

Samuel J. Sober, Ph.D.

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Positions and Research Experience

- EMORY UNIVERSITY Atlanta, GA
Associate Professor of Biology 9/17-present
- EMORY UNIVERSITY Atlanta, GA
Assistant Professor of Biology 9/10-8/17
- UNIVERSITY OF CALIFORNIA, SAN FRANCISCO San Francisco, CA
Postdoctoral Fellow 4/05-8/10
Advisor: Dr. Michael S. Brainard
Postdoctoral research on the physiology of motor control and motor learning in songbirds.
- UNIVERSITY OF CALIFORNIA, SAN FRANCISCO San Francisco, CA
Graduate Student 9/99-2/05
Advisor: Dr. Philip N. Sabes
Doctoral research on the psychophysics of motor planning and multisensory integration.
- UNIVERSITY OF WISCONSIN - MADISON Madison, WI
Undergraduate Research Assistant 6/96-8/96
Advisors: Drs. William W. Lytton and Dwayne S. Yamasaki 6/97-5/98
Designed and programmed simulations of the effects of cortical lesions on the information-processing properties of surviving neurons.

Education

- UNIVERSITY OF CALIFORNIA, SAN FRANCISCO San Francisco, CA
Graduate Program in Neuroscience 9/99-2/05
Doctoral thesis research on human motor planning and sensory integration.
- MARINE BIOLOGICAL LABORATORIES Woods Hole, MA
Methods in Computational Neuroscience 8/04
Intensive summer course.
- KYUNGHEE UNIVERSITY Seoul, South Korea
Henry Luce Visiting Scholar 9/98-6/99
Independent study on the clinical practice and physiological bases of acupuncture.
- WESLEYAN UNIVERSITY Middletown, CT
B.A., Neuroscience & Behavior 9/94-6/98

Honors

HHMI Gilliam Fellowship for Advanced Study	2022
Awarded by the Howard Hughes Medical Institute to advisor/student pairs to prepare students from historically underrepresented groups for leadership roles in science. Jointly awarded to Dr. Sober and PhD student Leila May Pascual (Emory Neuroscience Program).	
Winship Distinguished Research Professor	2021
Awarded to tenured faculty at Emory who demonstrate singular accomplishments in research.	
Landis Award for Outstanding Mentorship	2021
Awarded by the National Institute of Neurological Disorders and Stroke in recognition of outstanding mentorship of scientific trainees. This award includes a \$100,000 research grant supplement.	
McKnight Foundation Award for Technological Innovations in Neuroscience.....	2018
Graduates in Neuroscience Faculty Mentor Award	2018
Awarded by the students in Emory's Neuroscience Graduate Program in recognition of outstanding mentoring of trainees.	
————— <i>above this line = after 2017 promotion to Associate Professor</i> —————	
Albert E. Levy Scientific Research Award	2017
Awarded to recognize the contributions of Emory faculty members to the advancement of scientific knowledge.	
Graduates in Neuroscience Exemplary Lecturer Award	2016
Awarded by the students in Emory's Neuroscience Graduate Program in recognition of outstanding teaching contributions.	
COSYNE Mentorship Award	2014
Awarded by the Computational and Systems Neuroscience (COSYNE) meeting to recognize a faculty member's outstanding mentorship of a student from an underrepresented group. Award provides travel funds for the student to attend the annual meeting.	
Helen Hay Whitney Foundation Postdoctoral Research Fellowship.....	2006-2009
NSF Graduate Research Fellowship	1999-2002

Current and Completed Grant Support

1. NATIONAL INSTITUTES OF HEALTH GRANT U24 NS126936 2/2023-1/2028
Center for Advanced Motor BioElectronics and Research (CAMBER)
Role: Director and PI (multi-PI grant with Dr. Muhannad Bakir, Georgia Institute of Technology)
Direct cost: \$3,706,800
Total cost: \$4,752,304
Total cost at Emory (multi-institutional grant): \$2,720,400

The grant supports a [center \(headquartered at Emory\) for the development of next-generation neuroscience technology](#) and for supplying this technology to the global neuroscience community. To date we have provided these tools (at no cost to the users) to over 150 labs in a total of 14 countries. My role as PI is to design and test novel technology for recording and understanding brain activity across species and muscles. My role as Director is to disseminate this technology to the global neuroscience community.

Current and Completed Grant Support (continued)

2. SIMONS-EMORY INTERNATIONAL CONSORTIUM ON MOTOR CONTROL.....3/2020-2/2025
Neuromotor agility across the tree of life
Role: Director and PI
Direct cost: \$3,290,909
Total cost: \$3,749,091
Total cost at Emory (multi-institutional grant): \$2,863,591

The goal of [the Consortium](#), which includes groups in the USA, Canada, and Portugal, is to create innovative hardware and algorithmic methods for studying the neural control of skilled behavior. My role as a PI is to investigate how complex brain circuits in shape skilled behavior in mice and songbirds. My role as Director is to guide Consortium's scientific mission, create training opportunities for the 20 student and postdoc research fellows supported by the Consortium, and organize scientific meetings and symposia.

3. AZRIELI FOUNDATION.....2/2023-2/2028
Collaboration on motor planning, execution and resilience (COMPERE)
Role: Director and PI
Direct cost: \$3,710,648
Total cost: \$3,710,648
Total cost at Emory (multi-institutional grant): \$743,700

This grant supports a [US-Canadian network of neuroscience researchers](#) (co-Directed by myself and Dr. Andrew Pruszynski, Western University, Ontario, Canada) to investigate how the brain controls complex behaviors. My role is to co-direct (with Pruszynski) the scientific direction of the collaboration, identify and encourage new research directions and network investigators. Moreover my role includes developing and providing novel neurotechnology to support the network's mission.

4. NATIONAL INSTITUTES OF HEALTH R01 NS084844 3/2013-4/2024, renewed in 2019
Vocal motor control and sensorimotor learning - behavior, muscles, and neurons
Role: PI
Direct cost: \$1,128,829 Total cost: \$1,626,442 (Currently in no-cost extension)

The goal of this study is to understand how patterns of neural activity and muscle activation are reshaped during vocal learning.

5. NATIONAL INSTITUTES OF HEALTH R01 NS109237 6/2019-5/2024, renewal application pending
Large-scale recording of spike train ensembles from muscle fibers during skilled behavior in mice and songbirds
Role: PI (multi-PI grant with Dr. Muhanad Bakir, Georgia Institute of Technology)
Direct cost: \$1,917,500
Total cost: \$2,458,355
Total cost at Emory (multi-institutional grant): \$1,535,440

The goal of this project is to develop novel hardware and algorithms to record ensembles of motor units in two model systems - vocal performance in songbirds and skilled forelimb behavior in mice.

6. NOVO NORDISK FOUNDATION.....6/2021-6/2025
Burst into song: a systems approach to accurate predictions of voice
Role: PI (multi-PI grant led by Dr. Coen Elemans, University of Southern Denmark)
Direct cost: \$1,446,000
Total cost: \$1,104,920
Total cost at Emory (multi-institutional grant): \$277,045

The goal of this work is to causally link motor control to song production by integrating in vitro, ex vivo, and in vivo data into a new generation of predictive computational models.

Current and Completed Grant Support (continued)

7. HALLE INSTITUTE FOR GLOBAL RESEARCH 1/2023-1/2025
Decoding the basic units of movement
Role: PI (multi-PI with Dr. Graziana Gatto, University of Cologne, Germany)
Direct cost: \$30,000
Total cost: \$30,000
Total cost at Emory (multi-institutional grant): \$15,000

This project, conducted in partnership with Dr. Gatto as part of the Halle Institute's goal of fostering collaboration between researchers in the US and Germany, seeks to understand the spinal circuits controlling body movements.

