 (6424): 276-81
- **An amygdalar neural ensemble that encodes the unpleasantness of pain** *SCIENCE*
Corder, G., Ahanonu, B., Grewe, B. F., Wang, D., Schnitzer, M. J., Scherrer, G.
2019; 363 (6424): 276-+
- **Kilohertz two-photon brain imaging in awake mice.** *Nature methods*
Zhang, T. n., Hernandez, O. n., Chrapkiewicz, R. n., Shai, A. n., Wagner, M. J., Zhang, Y. n., Wu, C. H., Li, J. Z., Inoue, M. n., Gong, Y. n., Ahanonu, B. n., Zeng, H. n., Bito, et al
2019
- **An Amygdalar Neural Ensemble Encoding the Unpleasantness of Pain**

- Corder, G., Ahanonu, B., Grewe, B., Schnitzer, M., Scherrer, G.
NATURE PUBLISHING GROUP.2018: S527
- **Fast, in vivo voltage imaging using a red fluorescent indicator** *NATURE METHODS*
Kannan, M., Vasan, G., Huang, C., Haziza, S., Li, J., Inan, H., Schnitzer, M. J., Pieribone, V. A.
2018; 15 (12): 1108-+
 - **Fast, in vivo voltage imaging using a red fluorescent indicator.** *Nature methods*
Kannan, M., Vasan, G., Huang, C., Haziza, S., Li, J. Z., Inan, H., Schnitzer, M. J., Pieribone, V. A.
2018
 - **Long-Term Consolidation of Ensemble Neural Plasticity Patterns in Hippocampal Area CA1.** *Cell reports*
Attardo, A., Lu, J., Kawashima, T., Okuno, H., Fitzgerald, J. E., Bito, H., Schnitzer, M. J.
2018; 25 (3): 640
 - **Long-Term Consolidation of Ensemble Neural Plasticity Patterns in Hippocampal Area CA1** *CELL REPORTS*
Attardo, A., Lu, J., Kawashima, T., Okuno, H., Fitzgerald, J. E., Bito, H., Schnitzer, M. J.
2018; 25 (3): 640-+
 - **Three-photon imaging of mouse brain structure and function through the intact skull** *NATURE METHODS*
Wang, T., Ouzounov, D. G., Wu, C., Horton, N. G., Zhang, B., Wu, C., Zhang, Y., Schnitzer, M. J., Xu, C.
2018; 15 (10): 789-+
 - **Calcium Transient Dynamics of Neural Ensembles in the Primary Motor Cortex of Naturally Behaving Monkeys** *CELL REPORTS*
Kondo, T., Saito, R., Otaka, M., Yoshino-Saito, K., Yamanaka, A., Yamamori, T., Watakabe, A., Mizukami, H., Schnitzer, M. J., Tanaka, K. F., Ushiba, J., Okano, H.
2018; 24 (8): 2191-+
 - **Unsupervised Discovery of Demixed, Low-Dimensional Neural Dynamics across Multiple Timescales through Tensor Component Analysis** *NEURON*
Williams, A. H., Kim, T., Wang, F., Vyas, S., Ryu, S. I., Shenoy, K. V., Schnitzer, M., Kolda, T. G., Ganguli, S.
2018; 98 (6): 1099-+
 - **Long-term optical brain imaging in live adult fruit flies** *NATURE COMMUNICATIONS*
Huang, C., Maxey, J. R., Sinha, S., Savall, J., Gong, Y., Schnitzer, M. J.
2018; 9: 872
 - **Unsupervised Discovery of Demixed, Low-Dimensional Neural Dynamics across Multiple Timescales through Tensor Component Analysis.** *Neuron*
Williams, A. H., Kim, T. H., Wang, F. n., Vyas, S. n., Ryu, S. I., Shenoy, K. V., Schnitzer, M. n., Kolda, T. G., Ganguli, S. n.
2018
 - **Diametric neural ensemble dynamics in parkinsonian and dyskinetic states.** *Nature*
Parker, J. G., Marshall, J. D., Ahanonu, B. n., Wu, Y. W., Kim, T. H., Grewe, B. F., Zhang, Y. n., Li, J. Z., Ding, J. B., Ehlers, M. D., Schnitzer, M. J.
2018
 - **Neuronal Representation of Social Information in the Medial Amygdala of Awake Behaving Mice** *CELL*
Li, Y., Mathis, A., Grewe, B. F., Osterhout, J. A., Ahanonu, B., Schnitzer, M. J., Murthy, V. N., Dulac, C.
2017; 171 (5): 1176-+
 - **Social behaviour shapes hypothalamic neural ensemble representations of conspecific sex** *NATURE*
Remedios, R., Kennedy, A., Zelikowsky, M., Grewe, B. F., Schnitzer, M. J., Anderson, D. J.
2017; 550 (7676): 388-+
 - **Cerebellar granule cells encode the expectation of reward** *NATURE*
Wagner, M. J., Kim, T. H., Savall, J., Schnitzer, M. J., Luo, L.
2017; 544 (7648): 96-?
 - **Neural ensemble dynamics underlying a long-term associative memory** *NATURE*
Grewe, B. F., Grundemann, J., Kitch, L. J., Lecoq, J. A., Parker, J. G., Marshall, J. D., Larkin, M. C., Jercog, P. E., Grenier, F., Li, J. Z., Luthi, A., Schnitzer, M. J.

