

SfN 2017
science
program

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POSTERS & PRESENTATIONS FROM THE INSCOPIX COMMUNITY AT SFN 2017

Program #	Title
069.16 DP08 II20	Encoding the relationship between anxiety-related behaviors and nociceptin neurons of the bed nucleus of the stria terminalis
066.03 GG25	Neural sequences underlying rapid learning of new syllables in juvenile zebra finches
164.05 RR2	<i>In vivo</i> calcium imaging of SKF38393 induced perseverative grooming in awake behaving mice
174.07 UU28	Large-scale calcium imaging of the visual cortex in freely behaving, juvenile mice
115.23 B31	Adult hippocampal neurogenesis buffers ventral dentate gyrus responses to chronic stress
193.01	Hypothalamic switch of REM sleep
254.09 TT19	Distinct neural circuits for the formation and retrieval of episodic memories
253.05 SS60	Temporal coding of hippocampal neurons across scales
254.02 TT12	Unraveling the dynamism of engram cells during contextual memory processing
244.22 NN26	Mechanisms of RMTg responses to aversive stimuli.
235.07 GG29	Imaging basal ganglia activity associated with learned vocalizations

Authors	Date	Time	Location
*R. L. Ung, J. Rodriguez-Romaguera, H. Nomura, V. M. K. Nambodiri, J. M. Otis, J. Robinson, S. L. Resendez, J. A. McHenry, L. E. H. Eckman, O. Kosyk, H. E. Van den Munkhof, P. Zhou, L. Paninski, T. Kash, M. R. Bruchas, G. D. Stuber	11/11	1:00pm - 5:00pm	Halls A-C
*E. L. Mackevicius, N. Denissenko, M. S. Fee	11/11	3:00pm - 4:00pm	Halls A-C
*J. R. Hyde, S. E. Ahmari	11/12	8:00am - 9:00am	Halls A-C
*C. Groves Kuhnle, K. B. Hengen, S. E. Richards, S. D. Van Hooser, G. Turrigiano	11/12	10:00am - 11:00am	Halls A-C
*C. Anacker, G. Stevens, A. Millette, R. Shores, R. Hen	11/12	10:00am - 11:00am	Halls A-C
*K.-S. Chen, M. Xu, Y. Dan	11/12	1:00pm - 1:15pm	Room 156
*D. Roy, T. Kitamura, T. Okuyama, S. Ogawa-Kitamura, C. Sun, Y. Obata, A. Yoshiki, S. Tonegawa	11/12	1:00pm - 2:00pm	Halls A-C
*W. Mau, D. W. Sullivan, N. R. Kinsky, Z. Tiganj, J. Wei, M. W. Howard, H. B. Eichenbaum	11/12	1:00pm - 2:00pm	Halls A-C
*K. Ghandour, N. Ohkawa, C. Fung, Y. Saitoh, T. Takekawa, H. Asai, R. Okubo-Suzuki, M. Nomoto, S. Soya, S. Tsujimura, H. Nishizono, M. Matsuo, M. Sato, M. Ohkura, J. Nakai, Y. Hayashi, T. Sakurai, M. Osanai, T. Fukai, K. Inokuchi	11/12	2:00pm - 3:00pm	Halls A-C
*H. Li, P. Vento, D. Pullmann, M. Eid, T. Jhou	11/12	2:00pm - 3:00pm	Halls A-C
*J. Singh Alvarado, M. Ben-Tov, M. G. Kearney, R. D. Mooney	11/12	3:00pm - 4:00pm	Halls A-C