8. META PLATFORMS INC. 9/2022-9/2024
Electrode development for human muscle recording
Role: PI
Direct cost: \$100,000 Total cost: \$100,000

The goal of this work is to develop a novel class of devices for high-resolution recording from human muscles. Note that these funds were awarded as an unrestricted gift, not as a grant. This award is therefore awarded with no restrictions on how the funds are to be spent, with no required deliverables to Meta, and is administered through Emory's Office of Corporate and Foundation Relations.

————— *above this line = grant awarded after 2017 promotion to Associate Professor* —————

9. NATIONAL INSTITUTES OF HEALTH R01 NS099375 3/2017-2/2022
Spike timing codes for motor control
Role: PI
Direct cost: \$1,134,500 Total cost: \$1,660,500
10. NSF 1822677 9/2018-8/2022
CRCNS: Randomness and systematicity in neural codes for motor exploration
Role: PI (multi-PI grant with Dr. Ilya Nemenman)
Direct cost: \$661,147 Total cost: \$1,000,000

The goal of this project was to understand how the nervous system controls behavior by precisely regulating the timing of electrical activity in neurons and muscles.

11. MCKNIGHT FOUNDATION AWARD FOR TECHNOLOGICAL INNOVATIONS IN NEUROSCIENCE .. 7/2018-6/2020
Nanofabricated flexible electronics for recording neuromuscular signals at scale
Role: PI (multi-PI grant with Dr. Muhammad Bakir, Georgia Institute of Technology)
Direct cost: \$180,000
Total cost: \$200,000
Total cost at Emory (multi-institutional grant): \$100,000

The goal of this project was to understand how the nervous systems generates behavioral variability.

12. NATIONAL INSTITUTES OF HEALTH R01 EB022872 9/2016-6/2019
Neural mechanisms and behavioral consequences of non-Gaussian likelihoods in sensorimotor learning
Role: PI (multi-PI grant with Dr. Ilya Nemenman)
Direct cost: \$675,000 Total cost: \$1,034,495

The goal of this work (supported by the federal BRAIN initiative) was to develop new experimental and analytical methods for revealing how the brain implements complex computations.

Current and Completed Grant Support (continued)

13. NSF 1456912.....5/2015-4/2018
The neural basis of online error correction
Role: PI
Direct cost: \$331,379 Total cost: \$510,000

The goal of this study was to understand how the brain rapidly integrates sensory information to correct motor errors online.

Pending Grant Applications

NATIONAL INSTITUTES OF HEALTH RM1 NS139225 7/2024-6/2029
Revealing early ALS pathology with longitudinal, high-resolution measures of behavior and motor physiology
Role: PI (multi-PI grant with Drs. Eiman Azim and Talmo Pereira, Salk Institute of Biology)
Direct cost requested: \$5,648,900
Total cost requested: \$9,603,132
Total cost requested at Emory (multi-institutional grant): \$2,597,400

The goal of this work is to create experimental and computational tools to identify quantitative biomarkers of disease in mouse models of amyotrophic lateral sclerosis (ALS).

NATIONAL INSTITUTES OF HEALTH R01 NS109237 7/2024-6/2029
Renewal application: Large-scale recording of spike train ensembles from muscle fibers during skilled behavior in mice and songbirds
Role: PI (multi-PI grant with Dr. Muhannad Bakir, Georgia Institute of Technology)
Direct cost requested: \$2,511,996
Total cost requested: \$3,767,994
Total cost requested at Emory (multi-institutional grant): \$1,970,778

The goal of this project is to develop novel hardware and algorithms to record ensembles of motor units in two model systems - vocal performance in songbirds and skilled forelimb behavior in mice.

Grant Support Awarded to Trainees in my Group

1. HHMI GILLIAM FELLOWSHIP FOR ADVANCED STUDY 2/2022-1/2025
Motor skill learning and the development of precise brain activity patterns
Role: Faculty Advisor (PI is Leila Pascual, a graduate student in my lab)
Direct cost: \$159,000 Total cost: \$159,000
2. NATIONAL INSTITUTES OF HEALTH GRANT F31NS130462
Motor skill learning and the development of precise brain activity patterns
Role: Faculty Advisor (PI is Leila Pascual, a graduate student in my lab)
Award declined by Ms. Pascual; accepted HHMI Gilliam Award instead (see above)
3. NATIONAL SCIENCE FOUNDATION GRFP DGE-1444932 6/2021-5/2024
Motor neuron coordination during sensorimotor adaptation in mice
Role: Faculty Advisor (PI is Kyle Thomas, a graduate student in my lab)
Direct cost: \$111,000 Total cost: \$111,000

————— *above this line = grant awarded after 2017 promotion to Associate Professor* —————

Grant Support Awarded to Trainees in my Group (continued)

4. NATIONAL SCIENCE FOUNDATION GRFP DGE-1444932 6/2017-5/2020
Precise spike-timing codes for motor control
Role: Faculty Advisor (PI was Andrea Pack, a graduate student in my lab)
Direct cost: \$104,000 Total cost: \$104,000
5. NATIONAL INSTITUTES OF HEALTH GRANT F31NS100406 9/2017-8/2019
Establishing the role of dopamine in Vocal Learning in Songbirds
Role: Faculty Advisor (PI was Varun Saravanan, a graduate student in my lab)
Direct cost: \$87,152 Total cost: \$87,152
6. NATIONAL SCIENCE FOUNDATION GRFP DGE-1444932 6/2016-5/2019
Dopaminergic contributions to vocal learning in the basal ganglia
Role: Faculty Advisor (PI was Alynda Wood, a graduate student in my lab)
Direct cost: \$102,000 Total cost: \$102,000
7. NATIONAL INSTITUTES OF HEALTH GRANT F31 DC013753 3/2014-2/2017
Defining the Neuromuscular Mechanisms of Vocal Error Correction
Role: Faculty Advisor (PI was Kyle Srivastava, a graduate student in my lab)
Direct cost: \$126,696 Total cost: \$126,696
8. NATIONAL INSTITUTES OF HEALTH GRANT F31 NS089406 9/2014-8/2016
Dissecting the basal ganglia's contribution to sensorimotor learning and generalization
Role: Faculty Advisor (PI was Lukas Hoffmann, a graduate student in my lab)
Direct cost: \$85,352 Total cost: \$85,352

Patent Applications

“Digital sutures”. International patent published by the World Intellectual Property Organization (WIPO) on March 9, 2023 as application 2023/034258A1. [Available via GooglePatents.](#)

Peer-Reviewed Publications

* Students/postdocs I have trained # Equal contributions

31. Chung B*, Zia M, Thomas KA*, Michaels JA*, Jacob AL*, Pack A*, Williams MJ*, Nagapudi K*, TengL*, Arrambide E*, Ouellette L*, Oey N*, Gibbs R*, Anschutz P, Lu J, Wu Y, Kashefi M, Oya T, Kersten R, Mosberger A, O’Connell S, Wang R, Marques H, Mendes AR, Lenschow C, Kondakath G, Kim J, Olson W, Quinn Q, Perkins P, Gatto G, Thanawalla A, Coltman S, Kim T, Smith T, Binder-Markey B, Zaback M, Thompson CK, Giszter S, Person A, Goulding M, Azim A, Thakor N, O’Connor D, Trimmer B, Lima SQ, Carey MR, Pandarinath C, Costa RM, Pruszynski JA, Bakir M, **Sober SJ** (2023). Myomatrix arrays for high-definition muscle recording. *eLife* doi: 10.7554/eLife.88551.3.

This paper is the culmination of roughly 10 years of work developing next-generation technology for recording the brain’s motor output. Here we show that our methods far outperform current technology across many species, with the large number of authors (and species) reflecting the size and diversity of my group’s network of collaborators. This work’s impact was highlighted by an [“insight” article](#) (commentary) in *eLife*.