2017; 543 (7647): 670-?

- **Robust Estimation of Neural Signals in Calcium Imaging**
Inan, H., Erdogdu, M. A., Schnitzer, M. J.
edited by Guyon, Luxburg, U. V., Bengio, S., Wallach, H., Fergus, R., Vishwanathan, S., Garnett, R.
NEURAL INFORMATION PROCESSING SYSTEMS (NIPS).2017
- **Long-Term Optical Access to an Estimated One Million Neurons in the Live Mouse Cortex** *CELL REPORTS*
Kim, T. H., Zhang, Y., Lecoq, J., Jung, J. C., Li, J., Zeng, H., Niell, C. M., Schnitzer, M. J.
2016; 17 (12): 3385-3394
- **Cell-Type-Specific Optical Recording of Membrane Voltage Dynamics in Freely Moving Mice** *CELL*
Marshall, J. D., Li, J. Z., Zhang, Y., Gong, Y., St-Pierre, F., Lin, M. Z., Schnitzer, M. J.
2016; 167 (6): 1650-?
- **Distinct Hippocampal Pathways Mediate Dissociable Roles of Context in Memory Retrieval.** *Cell*
Xu, C., Krabbe, S., Gründemann, J., Botta, P., Fadok, J. P., Osakada, F., Saur, D., Grewe, B. F., Schnitzer, M. J., Callaway, E. M., Lüthi, A.
2016; 167 (4): 961-972 e16
- **Changes in sarcomere lengths of the human vastus lateralis muscle with knee flexion measured using in vivo microendoscopy** *JOURNAL OF BIOMECHANICS*
Chen, X., Sanchez, G. N., Schnitzer, M. J., Delp, S. L.
2016; 49 (13): 2989-2994
- **Genetically encoded indicators of neuronal activity.** *Nature neuroscience*
Lin, M. Z., Schnitzer, M. J.
2016; 19 (9): 1142-1153
- **Large-Scale Fluorescence Calcium-Imaging Methods for Studies of Long-Term Memory in Behaving Mammals** *COLD SPRING HARBOR PERSPECTIVES IN BIOLOGY*
Jercog, P., Rogerson, T., Schnitzer, M. J.
2016; 8 (5)
- **In Vivo Imaging of Human Sarcomere Twitch Dynamics in Individual Motor Units.** *Neuron*
Sanchez, G. N., Sinha, S., Liske, H., Chen, X., Nguyen, V., Delp, S. L., Schnitzer, M. J.
2015; 88 (6): 1109-20
- **High-speed recording of neural spikes in awake mice and flies with a fluorescent voltage sensor** *SCIENCE*
Gong, Y., Huang, C., Li, J. Z., Grewe, B. F., Zhang, Y., Eismann, S., Schnitzer, M. J.
2015; 350 (6266): 1361-1366
- **In Vivo Imaging of Human Sarcomere Twitch Dynamics in Individual Motor Units** *NEURON*
Sanchez, G. N., Sinha, S., Liske, H., Chen, X., Viet Nguyen, V., Delp, S. L., Schnitzer, M. J.
2015; 88 (6): 1109-1120
- **Entorhinal Cortical Ocean Cells Encode Specific Contexts and Drive Context-Specific Fear Memory.** *Neuron*
Kitamura, T., Sun, C., Martin, J., Kitch, L. J., Schnitzer, M. J., Tonegawa, S.
2015; 87 (6): 1317-1331
- **Optogenetics: 10 years after ChR2 in neurons-views from the community** *NATURE NEUROSCIENCE*
Adamantidis, A., Arber, S., Bains, J. S., Bamberg, E., Bonci, A., Buzsaki, G., Cardin, J. A., Costa, R. M., Dan, Y., Goda, Y., Graybiel, A. M., Haeusser, M., Hegemann, et al
2015; 18 (9): 1202-12
- **Impermanence of dendritic spines in live adult CA1 hippocampus.** *Nature*
Attardo, A., Fitzgerald, J. E., Schnitzer, M. J.
2015; 523 (7562): 592-596
- **Impermanence of dendritic spines in live adult CA1 hippocampus** *NATURE*
Attardo, A., Fitzgerald, J. E., Schnitzer, M. J.
2015; 523 (7562): 592-?