Program #	Title
253.07 SS62	Cognitive maps of memories and space in large hippocampal neural ensembles
254.07 TT17	Ventral CA1 neurons store social memory
253.04 SS59	Large-scale hippocampal population representations: Coherent spatial maps that gradually evolve over time
253.08 SS63	TENASPIS: A fast, accurate, and improved tool for detecting ROIs and calcium transients from in-vivo single photon fluorescence microscopy
328.01 OO15	Disinhibitory amygdala microcircuits for aversive learning
278.02	Choice-selective sequential activity in prelimbic cortical neurons that project to the nucleus accumbens
278.03	The role of the anterior cingulate cortex projection to the dorsomedial striatum in reinforcement learning
325.07 MM10	Coupling of dentate granule cell activity and micro-vessel hemodynamics <i>in vivo</i> regulates adult hippocampal neurogenesis
315.19 FF21	Fast-spiking interneurons regulate ensemble calcium signaling and striatum-dependent learning
344.12 VV80	High Yield Cranial Window Technique for Imaging Cortical Neuron Activity with Head-Mounted Miniaturized Microscopes
389.15 DP06 Y15	Calcium imaging of striatal activity evoked by subthalamic nucleus deep brain stimulation
348.02	Neuronal circuit mechanisms for associative fear conditioning

Authors	Date	Time	Location
*S. J. Levy, N. R. Kinsky, D. W. Sullivan, H. B. Eichenbaum	11/12	3:00pm - 4:00pm	Halls A-C
*T. Okuyama, T. Kitamura, D. S. Roy, S. Itohara, S. Tonegawa	11/12	3:00pm - 4:00pm	Halls A-C
*N. R. Kinsky, D. W. Sullivan, W. Mau, H. B. Eichenbaum	11/12	4:00pm - 5:00pm	Halls A-C
*D. W. Sullivan, N. R. Kinsky, W. Mau, H. B. Eichenbaum	11/12	4:00pm - 5:00pm	Halls A-C
*E. Paradiso, S. Krabbe, C. Xu, S. D'Aquin, M. Markovic, J. Gründemann, F. Ferraguti, A. Lüthi	11/13	8:00am - 9:00am	Halls A-C
*N. F. Parker, M. Murugan, I. B. Witten	11/13	8:15am - 8:30am	Room 143A
*J. M. Cox, N. Rangarajan, I. B. Witten	11/13	8:30am - 8:45am	Room 143A
*J. Shen, D. Wang, G. Kirschen, Q. Xiong, J. Xia, S. Ge	11/13	10:00am - 11:00am	Halls A-C
*S. F. Owen, J. D. Berke, A. C. Kreitzer	11/13	10:00am - 11:00am	Halls A-C
*X. Li, V. Cao, W. Zhang, S. Mastwal, Q. Liu, S. Otte, K. Wang	11/13	11:00am - 12:00pm	Halls A-C
*J. Trevathan, E. N. Nicolai, A. J. Asp, D. Cheng, M. J. Schachter, J. J. Nassi, S. L. Otte, J. G. Parker, J. Lujan, K. A. Ludwig	11/13	1:00pm - 5:00pm	Halls A-C
A. Lüthi	11/13	1:35pm - 2:10pm	Ballroom B

Program #	Title
361.03	Neuronal representation of social information in the medial amygdala of awake behaving mice
514.21 SS10	Cortical circuit dynamics during punishment-resistant alcohol drinking
450.05	Hippocampal circuit dysfunction underlies fear memory deficits in Rett syndrome mice
522.18 UU21	Long-term imaging of ensemble neural calcium dynamics in the perirhinal cortex of freely behaving mice learning context-stimulus associations
512.11 QQ22	Neural representation of sensory-state value in the striatal striosome compartment
523.07 UU39	Place cell ensemble function in a mouse model of chronic stress
616.03 UU5	Unsupervised learning of neuronal ensemble dynamics reveals representation of space without behavioral measurement
611.24 SS35	Imaging fluoxetine modulation of dentate gyrus function
698.01 OO10	Amygdalar neural ensembles that encode the aversive quality of pain experience
717.01 VV33	Simultaneous optogenetic manipulations and cellular resolution calcium imaging during active behavior using a head-mountable miniaturized microscope - <i>Inscopix poster!</i>
698.07 OO17	Anxiety cells in a hippocampal-hypothalamic circuit
723.02	Function of basal ganglia circuitry in movement and action selection