Peer-Reviewed Publications (continued)

30. Pack AR*, Yan JS, Pasquali M, **Sober SJ**[#], and Elemans CP[#] (2023). A flexible carbon nanotube electrode array for acute in vivo EMG recordings. *Journal of Neurophysiology*129(3):651-661.

Co-senior authorship with Coen Elemans reflects our contributions to developing this novel biosensor. His group worked with the fabrication team at Rice University (Yan and Pasquali) to design carbon-fiber electrodes, which my lab then used to create biosensor arrays and record muscle activity. Additionally, my group created additional electrode arrays for testing in Dr. Elemans' group and performed all analysis of physiological data.

29. McGregor JN*, Grassler AL*, Jaffe PI, Jacob AL*, Brainard MS, **Sober SJ** (2022). Shared mechanisms of auditory and non-auditory vocal learning in the songbird brain. *eLife* e75691.

Note that co-author Brainard was my postdoctoral advisor from 2005-2010. The this study was developed independently of Dr. Brainard, and approximately 90% of the paper's data was collected in my laboratory. As we were preparing to submit our findings, we discovered that graduate student Jaffe in the Brainard lab had collected an earlier dataset that complemented our findings. We therefore combined our data, and the middle author listing of Jaffe and Brainard reflects their relatively smaller contributions to the project.

28. Hernandez DG, **Sober SJ**, Nemenman I (2022). Unsupervised Bayesian Ising Approximation for decoding neural activity and other biological dictionaries. *eLife* e68192.

My contribution was to co-develop (with co-author Nemenman) the idea underlying the "uBIA" algorithm, which provides a mathematical tool for understanding how patterns of brain activity control an animal's behavior. Additionally, I provided all of the experimental data used in the paper to demonstrate the utility of uBIA, wrote the portions of the paper that discuss the biological implications of our work, created most of the display figures, and worked with the other co-authors to revise the entire manuscript. The mathematical derivation of uBIA was done by co-authors Hernandez and Nemenman.

27. Lu J., Zia M, Williams MJ*, Jacob AL*, Chung B*, **Sober SJ**, and Bakir M (2022). High-performance Flexible Microelectrode Array with PEDOT:PSS Coated 3D Micro-cones for Electromyographic Recording. *Proc. IEEE Eng Med Biol Soc*doi: 10.1109/EMBC48229.2022.9871052.

My contribution was to design the overall layout of the electrode devices reported here and develop methods for their surgical implantation. Additionally, my lab members (Williams, Jacob, and Chung) and I performed all animal testing of the electrodes and analyzed all of the resulting physiological data. Device fabrication was performed by co-authors Lu and Bakir.

26. Saravanan V*, Berman GJ, **Sober SJ** (2020). Application of the hierarchical bootstrap to multi-level data in neuroscience. *Neurons, Behavior, Data analysis, and Theory* 3;5.

25. Zia M, Chung B*, **Sober SJ**, and Bakir M (2020). Flexible Multielectrode Arrays With 2-D and 3-D Contacts for In Vivo Electromyography Recording. *Proc. IEEE Trans Compon Packaging Manuf Technol* doi: 10.1109/tcpmt.2019.2963556.

My contribution was to design the layout of the electrode devices presented here and create surgical methods for the implanting the devices. Additionally, my postdoc (Chung) and I performed all animal testing of the electrodes and analyzed all of the resulting physiological data. Device fabrication was performed by co-authors Zia and Bakir.

Peer-Reviewed Publications (continued)

24. Daliparthi VK, Tachibana RO, Cooper BG, Hahnloser RH, Kojima S, **Sober SJ**, Roberts TF (2019). Transitioning between preparatory and precisely sequenced neuronal activity in production of a skilled behavior. *eLife* 11;8.

My contribution consisted of providing a physiological dataset recorded from songbirds, performing computational analysis on these data, writing manuscript text describing this contribution, and creating a display figures. Along with my co-authors (representing six different labs in the US, Japan, and Switzerland), I also helped edit and revise the full manuscript.

23. Saravanan V*, Hoffmann LA*, Jacob AL*, Berman GJ, **Sober SJ** (2019). Dopamine Depletion Affects Vocal Acoustics and Disrupts Sensorimotor Adaptation in Songbirds. *eNeuro* 6(3).
22. Zhou B, Hofmann D, Pinkoviezky I, **Sober SJ**, Nemenman I (2018). Chance, long tails, and inference in a non-Gaussian, Bayesian theory of vocal learning in songbirds. *Proceedings of the National Academy of Sciences* Sep 4;115(36):E8538-E8546.

My contribution was to co-develop (with Nemenman) the idea underlying the computational model presented in the paper. Additionally, I provided all of the experimental data used in the study, wrote the portions of the paper that discuss the biological implications of our findings, created some of the display figures, and worked with the other co-authors to revise the entire manuscript.

21. Nicholson DA*, Roberts T, and **Sober SJ** (2018). Thalamostriatal and cerebellothalamic pathways in a songbird, the Bengalese finch. *Journal of Comparative Neurology* doi: 10.1002/cne.24428.
20. Zia M, Chung B, **Sober SJ**, and Bakir M (2018). Fabrication and Characterization of 3D Multi-Electrode Array on Flexible Substrate for In Vivo EMG Recording from Expiratory Muscle of Songbird. *Proc. IEEE International Electron Devices Meeting (IEDM)* San Francisco, CA, Dec. 2018.

My contribution was to co-design the electrode devices reported here. Additionally, my postdoc (Chung) and I performed all animal testing of the electrodes and analyzed all of the resulting physiological data. Device fabrication was performed by co-authors Zia and Bakir.

————— above this line = published after 2017 promotion to Associate Professor —————

19. Srivastava K* #, Holmes CM* #, Vellema M, Pack A*, Elemans C, Nemenman I, and **Sober SJ** (2017). Motor control by precisely timed spike patterns. *Proceedings of the National Academy of Sciences* 114(5):1171-1176.
18. Wyatt M*, Berthiaume E*, and **Sober SJ** (2017). The Effects of Pitch Shifts on Delay-induced Changes in Vocal Sequencing in a Songbird. *eNeuro* doi: 10.1523/ENEURO.0254-16.2017.
17. Hoffmann LA*, Saravanan V*, Wood AN*, and **Sober SJ** (2016). Dopaminergic Contributions to Vocal Learning. *J. Neuroscience* 36(7): 2176-89.
16. Elemans CP, During DN, Herbst CT, Rasmussen JH, Zollinger SA, Brumm H, Srivastava K*, Svane N, Ding M, Larsen ON, **Sober SJ**, and Svec JG (2015). Universal mechanisms of sound production and control in birds and mammals. *Nature Communications* 6:8978:1-13.

My group developed, implemented, and analyzed data from a key experimental technique for this study (electrical muscle stimulation during *in vitro* high-speed imaging of the intact vocal organ).

Peer-Reviewed Publications (continued)

15. Srivastava K*, Elemans C, and **Sober SJ** (2015). Multifunctional and context-dependent control of vocal acoustics by individual muscles. *J. Neuroscience* 35(42):14183-94.
14. Tang C*, Srivastava K*, Chehayeb D, Nemenman I, and **Sober SJ** (2014). Precise temporal encoding in a vocal motor system. *PLoS Biology* 12(12):e1002018:1-13.