- **Distinct speed dependence of entorhinal island and ocean cells, including respective grid cells** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Sun, C., Kitamura, T., Yamamoto, J., Martin, J., Pignatelli, M., Kitch, L. J., Schnitzer, M. J., Tonegawa, S.
2015; 112 (30): 9466-9471
- **Distinct speed dependence of entorhinal island and ocean cells, including respective grid cells.** *Proceedings of the National Academy of Sciences of the United States of America*
Sun, C., Kitamura, T., Yamamoto, J., Martin, J., Pignatelli, M., Kitch, L. J., Schnitzer, M. J., Tonegawa, S.
2015; 112 (30): 9466-71
- **Dexterous robotic manipulation of alert adult *Drosophila* for high-content experimentation.** *Nature methods*
Savall, J., Ho, E. T., Huang, C., Maxey, J. R., Schnitzer, M. J.
2015; 12 (7): 657-660
- **Dexterous robotic manipulation of alert adult *Drosophila* for high-content experimentation.** *Nature methods*
Savall, J., Ho, E. T., Huang, C., Maxey, J. R., Schnitzer, M. J.
2015; 12 (7): 657-660
- **Editorial overview: Large-scale recording technology: Scaling up neuroscience.** *Current opinion in neurobiology*
Battaglia, F. P., Schnitzer, M. J.
2015; 32: iv-vi
- **The BRAIN Initiative: developing technology to catalyse neuroscience discovery** *PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES*
Jorgenson, L. A., Newsome, W. T., Anderson, D. J., Bargmann, C. I., Brown, E. N., Deisseroth, K., Donoghue, J. P., Hudson, K. L., Ling, G. S., MacLeish, P. R., Marder, E., Normann, R. A., Sanes, et al
2015; 370 (1668): 8-19
- **Cellular Level Brain Imaging in Behaving Mammals: An Engineering Approach** *NEURON*
Hamel, E. J., Grewe, B. F., Parker, J. G., Schnitzer, M. J.
2015; 86 (1): 140-159
- **The neural representation of taste quality at the periphery** *NATURE*
Barretto, R. P., Gillis-Smith, S., Chandrashekar, J., Yarmolinsky, D. A., Schnitzer, M. J., Ryba, N. J., Zuker, C. S.
2015; 517 (7534): 373-U511
- **Visualizing mammalian brain area interactions by dual-axis two-photon calcium imaging** *NATURE NEUROSCIENCE*
Lecoq, J., Savall, J., Vucinic, D., Grewe, B. F., Kim, H., Li, T. Z., Kitch, L. J., Schnitzer, M. J.
2014; 17 (12): 1825-1829
- **Visualizing mammalian brain area interactions by dual-axis two-photon calcium imaging.** *Nature neuroscience*
Lecoq, J., Savall, J., Vucinic, D., Grewe, B. F., Kim, H., Li, J. Z., Kitch, L. J., Schnitzer, M. J.
2014; 17 (12): 1825-1829
- **High-fidelity optical reporting of neuronal electrical activity with an ultrafast fluorescent voltage sensor.** *Nature neuroscience*
St-Pierre, F., Marshall, J. D., Yang, Y., Gong, Y., Schnitzer, M. J., Lin, M. Z.
2014; 17 (6): 884-889
- **Imaging neural spiking in brain tissue using FRET-opsin protein voltage sensors** *NATURE COMMUNICATIONS*
Gong, Y., Wagner, M. J., Li, J. Z., Schnitzer, M. J.
2014; 5
- **Bidirectional plasticity of purkinje cells matches temporal features of learning.** *journal of neuroscience*
Wetmore, D. Z., Jirenhed, D., Rasmussen, A., Johansson, F., Schnitzer, M. J., Hesslow, G.
2014; 34 (5): 1731-1737
- **Imaging neural spiking in brain tissue using FRET-opsin protein voltage sensors.** *Nature communications*
Gong, Y., Wagner, M. J., Zhong Li, J., Schnitzer, M. J.
2014; 5: 3674-?

- **High-speed laser microsurgery of alert fruit flies for fluorescence imaging of neural activity** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Sinha, S., Liang, L., Ho, E. T., Urbaneck, K. E., Luo, L., Baer, T. M., Schnitzer, M. J.
2013; 110 (46): 18374-18379
- **Engineering Approaches to Illuminating Brain Structure and Dynamics** *NEURON*
Deisseroth, K., Schnitzer, M. J.
2013; 80 (3): 568-577
- **Sarcomere lengths in human extensor carpi radialis brevis measured by microendoscopy** *MUSCLE & NERVE*
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