Authors	Date	Time	Location
*Y. Li, A. Mathis, B. F. Grewe, M. J. Schnitzer, V. N. Murthy, C. G. Dulac	11/13	1:30pm - 1:45pm	Room 140A
*C. Siciliano, Y. Leow, X. Chen, E. Y. Kimchi, C. M. Vander Weele, K. M. Tye	11/14	8:00am - 9:00am	Halls A-C
*L. He, C.-T. Wu, R. T. Ash, S. Hao, Y. Sun, J. Tang, D. Ji, X. Jiang, H. Y. Zoghbi	11/14	9:00am - 9:15am	Room 140A
*T. Rogerson, J. Maxey, P. Jercog, T. H. Kim, S. Eismann, B. Ahanonu, B. Grewe, J. Li, M. J. Schnitzer	11/14	9:00am - 10:00am	Halls A-C
*T. Yoshizawa, M. Ito, K. Doya	11/14	10:00am - 11:00am	Halls A-C
*T. Indersmitten, M. Schachter, R. Wyatt, N. Welty, S. Young, S. Campbell, S. Otte, J. Nassi, P. Bonaventure	11/14	10:00am - 11:00am	Halls A-C
*A. Rubin, L. Sheintuch, O. Pinchasov, N. Brande-Eilat, Y. Rechavi, N. Geva, Y. Ziv	11/14	3:00pm - 4:00pm	Halls A-C
*E. Carazo, C. Anacker, R. Hen	11/15	4:00pm - 5:00pm	Halls A-C
*G. F. Corder, B. Ahanonu, B. Grewe, M. Schnitzer, G. Scherrer	11/15	8:00am - 9:00am	Halls A-C
*A. M. Stamatakis, M. J. Schachter, S. Gulati, S. Malanowski, M. Trulson, S. Otte	11/15	8:00am - 9:00am	Halls A-C
*J. C. Jimenez, K. Su, A. Goldberg, V. Luna, P. Zhou, G. Ordek, S. Ong, L. Zweifel, L. Paninski, R. Hen, M. Kheirbek	11/15	11:00am - 12:00pm	Halls A-C
A. C. Kreitzer	11/15	1:35pm - 2:10pm	Ballroom A

Program #	Title
735.02	Function of basal ganglia circuitry in motivation
735.03	Dopaminergic modulation of projection-defined prefrontal circuits
735.04	Activity transients in dopaminergic neurons modulate action initiation but not action execution
735.05	The spatiotemporal organization of striatal direct- and indirect-pathway projection neurons encodes action space
735.08	Nociceptin neurons in the bed nucleus of the stria terminalis regulate anxiety
735.09	Modulation of contextual fear discrimination by the locus coeruleus noradrenergic system in the dentate gyrus
735.10	Ensemble coding of amygdala circuits in anxiety and fear behaviours
735.11	Hypothalamic ensemble representations during social interactions, mating and fighting
735.12	Using <i>in vivo</i> microscopy to assess the role of striatal medium spiny neurons in compulsive behavior and response to pharmacological treatment
735.13	The central amygdala controls learning in the lateral amygdala
785.30 LL11	Dissecting the TRH-TSH-Thyroid axis in behaving animals
799.07 TT2	Processing information over time in prefrontal cortex

Authors	Date	Time	Location
*C. H. Donahue, A. C. Kreitzer	11/15	1:15pm - 1:30pm	Room 146C
*C. M. Vander Weele, C. A. Siciliano, G. A. Matthews, E. Izadmehr, I. C. Espinel, E. H. Nieh, P. Namburi, E. H. S. Schut, E. Kimchi, A. Beyeler, R. Wichmann, N. Padilla-Coreano, K. Tye	11/15	1:30pm - 1:45pm	Room 146C
*J. Alves da Silva, V. Paixão, F. Tecuapetla, R. M. Costa	11/15	1:45pm - 2:00pm	Room 146C
*A. Klaus, G. J. Martins, V. B. Paixão, P. Zhou, L. Paninski, R. M. Costa	11/15	2:00pm - 2:15pm	Room 146C
*J. Rodriguez-Romaguera, R. Ung, H. Nomura, V. K. Nambodiri, J. M. Otis, J. Robinson, S. Resendez, J. A. McHenry, L. E. H. Eckman, O. Kosyk, H. E. Van den Munkhof, P. Zhou, L. Paninski, T. Kash, M. R. Bruchas, G. D. Stuber	11/15	2:45pm - 3:00pm	Room 146C
*D.-O. Seo, L. E. Motard, L. Xia, M. R. Bruchas	11/15	3:00pm - 3:15pm	Room 146C
*J. Gründemann, Y. Bitterman, T. Lu, S. Krabbe, K. Hagihara, B. F. Grewe, M. J. Schnitzer, A. Lüthi	11/15	3:15pm - 3:30pm	Room 146C
*R. Remedios	11/15	3:30pm - 3:45pm	Room 146C
*S. C. Piantadosi, J. R. Hyde, S. E. Ahmari	11/15	3:45pm - 4:00pm	Room 146C
*K. Yu, S. Ahrens, X. Zhang, H. C. Schiff, C. Ramakrishnan, L. Fenno, K. Deisseroth, P. Zhou, L. Paninski, B. Li	11/15	4:00pm - 4:15pm	Room 146C
P. Campos, A. Guillou, O. Hoa, *P. E. Mollard	11/15	2:00pm - 3:00pm	Halls A-C
*E. H. Schut, S. Hulzebos, L. Reinink, L. Genzel, F. Battaglia	11/15	3:00pm - 4:00pm	Halls A-C