The above paper was featured with a cover image and synopsis in *PLoS Biology* and was selected as a “Research Highlight” by *Nature Reviews Neuroscience* (15 January 2015).
13. Hoffmann LA* and **Sober SJ** (2014). Vocal generalization depends on gesture identity and sequence. *J. Neuroscience*. 34(16):5564-74
12. Kelly CW* and **Sober SJ** (2014). A simple computational principle predicts vocal adaptation dynamics across age and error size. *Front. Integr. Neurosci.* 8:75:1-9
11. Hoffmann LA*, Kelly CW*, Nicholson DA*, and **Sober SJ** (2012). A lightweight, headphones-based system for manipulating auditory feedback in songbirds. *J. Visualized Experiments*. (69):1-9
10. **Sober SJ** and Brainard MS (2012). Vocal learning is constrained by the statistics of sensorimotor experience. *Proceedings of the National Academy of Sciences*. 109(51):21099-103
9. Wohlgenuth MJ#, **Sober SJ**#, and Brainard MS (2010). Linked Control of Syllable Sequence and Phonology in Birdsong. *J. Neuroscience* 30(39):12936-49.
8. **Sober SJ** and Brainard MS (2009). Adult birdsong is actively maintained by error correction. *Nature Neuroscience* 12(7):927-31.
7. **Sober SJ**#, Wohlgenuth MJ#, and Brainard MS (2008). Central Contributions to Acoustic Variation in Birdsong. *J. Neuroscience*, 28(41):10370-9.
6. **Sober SJ**#, Wohlgenuth MJ#, and Brainard MS (2008). Central Contributions to Acoustic Variation in Birdsong. *J. Neuroscience*, 28(41):10370-9.
5. **Sober SJ** and Sabes PN (2005). Flexible Strategies for Sensory Integration during Motor Planning. *Nature Neuroscience*, 8(4):490-7.
4. **Sober SJ** and Sabes PN (2003). Multisensory Integration During Motor Planning. *J. Neuroscience* 23(18):6982-92.
3. Lytton WW, Williams ST, **Sober SJ** (1999). Unmasking unmasked: Neural dynamics following stroke. *Progress In Brain Research* 121:203-218.
2. Lytton WW; Stark JM; Yamasaki DS; **Sober, SJ** (1999). Computer models of stroke recovery: Implications for neurorehabilitation. *The Neuroscientist* 5:100-111.
1. **Sober SJ**; Stark JM; Yamasaki DS; Lytton WW (1997). Receptive field changes following stroke-like cortical ablation: a role for activation dynamics. *J. Neurophysiology* 78:3438-3443.

Publications: Invited Commentaries

4. **Sober SJ**, Sponberg S, Nemenman I, Ting LH (2018). Millisecond Spike Timing Codes for Motor Control. *Trends in Neurosciences* 41(10):644-648.

This invited review article was part of a special combined issue of *Trends in Neurosciences* and *Trends in Cognitive Sciences* exploring “Time in the Nervous System.”

————— above this line = published after 2017 promotion to Associate Professor —————

3. Kuebrich B* and **Sober SJ** (2015). Variations on a theme: songbirds, variability, and sensorimotor error correction. *Neuroscience* 296:48-54.

This invited review article was part of a special issue of *Neuroscience* highlighting the contributions of different animal model systems to the field of neurobiology.

2. **Sober SJ** and Calabrese RL (2014). Falling on deaf neurons. *eLife*. 3:e02289

1. **Sober SJ** and Kording K (2012). What silly postures tell us about the brain. *Frontiers in Neuroscience*. 6:154

Manuscripts under Review/Revision

1. Kirk EA, Hope KT, **Sober SJ**, and Sauerbrei BA (2023). An output-null signature of inertial load in motor cortex.. *Under review at Nature Communications*, preprint is [available on bioRxiv](#).

Invited Seminars and Platform Presentations (since 2014)

Sober SJ *Next-Generation Technology for Measuring and Manipulating Motor Activity*. Allen Institute OpenScope 2.0 Vision Meeting (Washington, DC), November 14, 2023 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control*. Lake Conference on Sensation and Action (Thun, Switzerland), May 10, 2023 (Invited speaker).

Sober SJ *New methods for high-resolution EMG*. Johns Hopkins University (Baltimore, MD; virtual presentation), April 21, 2023 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control*. University of California, San Diego (San Diego, CA), February 7, 2023 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control*. University of Washington (Seattle, WA), December 6, 2022 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control*. Allen Institute for Brain Science (Seattle, WA), December 5, 2022 (Invited speaker).

Sober SJ *New methods for high-resolution EMG*. Salk Institute (La Jolla, CA), November 11, 2022 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control*. Virtual Songbird Neurobiology Symposium (online), April 29, 2022 (Invited speaker).

Sober SJ *New technology for high-resolution muscle recording during skilled behavior in rodents, songbirds, and primates*. Northwestern University (Chicago, IL), March 28, 2022 (Invited speaker).

Invited Seminars and Platform Presentations (continued)

Sober SJ *New tools and opportunities for high-resolution EMG recording.* Kavli Foundation NeuroFutures meeting (online), July 21, 2021 (Invited speaker).

Sober SJ *Spiking codes for skilled motor control.* Society for Neuroscience Annual Meeting (online), November 12, 2021 (Invited speaker).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Motor Control.* Morehouse School of Medicine, Atlanta, GA, May 21, 2021 (Invited speaker).

Sober SJ *Opening meeting: Simons-Emory International Consortium on Motor Control.* Simons Foundation Headquarters, New York, NY, January 7, 2020 (Invited speaker).

Sober SJ *How birds sing: taking precise data, making precise theories.* October 11, 2019, City University of New York, New York, NY (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Motor Control.* September 27, 2019, Northwestern University, Chicago, IL (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Motor Control.* University of Chicago, Chicago, IL, September 26, 2019 (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Skilled Motor Control.* September 20, 2019, Salk Institute, La Jolla, CA (Invited seminar).

Sober SJ *New approaches to motor control: muscles, neurons, and computations.* Simons Foundation Headquarters, New York, NY, August 8, 2019 (Invited speaker).

Sober SJ *Neural, Muscular and Computational Mechanisms of Motor Control.* July 18, 2019, Columbia University, New York, NY (Invited seminar).

Sober SJ *Neural, Muscular and Computational Mechanisms of Motor Control.* July 15, 2019, Princeton University, Princeton, NJ (Invited seminar).

Sober SJ *Neural, muscular, and computational mechanisms of vocal control.* Burke Neurological Institute/Weill Cornell Medicine, White Plains, NY, March 19, 2019 (Invited seminar).

Sober SJ *Neural and Computational Mechanisms of Vocal Control.* University of Texas, Southwestern, January 29, 2019 (Invited seminar).

Sober SJ *Dopaminergic Signals for Vocal Learning in Songbirds.* Federation of European Neuroscience Unions (FENS) meeting, Berlin, Germany, July 8, 2018 (Invited speaker).

Sober SJ *Neural and Computational Mechanisms of Vocal Control.* Aspen Center for Physics, Aspen, CO, June 4, 2018 (Invited speaker and participant, Aspen Center for Physics Summer Workshop).

Sober SJ *Sensorimotor learning and the dynamics of birdsong.* University of Southern California, October 5, 2018 (Invited speaker, Hearing and Communication Neuroscience Symposium).

Sober SJ *Spike timing codes for skilled motor control.* The Banbury Center, Cold Spring Harbor Laboratory, Lloyd Harbor, NY, September 24, 2018 (Invited speaker, Quantitative Approaches to Naturalistic Behaviors Meeting).

Sober SJ *Spike timing codes for dexterous motor control.* Janelia Research Campus, Ashburn, VA, May 14, 2018 (Invited speaker, Mechanisms of Dexterous Behavior symposium).

Sober SJ *Spike timing codes for skilled motor control.* NIH BRAIN Investigators Meeting, Bethesda, MD, April 11, 2018 (Invited speaker, Research Highlight talk).

Sober SJ *Advanced technologies for monitoring and manipulating muscle activity during skilled behavior.* Rice University, Houston, TX, February 7, 2018 (Invited seminar).