Neuronal representation of social information in the medial amygdala of awake behaving mice

Ying Li, Alexander Mathis, Benjamin F. Grewe, Jessica A. Osterhout, Biafra Ahanonu, Mark J. Schnitzer, Venkatesh N. Murthy, Catherine Dulac

Cell

October 26, 2017

The medial amygdala (MeA) plays a critical role in processing species- and sex-specific signals that trigger social and defensive behaviors. However, the principles by which this deep brain structure encodes social information is poorly understood. We used a miniature microscope to image the Ca^{2+} dynamics of large neural ensembles in awake behaving mice and tracked the responses of MeA neurons over several months. These recordings revealed spatially intermingled subsets of MeA neurons with distinct temporal dynamics. The encoding of social information in the MeA differed between males and females and relied on information from both individual cells and neuronal populations.

Tracking the same neurons across multiple days in Ca^{2+} imaging data

Liron Sheintuch, Alon Rubin, Noa Brande-Eilat, Nitzan Geva, Noa Sadeh, Or Pinchasof, Yaniv Ziv

Cell Reports

October 24, 2017

Ca^{2+} imaging techniques permit time-lapse recordings of neuronal activity from large populations over weeks. However, without identifying the same neurons across imaging sessions (cell registration), longitudinal analysis of the neural code is restricted to population-level statistics. Accurate cell registration becomes challenging with increased numbers of cells, sessions, and inter-session intervals. Current cell registration practices, whether manual or automatic, do not quantitatively evaluate registration accuracy, possibly leading to data misinterpretation. We developed a probabilistic method that automatically registers cells across multiple sessions and estimates the registration confidence for each registered cell.

Social behaviour shapes hypothalamic neural ensemble representations of conspecific sex

Ryan Remedios, Ann Kennedy, Moriel Zelikowsky, Benjamin F. Grewe, Mark J. Schnitzer, David J. Anderson

Nature

October 18, 2017

All animals possess a repertoire of innate (or instinctive^{1,2}) behaviours, which can be performed without training. Whether such behaviours are mediated by anatomically distinct and/or genetically specified neural pathways remains unknown^{3,4,5}. Here we report that neural representations within the mouse hypothalamus, that underlie innate social behaviours, are shaped by social experience. Oestrogen receptor 1-expressing (Esr1+) neurons in the ventrolateral subdivision of the ventromedial hypothalamus (VMHvl) control mating and fighting in rodents^{6,7,8}. We used microendoscopy⁹ to image Esr1+ neuronal activity in the VMHvl of male mice engaged in these social behaviours.

Deconstruction of corticospinal circuits for goal-directed motor skills

Xuhua Wang, Yuanyuan Liu, Xinjian Li, Zicong Zhang, Hengfu Yang, Yu Zhang, Philip R. Williams, Noaf S.A. Alwahab, Kush Kapur, Bin Yu, Yiming Zhang, Mengying Chen, Haixia Ding, Charles R. Gerfen, Kuan Hong Wang, Zhigang He

Cell

September 21, 2017

Corticospinal neurons (CSNs) represent the direct cortical outputs to the spinal cord and play important roles in motor control across different species. However, their organizational principle remains unclear. By using a retrograde labeling system, we defined the requirement of CSNs in the execution of a skilled forelimb food-pellet retrieval task in mice. *In vivo* imaging of CSN activity during performance revealed the sequential activation of topographically ordered functional ensembles with moderate local mixing.