Invited Seminars and Platform Presentations (continued)

Sober SJ *Vocal control, sensorimotor learning, and the dynamics of birdsong.* International Bioacoustics Council, XXVI IBAC Congress, Haridwar, India, October 10, 2017 (Platform presentation).

Sober SJ *Vocal motor control and sensorimotor learning: behavior, neurophysiology, and biomechanics.* Indian Institute of Science Education and Research, Pune, India, October 6, 2017 (Invited seminar).

————— *above this line = presented after 2017 promotion to Associate Professor* —————

Sober SJ *Spike timing codes for motor control.* Computational and Systems Neuroscience (COSYNE) meeting; Salt Lake City, Utah, February 28, 2017 (Platform presentation).

Sober SJ *Vocal motor control and sensorimotor learning: behavior, neurophysiology, and biomechanics.* Georgia Institute of Technology, Atlanta, GA, February 21, 2017 (Invited seminar).

Sober SJ *Sensorimotor learning and the dynamics of birdsong.* University of California Berkeley, January 23, 2017 (Invited seminar).

Sober SJ *Sensorimotor learning and the dynamics of birdsong.* University of Washington, Seattle, WA, October 28, 2016 (Invited seminar).

Sober SJ *Vocal motor control and sensorimotor learning: behavior, neurophysiology, and biomechanics.* University of Washington, Seattle, WA, October 27, 2016 (Invited seminar).

Sober SJ *Opening meeting: Simons-Emory International Consortium on Motor Control.* Simons Foundation Headquarters, New York, NY, January 7, 2020 (Invited speaker).

Sober SJ *How birds sing: taking precise data, making precise theories.* October 11, 2019, City University of New York, New York, NY (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Motor Control.* September 27, 2019, Northwestern University, Chicago, IL (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Motor Control.* University of Chicago, Chicago, IL, September 26, 2019 (Invited seminar).

Sober SJ *Neural, Muscular, and Computational Mechanisms of Skilled Motor Control.* September 20, 2019, Salk Institute, La Jolla, CA (Invited seminar).

Sober SJ *New approaches to motor control: muscles, neurons, and computations.* Simons Foundation Headquarters, New York, NY, August 8, 2019 (Invited speaker).

Sober SJ *Neural, Muscular and Computational Mechanisms of Motor Control.* July 18, 2019, Columbia University, New York, NY (Invited seminar).

Sober SJ *Neural, Muscular and Computational Mechanisms of Motor Control.* July 15, 2019, Princeton University, Princeton, NJ (Invited seminar).

Sober SJ *Neural, muscular, and computational mechanisms of vocal control.* Burke Neurological Institute/Weill Cornell Medicine, White Plains, NY, March 19, 2019 (Invited seminar).

Sober SJ *Neural and Computational Mechanisms of Vocal Control.* University of Texas, Southwestern, January 29, 2019 (Invited seminar).

Sober SJ *Dopaminergic Signals for Vocal Learning in Songbirds.* Federation of European Neuroscience Unions (FENS) meeting, Berlin, Germany, July 8, 2018 (Invited speaker).

Sober SJ *Neural and Computational Mechanisms of Vocal Control.* Aspen Center for Physics, Aspen, CO, June 4, 2018 (Invited speaker and participant, Aspen Center for Physics Summer Workshop).

Invited Seminars and Platform Presentations (continued)

Sober SJ *Sensorimotor learning and the dynamics of birdsong*. University of Southern California, October 5, 2018 (Invited speaker, Hearing and Communication Neuroscience Symposium).

Sober SJ *Spike timing codes for skilled motor control*. The Banbury Center, Cold Spring Harbor Laboratory, Lloyd Harbor, NY, September 24, 2018 (Invited speaker, Quantitative Approaches to Naturalistic Behaviors Meeting).

Sober SJ *Spike timing codes for dexterous motor control*. Janelia Research Campus, Ashburn, VA, May 14, 2018 (Invited speaker, Mechanisms of Dexterous Behavior symposium).

Sober SJ *Spike timing codes for skilled motor control*. NIH BRAIN Investigators Meeting, Bethesda, MD, April 11, 2018 (Invited speaker, Research Highlight talk).

Sober SJ *Nonlinear Bayesian computations for vocal learning*. Computational and Systems Neuroscience Workshop, Salt Lake City, UT, February 29, 2016 (Platform presentation).

Sober SJ *Flexible strategies for sensory integration during motor planning*. Institut de Neurosciences de la Timone, Marseille, France, January 28, 2016 (Platform presentation).

Sober SJ *Vocal control, sensorimotor learning, and the dynamics of birdsong*. Hunter College, City University of New York, October 8, 2015 (Invited seminar).

Sober SJ *Neural and computational mechanisms of vocal control*. Cold Spring Harbor Laboratories, Cold Spring Harbor, NY, October 7, 2015 (Invited seminar).

Sober SJ *Neural and computational mechanisms of vocal control*. New York University, New York City, October 6, 2015 (Invited seminar).

Sober SJ *Vocal variability: Computational consequences and neurophysiological substrates*. CNS Satellite Symposium: Neural bases of speech production, San Francisco, CA, March 27, 2015 (Platform presentation).

Sober SJ *Dopaminergic contributions to vocal learning*. University of California, San Francisco, March 26, 2015 (Invited seminar).

Sober SJ *Behavioral, neural, and biomechanical approaches to vocal control*. University of California, Berkeley, March 25, 2015 (Invited seminar).

Sober SJ *Vocal control, sensorimotor learning, and the dynamics of birdsong*. Cornell University, Ithaca, NY, February 27, 2015 (Invited seminar).

Sober SJ *Millisecond-scale neural encoding in a vocal motor system*. Society for Neuroscience Satellite Symposium on Vocal Communication, Washington, DC, November 14, 2014 (Platform presentation).

Sober SJ *Behavioral, neural, and biomechanical approaches to vocal control*. University of Texas, San Antonio, October 2, 2014 (Invited seminar).

Sober SJ, Tang C, Srivastava K, Chehayeb D, Nemenman I *Precise temporal encoding in a vocal motor system*. Annual Meeting, Society for the Neural Control of Movement; Amsterdam, The Netherlands, April 25, 2014. (Platform presentation)

Sober SJ *Behavioral, neural, and biomechanical approaches to vocal control*. CNRS, Universite Rene Descartes; Paris, France, April 18, 2014 (Invited seminar).

Contributed Presentations (since starting at Emory in 2010)

* Indicates students/postdocs I have trained

Motor unit coordination within and across muscles during locomotion in mice (2023). Thomas KA*, Gibbs R, Marques H, Carey MR, **Sober SJ**. *Annual Meeting, Society for Neuroscience* (Poster).

Pascual LM*, **Sober SJ** (2023). Emergence of crystallized neural patterns during vocal learning. *Annual Meeting, Society for Neuroscience* (Poster).

Williams M*, Keim A, Azim E, **Sober SJ** (2023). Neuromuscular Control During A Bimanual Precision Force Production Task. *Annual Meeting, Society for Neuroscience* (Poster).

Amer A, Liu Y, Williams M*, Imai F, Pavlova I, Lachhab A, Francois R, **Sober SJ**, Rogers J, and Yoshida Y. (2023). Restoration of Motor Function following Spinal Cord Injury through Harnessing Opsins with Ultra-Potent Light Sensitivity and Wireless Spinal Interface. *Annual Meeting, Society for Neuroscience* (Poster).

Jacob AL, Zia M, Sotirescu A, O'Connell S, Pack A, Thomas KA*, Williams M*, Chung B, Elemans CP, Bakir M, **Sober SJ** (2023). Myomatrix arrays for recording muscle activity. *Annual Meeting, Society for Neuroscience* (Poster).

William M*, Thomas KA*, Chung B*, Keim A, Azim E, Zia M, Bakir M, and **Sober SJ** (2022). Motor Unit Coordination Across Multiple Skilled Behaviors In Mice. *Annual Meeting, Society for Neuroscience* (Poster).

Chung B*, Zia M, Thomas KA*, Micheals JA*, Oya T, Kashefi M, William M*, Nagapudi K, Pruszynski A, Bakir M, and **Sober SJ** (2022). Next-generation electrode arrays for high-resolution muscle recording in rodents, songbirds, primates, and humans. *Annual Meeting, Society for Neuroscience* (Poster).

Pack A*, Adam I, Elemans C, and **Sober SJ** (2022). Millisecond-scale differences in muscle stimulation patterns modify motor output. *Annual Meeting, Society for Neuroscience* (Poster).

William M*, Thomas KA*, Chung B*, Zia M, Bakir M, and **Sober SJ** (2022). New technology for high-resolution muscle recording during skilled behavior in rodents, songbirds, and primates. *Annual Meeting, Society for the Neural Control of Movement* (Poster).

William M*, Thomas KA*, Chung B*, Zia M, Keim A, Azim E, Bakir M, and **Sober SJ** (2022). Motor unit coordination during skilled behavior in mice. *Annual Meeting, Society for the Neural Control of Movement* (Poster).

Wood A*, Chibber R*, and **Sober SJ** (2022). Pallidal neurons in a vocal motor basal ganglia nucleus reflect motor sequencing. *Annual Meeting, Society for the Neural Control of Movement* (Poster).

Chung B*, Zia M, Thomas KA*, Micheals JA, William M*, Nagapudi K, Pruszynski A, Bakir M, and **Sober SJ** (2022). Flexible multielectrode array for high-resolution motor unit recording in rodents, songbirds, and primates. *Annual Meeting, Society for the Neural Control of Movement* (Poster).

Wood A*, Chibber R*, and **Sober SJ** (2021). Sequence-dependent modulation of neural activity in the songbird basal ganglia. *Annual Meeting, Society for Neuroscience* (Poster).

McGregor JN*, Grassler AL*, Jaffe PI, Jacob AL*, Brainard MS, and **Sober SJ** (2021). Shared neural circuit mechanisms for auditory and non-auditory guided vocal learning in adult songbirds. *Annual Meeting, Society for Neuroscience* (Poster).

Chung B*, Zia M, Thomas KA*, William M*, Thomas KA*, Lu J, Bakir M, and **Sober SJ** (2021). Novel Flexible Multielectrode Arrays Record Multiple Single Motor Units and Reveal Organization of Behaviors Across Time Scales. *Annual Meeting, Society for Neuroscience* (Poster).

Thomas KA*, William M*, Jacob AL*, Chung B*, Zia M, Bakir M, and **Sober SJ** (2021). High-resolution EMG recordings during skilled behavior in mice. *Annual Meeting, Society for Neuroscience* (Poster).

Contributed Presentations (continued)

- Rigotti-Thompson M, O'Connell S*, Corsten A, Zhu F, Ali Y, Li K, **Sober SJ**, and Pandarinath C (2021). A low-latency behavioral feedback system for training, analyzing, and perturbing skilled forelimb rotation in rats. *Annual Meeting, Society for Neuroscience* (Poster).
- Pack A*, Yan J, Wood A*, Srivastava K*, Pasquali M, Elemans CP, and **Sober SJ** (2019). Neuromotor agility in the songbird: Tools and goals. *Annual Meeting, Society for Neuroscience* (Poster).
- Zia M, Chung B*, Bakir M, and **Sober SJ** (2019). Neuromotor agility in the songbird: Flexible multielectrode arrays with 3-dimensional contacts to enhance electromyogram recordings. *Annual Meeting, Society for Neuroscience* (Poster).
- Chung B*, Conn R*, Zia M, Bakir M, Nemenman I, and **Sober SJ** (2019). Neuromotor agility in the songbird: Distributed spike codes across populations of motor units. *Annual Meeting, Society for Neuroscience* (Poster).
- Conn R*, Chung B*, Marshall N, Churchland MM, Nemenman I, and **Sober SJ** (2019). Neuromotor agility in the songbird: Efficient algorithms for data analysis. *Annual Meeting, Society for Neuroscience* (Poster).
- Wood AN*, Jacob AL*, and **Sober SJ** (2019). Effects of dopamine depletion on neural activity in the songbird basal ganglia. *Annual Meeting, Society for Neuroscience* (Poster).
- McGregor JN*, Jaffe PI, Grassler AL*, Jacob AL*, Brainard MS, and **Sober SJ** (2019). Neural circuit mechanisms underlying different forms of vocal learning in adult songbirds. *Annual Meeting, Society for Neuroscience* (Poster).
- Sober SJ** (2019). A general computational approach to decoding biological dictionaries from limited datasets, illustrated by deciphering a neural motor code in songbirds. *BRAIN Investigators Annual Meeting* (Poster).
- Wood AN*, Hoffmann LA*, Jacob AL*, Saravanan V*, and **Sober SJ** (2018). Dopaminergic contributions to vocal learning. *Gordon Conference on the Basal Ganglia* (Poster - **won best poster award**).
- Saravanan V*, Hoffmann LA*, Jacob AL*, and **Sober SJ** (2017). The role of dopamine in sensorimotor adaptation in songbirds. *Annual Meeting, Society for Neuroscience* (Poster).
- Jacob AL*, Wood AN*, and **Sober SJ** (2017). Dopaminergic input to Bengalese finch song system nuclei. *Annual Meeting, Society for Neuroscience* (Poster).
- Nicholson DA*, Roberts TF, and **Sober SJ** (2017). Cerebellothalamic and thalamostriatal projections in a songbird. *Annual Meeting, Society for Neuroscience* (Poster).
- McGregor JN*, Jaffe PI, Brainard MS, and **Sober SJ** (2017). Somatosensory-driven vocal learning in adult songbirds. *Annual Meeting, Society for Neuroscience* (Poster).
- Zhou B, Hofman D, **Sober SJ**, and Nemenman I (2017). Dynamics of Bayesian non-Gaussian sensorimotor learning with multiple time scales. *Annual Meeting, American Physical Society* (Talk).
- Lahme D, **Sober SJ**, and Nemenman I (2017). Bayesian Ising approximation for learning dictionaries of multispike timing patterns in premotor neurons. *Annual Meeting, American Physical Society* (Talk).
- Holmes C*, Srivastava K*, Vellema M, Elemans C, Nemenman I, and **Sober SJ** (2016). Songbird Respiration is Controlled by Multispike Patterns at Millisecond Temporal Resolution. *Annual Meeting, American Physical Society* (Talk).
- Zhou B, Nemenman I, and **Sober SJ** (2016). Nonlinear Bayesian cue integration explains the dynamics of vocal learning. *Annual Meeting, American Physical Society* (Talk).

Contributed Presentations (continued)

Srivastava K*, Holmes C*, Vellema M, Elemans C, Nemenman I., and **Sober SJ** (2016). A spike timing mechanism for respiratory motor control. *Annual Meeting, Society for the Neural Control of Movement* (Poster).

Holmes C*, Srivastava K*, Vellema M, Elemans C, Nemenman I., and **Sober SJ** (2016). Songbird respiration is controlled by multispikes patterns at millisecond temporal resolution. *Computational and Systems Neuroscience Meeting* (Poster).

Zhou B, Nemenman I., and **Sober SJ** (2016). Nonlinear Bayesian cue integration explains the dynamics of vocal learning. *Computational and Systems Neuroscience Meeting* (Poster).

Hernandez D, Nemenman I., and **Sober SJ** (2016). Deconstructing spike timing codes in single premotor neurons using Bayesian feature selection. *Computational and Systems Neuroscience Meeting* (Poster).