The spatiotemporal organization of the striatum encodes action space

Andreas Klaus, Gabriela J. Martins, Vitor B. Paixao, Pengcheng Zhou, Liam Paninski, Rui M. Costa

Neuron

August 30, 2017

Activity in striatal direct- and indirect-pathway spiny projection neurons (SPNs) is critical for proper movement. However, little is known about the spatiotemporal organization of this activity. We investigated the spatiotemporal organization of SPN ensemble activity in mice during self-paced, natural movements using microendoscopic imaging. Activity in both pathways showed predominantly local but also some long-range correlations. Using a novel approach to cluster and quantify behaviors based on continuous accelerometer and video data, we found that SPN ensembles active during specific actions were spatially closer and more correlated overall.

Central amygdala circuits modulate food consumption through a positive-valence mechanism

Amelia M Douglass, Hakan Kucukdereli, Marion Ponsérre, Milica Markovic, Jan Gründemann, Cornelia Strobel, Pilar L Alcalá Morales, Karl-Klaus Conzelmann, Andreas Lüthi & Rüdiger Klein

Nature Neuroscience

August 21, 2017

The complex behaviors underlying reward seeking and consumption are integral to organism survival. The hypothalamus and mesolimbic dopamine system are key mediators of these behaviors, yet regulation of appetitive and consummatory behaviors outside of these regions is poorly understood. The central nucleus of the amygdala (CeA) has been implicated in feeding and reward, but the neurons and circuit mechanisms that positively regulate these behaviors remain unclear.

Skin suturing and cortical surface viral infusion improves imaging of neuronal ensemble activity with head-mounted miniature microscopes

Xinjian Li, Vania Y. Cao, Wenyu Zhang, Surjeet S. Mastwal, Qing Liu, Stephani Otte, Kuan Hong Wang

Journal of Neuroscience Methods

August 19, 2017

In vivo optical imaging of neural activity provides important insights into brain functions at the single-cell level. Cranial windows and virally delivered calcium indicators are commonly used for imaging cortical activity through two-photon microscopes in head-fixed animals. Recently, head-mounted one-photon microscopes have been developed for freely behaving animals. However, minimizing tissue damage from the virus injection procedure and maintaining window clarity for imaging can be technically challenging.

Distinct neural circuits for the formation and retrieval of episodic memories

Dheeraj S. Roy, Takashi Kitamura, Teruhiro Okuyama, Sachie K. Ogawa, Chen Sun, Yuichi Obata, Atsushi Yoshiki & Susumu Tonegawa

Cell

August 17, 2017

The formation and retrieval of a memory is thought to be accomplished by activation and reactivation, respectively, of the memory-holding cells (engram cells) by a common set of neural circuits, but this hypothesis has not been established. The medial temporal-lobe system is essential for the formation and retrieval of episodic memory for which individual hippocampal subfields and entorhinal cortex layers contribute by carrying out specific functions. One subfield whose function is poorly known is the subiculum. Here, we show that dorsal subiculum and the circuit, CA1 to dorsal subiculum to medial entorhinal cortex layer 5, play a crucial role selectively in the retrieval of episodic memories.

Multi-layer cortical calcium imaging in freely moving mice with prism probes and miniaturized fluorescence microscopy

Srishti Gulati, Vania Cao, Stephani Otte

JoVE

June 13, 2017

In vivo circuit and cellular level functional imaging is a critical tool for understanding the brain in action. High resolution imaging of mouse cortical neurons with two-photon microscopy has provided unique insights into cortical structure, function and plasticity. However, these studies are limited to head fixed animals, greatly reducing the behavioral complexity available for study. In this paper, we describe a procedure for performing chronic fluorescence microscopy with cellular-resolution across multiple cortical layers in freely behaving mice. We used an integrated miniaturized fluorescence microscope paired with an implanted prism probe to simultaneously visualize and record the calcium dynamics of hundreds of neurons across multiple layers of the somatosensory cortex as the mouse engaged in a novel object exploration task, over several days.