Hoffmann LA*, Saravanan V*, Wood AN* , Li H, and **Sober SJ** (2015). Dopaminergic contributions to vocal learning. *Annual Meeting, Society for Neuroscience* (Poster).

Wood AN* and **Sober SJ** (2015). Catecholaminergic projections to song system nuclei in the Bengalese finch. *Annual Meeting, Society for Neuroscience* (Poster).

Saravanan V* and **Sober SJ** (2015). Vocal generalization during reinforcement learning in songbirds. *Annual Meeting, Society for Neuroscience* (Poster).

Nicholson DA* and **Sober SJ** (2015). Projections of the lateral deep cerebellar nuclei in Bengalese Finches. *Annual Meeting, Society for Neuroscience* (Poster).

Srivastava K* and **Sober SJ** (2015). A micro-scale, flexible, high-density electrode array for performing multi and single motor unit electromyographic recordings. *IEEE/EMBS Conference on Neural Engineering* (Poster).

Nicholson DA* and **Sober SJ** (2014). Projections of the lateral deep cerebellar nuclei in Bengalese Finches. *Annual Meeting, Society for Neuroscience* (Poster).

Tang C*, Srivastava K*, Chehayeb D, Nemenman I, **Sober SJ** (2014). Millisecond-scale encoding in a cortical motor area in songbirds. *Annual Meeting, Society for Neuroscience* (Poster).

Srivastava K* and **Sober SJ** (2014). A micro-scale, flexible electrode array for performing multi- and single motor unit electromyographic recordings of vocal muscles in songbirds. *Annual Meeting, Society for Neuroscience* (Poster).

Tang C*, Srivastava K*, Chehayeb D, Nemenman I, **Sober SJ** (2014). Precise temporal encoding in a vocal motor system. *Computational and Systems Neuroscience Meeting* (Poster).

Kelly CW* and **Sober SJ** (2013). A single computational mechanism for both stability and flexibility in vocal error correction. *Computational and Systems Neuroscience Meeting* (Poster).

Srivastava KH* and **Sober SJ** (2012). Control of multiple acoustic parameters by single vocal muscles in the Bengalese Finch. *Annual Meeting, Society for Neuroscience* (Poster).

Kelly CW* and **Sober SJ** (2012). Age-related changes in the dynamics of vocal error correction. *Annual Meeting, Society for Neuroscience* (Poster).

Hoffmann LA* and **Sober SJ** (2012). Songbird vocal error correction local to single motor gestures. *Annual Meeting, Society for Neuroscience* (Poster).

Ph.D. Students Supervised:

Kyle Srivastava (2010-2016)

Ph.D. conferred 5/6/2016. Dissertation: “Defining the Neuromuscular Mechanisms of Vocal Motor Control”.
Dr. Srivastava is now a Senior Data Scientist at Boston Scientific (Minneapolis-St. Paul, MN).

Lukas Hoffmann (2011 - 2017)

Ph.D. conferred 4/18/2017. Dissertation: “Complex sensorimotor processing and neural plasticity in the Bengalese finch song system during vocal learning and error correction”.
Dr. Hoffmann is now a Software Engineer at Micromeritics (Atlanta, GA).

David Nicholson (2011 - 2018)

Ph.D. conferred 9/18/2017. Dissertation: “Cerebellothalamic and thalamostriatal projections in a songbird, the Bengalese Finch”.
Dr. Nicholson is currently a Machine Intelligence Engineer at Embedded Intelligence (Washington, DC)

Varun Saravanan (2014 - 2019)

Ph.D. conferred 8/29/2019. Dissertation: “Elucidating the role of dopamine in sensorimotor learning in the Bengalese finch song system”.
Dr. Saravanan is currently a Data Scientist in the Brian Modulation Lab at Harvard Medical School (Boston, MA).

Alynda Wood (2015 - 2021)

Ph.D. conferred 10/19/2021. Dissertation: “Anatomy and physiology of a vocal learning circuit in the Bengalese Finch”.
Dr. Wood is currently a AAAS Science Policy Fellow, working at the National Institute of Neurological Disorders and Stroke in the Office of the Director.

James McGregor (2016 - 2021)

Ph.D. conferred 5/28/2021. Dissertation: “Shared mechanisms of auditory and non-auditory vocal learning in the songbirdbrain”.
Dr. McGregor is currently a postdoctoral fellow in the laboratory of Dr. Keith Hengen and Washington University in St. Louis.

Andrea Pack (2016 - 2022)

Ph.D. conferred 11/18/2022. Dissertation: “Measuring and Understanding Muscular Control of Vocal Production in Songbirds”.
Dr. Pack is taking time to deal with a serious health matter before starting her next position.

Ethan Corey	(2023 - present)	Biomedical Engineering
William McCallum	(2022 - present)	Neuroscience
Abi Grassler	(2022 - present)	Neuroscience
Kofi Vordzorgbe	(2021 - present)	Neuroscience, MD/PhD
Leila Pascual	(2020 - present)	Neuroscience
Kyle Thomas	(2020 - present)	Biomedical Engineering
Matt Williams	(2019 - present)	Biomedical Engineering
Sean O’Connell	(2019 - present)	Biomedical Engineering

Masters Students Supervised:

Rachel Conn (2018 - 2022) Neuroscience

Undergraduate Students Supervised:

Rhuna Gibbs	Spring 2022 - present	Publication: Chung et al. (<i>eLife</i> , 2023)
Logan Ouellette	Spring 2022 - Spring 2023	Publication: Chung et al. (<i>eLife</i> , 2023)
Mohammad Rashad	Spring 2021 - Fall 2021	
Eduardo Barquet	Spring 2021 - Spring 2022	
Samir Chowdhury	Fall 2019 - Spring 2021	
Shreya Rana	Fall 2019 - Spring 2020	
Nicole Oey	Fall 2019 - Fall 2021	
Clara Wang	Fall 2019 - Spring 2020	
Joyce Li	Spring 2019 - Spring 2022	
Tingting Bi	Fall 2019 - Spring 2020	
Pangsibo Shen	Fall 2019 - Spring 2020	
Abigail Grassler	Fall 2017 - Spring 2019	
Caroline Holmes	Fall 2015 - Spring 2017	Publication: Srivastava et al. (<i>PNAS</i> , 2017)
David Hercules	Fall 2016 - Summer 2017	
MacKenzie Wyatt	Fall 2013 - Spring 2016	Honors Thesis, received Highest Honors Publication: Wyatt et al. (<i>eNeuro</i> , 2017)
Umar Khan	Spring 2017 - Spring 2019	
Eli Patt	Fall 2015 - Fall 2016	
Benjamin Bolte	Spring 2014 - Spring 2015	
Emily Berthiaume	Spring 2013 - Spring 2014	Honors Thesis; received Highest Honors Publication: Wyatt et al. (<i>eNeuro</i> , 2017)
Claire Tang	Fall 2012 - Spring 2013	Publication: Tang et al. (<i>PLoS Biology</i> , 2014)
Sevara Rakhimova	Spring 2013 - Fall 2013	
Conor Kelly	Spring 2011-Fall 2012	Publication: Kelly & Sober (<i>Frontiers</i> , 2014)
Je Eun Park	Fall 2011- Spring 2012	
Jeffery Simpson	Spring 2011 - Fall 2011	

Teaching: Undergraduate and Graduate Courses

Blue = teaching after promotion to Associate Professor in 2017

EMORY UNIVERSITY Atlanta, GA
BIOL 190: Delicious! How the Brain Creates Flavor Spring 2016 & 2017, **Spring 2021**
 I developed this course, a first-year undergraduate seminar investigating the neurobiology of flavor perception. Class activities included discussions of primary research literature, cooking demonstrations, guest lectures by Atlanta chefs, and field trips to local restaurants. In **Spring 2021** I co-taught this course with Dr. Malu Murugan and we significantly revised course content to accommodate pandemic-related restrictions. Enrollment: 15 students; 3 credit hours.