Dorsal-CA1 hippocampal neuronal ensembles encode nicotine-reward contextual associations

Li Xia, Stephanie K. Nygard, Gabe G. Sobczak, Nicholas J. Hourguettes, Michael R. Bruchas

Cell Reports

June 6, 2017

Natural and drug rewards increase the motivational valence of stimuli in the environment that, through Pavlovian learning mechanisms, become conditioned stimuli that directly motivate behavior in the absence of the original unconditioned stimulus. While the hippocampus has received extensive attention for its role in learning and memory processes, less is known regarding its role in drug-reward associations.

Identification of a motor-to-auditory pathway important for vocal learning

Todd F Roberts, Erin Hisey, Masashi Tanaka, Matthew G Kearney, Gaurav Chattree, Cindy F Yang, Nirao M Shah, Richard Mooney

Nature Neuroscience

May 15, 2017

Learning to vocalize depends on the ability to adaptively modify the temporal and spectral features of vocal elements. Neurons that convey motor-related signals to the auditory system are theorized to facilitate vocal learning, but the identity and function of such neurons remain unknown. Here we identify a previously unknown neuron type in the songbird brain that transmits vocal motor signals to the auditory cortex. Genetically ablating these neurons in juveniles disrupted their ability to imitate features of an adult tutor's song.

Delay activity of specific prefrontal interneuron subtypes modulates memory-guided behavior

Tsukasa Kamigaki, Yang Dan

Nature Neuroscience

April 24, 2017

Memory-guided behavior requires maintenance of task-relevant information without sensory input, but the underlying circuit mechanism remains unclear. Calcium imaging in mice performing a delayed Go or No-Go task revealed robust delay activity in dorsomedial prefrontal cortex, with different pyramidal neurons signaling Go and No-Go action plans.

Engrams and circuits crucial for systems consolidation of a memory

Takashi Kitamura, Sachie K. Ogawa, Dheeraj S. Roy, Teruhiro Okuyama, Mark D. Morrissey, Lillian M. Smith, Roger L. Redondo, Susumu Tonegawa

Science

April 7, 2017

Episodic memories initially require rapid synaptic plasticity within the hippocampus for their formation and are gradually consolidated in neocortical networks for permanent storage. However, the engrams and circuits that support neocortical memory consolidation have thus far been unknown. We found that neocortical prefrontal memory engram cells, which are critical for remote contextual fear memory, were rapidly generated during initial learning through inputs from both the hippocampal–entorhinal cortex network and the basolateral amygdala.

Active dentate granule cells encode experience to promote the addition of adult-born hippocampal neurons

Gregory W. Kirschen, Jia Shen, Mu Tian, Bryce Schroeder, Jia Wang, Guoming Man, Song Wu and Shaoyu Ge

The Journal of Neuroscience

April 3, 2017

The continuous addition of new dentate granule cells, exquisitely regulated by brain activity, renders the hippocampus plastic. However, how neural circuits encode experiences to impact the addition of adult-born neurons remains unknown. Here, we used endoscopic Ca^{2+} imaging to track the real-time activity of individual dentate granule cells in freely-behaving mice.

Neural ensemble dynamics underlying a long-term associative memory

Benjamin F. Grewe, Jan Gründemann, Lacey J. Kitch, Jerome A. Lecoq, Jones G. Parker, Jesse D. Marshall, Margaret C. Larkin, Pablo E. Jercog, Francois Grenier, Jin Zhong Li, Andreas Lüthi, Mark J. Schnitzer

Nature

March 22, 2017

The brain's ability to associate different stimuli is vital for long-term memory, but how neural ensembles encode associative memories is unknown. Here we studied how cell ensembles in the basal and lateral amygdala encode associations between conditioned and unconditioned stimuli (CS and US, respectively). Using a miniature fluorescence microscope, we tracked the Ca²⁺ dynamics of ensembles of amygdalar neurons during fear learning and extinction over 6 days in behaving mice.



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