EMORY UNIVERSITY Atlanta, GA
BIOL 360: Introduction To Neurobiology Fall 2012, 2013, 2014, & 2017, **Spring 2024**
 Upper-level undergraduate lecture course covering cellular and integrative neurobiology. Enrollment: 76, 110, 114, and 136 students in 2012, 2013, 2014, and 2017 respectively; 3 credit hours. Co-taught with Dr. Dieter Jaeger in 2014 and with Dr. Astrid Prinz in 2024. Cross-listed as NBB301.

Teaching: Undergraduate and Graduate Courses (continued)

Blue = teaching after promotion to Associate Professor in 2017

EMORY UNIVERSITY Atlanta, GA

BIOL 360L: Neurosimulation laboratory Fall 2011, 2012, & 2014, **Fall 2021, 2022, & 2023**

Undergraduate laboratory in computational neuroscience.

Enrollment: 15-20 students in all years; 3 credit hours.

In **Fall 2021** I significantly revised the course to emphasize open-source datasets and programming in Python.

Co-taught with Dr. Dieter Jaeger in 2014. Cross-listed as NBB301L.

MOREHOUSE SCHOOL OF MEDICINE Atlanta, GA

Essentials in Neuroscience II **Spring 2022, 2023, & 2024**

Two lectures each year

Teaching in Morehouse School of Medicine's BS/MS program in Neuroscience, which recruits students from Morehouse College, Spelman, and other local institutions.

EMORY UNIVERSITY Atlanta, GA

IBS 526: Systems Neuroscience (graduate course) Fall 2011-2017, **Fall 2018-2024**

Two lectures each year

I received an Exemplary Lecturer Award for my work in this class; see Honors above.

EMORY UNIVERSITY Atlanta, GA

BIO450/IBS534: Computational Neuroscience (mixed grad/undergrad) **Spring 2020-2023**

Two lectures each year

Advanced course in computational neuroscience

Teaching: Technology Dissemination

REMOTE TRAINING WORKSHOP IN EMG ELECTRODE TECHNOLOGY **August 2021-August 2022**

Course Director

This workshop, co-sponsored by the Simons, Kavli, Azrieli, and Novo Nordisk Foundations, is distributing next-generation electrode devices to 100 researchers worldwide and supporting the technology with synchronous and asynchronous online teaching materials. Ten "cohorts" of researchers use our devices to muscle activity, with all training and research taking place at the participants' home institutions.

Enrollment: 100 researchers worldwide.

Teaching: Community

ONLINE Roughly 1,400 participants at Emory and around the world

The Neuroscience of Chocolate **April 28, 2021**

I organized and co-presented this online seminar along with my co-Instructor Malu Murugan and the students from our BIOL190 course ("Delicious! How the Brain Creates Flavor"). In collaboration with Atlanta-based chocolatiers **XocolATL Small-Batch Chocolate** we created a 2-hour long program on the neuroscience of why chocolate is delicious, including discussions of how sweet, bitter, and salty flavors interact with taste circuits in the nervous system. Each participant received (by mail or contactless pickup on campus) a selection of chocolates to taste during the presentation.

Teaching: Community (continued)

PHILLIPS STATE PRISON Buford, GA
Introduction to Neurobiology July-August 2016, July 2017
A survey of basic neuroscience concepts taught to inmates at Phillips State Prison, a maximum-security men's facility. This project was coordinated through Common Good Atlanta, a nonprofit which has taught college level courses (previously only composition and literature classes) at Phillips for 8 years. Ours was the first natural science class taught in prison in the state of Georgia.
Enrollment: 17-20 students per year.
Co-taught with Andrea Pack, a graduate student in my lab.

Teaching: Invited International Training Courses

Blue = teaching after promotion to Associate Professor in 2017

EUROPEAN UNION WORKSHOP ON SINGLE-UNIT EMG Cologne, Germany
Instructor and co-Organizer **3/2024**
Hands-on instruction for users of the technology developed in my group. Co-organized with Prof. Graziana Gatto (University of Cologne) and supported by our award from the Halle Foundation.
Enrollment: 15 students

EMORY-TIBET SCIENCE INITIATIVE Hubli, India
Instructor 5-6/2016
Taught neuroscience to Tibetan Buddhist monks as part of an initiative to provide Western scientific training to Tibetan monastics and foster dialogue between cultures.
Enrollment: 28 students

PERCEPTION AND ACTION IN COMPLEX ENVIRONMENTS (PACE) Marseille, France
Instructor 1/2016
Instructor for PACE, an EU-funded multi-site graduate training program focusing on complex motor control.
Enrollment: 30 students

CHAMPALIMAUD NEUROSCIENCE PROGRAMME Lisbon, Portugal
Course Co-coordinator 2/2011, 3/2012
Co-coordinator (with Dr. Megan Carey) for a week-long graduate short course on the neural basis of learning.
Enrollment: 15-20 students per year.

Service

University

Institutional Animal Care and Use Committee (IACUC). Committee member. 2021-present.

The IACUC oversees all animal care, housing, surgical procedures etc. across all of Emory. As a committee member I attend twice-monthly meetings (each meeting is 3.5 hours long) in addition to spending an average of 1.5 hours per week reviewing individual animal protocols and preparing presentations to the full committee evaluating each document.

Science Gallery Atlanta Advisory Committee. Committee member. 2021-2023.

As a member of the Advisory Committee I helped plan "Hooked," the inaugural exhibition at **Science Gallery Atlanta**. The Gallery is the newest member of a global network of organizations in London, Melbourne, Bengaluru, Rotterdam and Berlin, all of which were inspired by the first Science Gallery, which opened in Dublin in 2008. In addition to helping to plan opening exhibition, I also worked closely with a Detroit artist to create a piece called "**Tune/Reward**" that was shown at the exhibition.

Service (continued)

Emory College

Emory Institute for Quantitative Theory and Methods (QuanTM). Advisory Board member. 2013-2019.
Lecture-track Faculty Search Committee, Neuroscience & Behavioral Biology program. Member. 2012.

Departmental

Undergraduate Research in Biology (BIOL499R). Final report reviewer. 2014-present.
Biology Departmental Assessment Committee. Member. 2014-present.
Emory Biology Department Internet Outreach Committee. Member. 2011-2020.
Biology Department Neuroscience Faculty Search Committee. Member. 2018-2019.
Biology Undergraduate Research Symposium. Poster judge. 2012, 2013.
Biology BS/MS Program. Interim Coordinator. 2012.

Graduate Programs

Emory Neuroscience Graduate Program. Seminar series coordinator. 2021-2022.
Emory Neuroscience Graduate Program. Director of Graduate Studies. 2018-2021.
Emory Neuroscience Graduate Program. Executive Committee member. 2013-2022
Emory Neuroscience Graduate Program. Awards Committee. Member. 2014-2018; Chair, 2015-2018.
Emory Neuroscience Graduate Program. Standing Committee member. 2013-present.

National/International

Society for Neuroscience. Trainee Professional Development Awards Committee member. 2015-2021
Computational and Systems Neuroscience (COSYNE) conference. Program Committee member. 2014- 2018

Reviewing and Editorial work (since starting at Emory in 2010)

Editorial:

Guest Academic Editor - PLoS Biology - 2017 (2), 2018 (3)
eLife, Guest Reviewing Editor - 2021

Journal Article Reviews:

Nature - 2014 (3)
Nature Neuroscience - 2014 (2)
Nature Communications - 2018
Neuron - 2018, 2021, 2022
Current Biology - 2018, 2019 (3), 2023 (2)
PNAS - 2019, 2020 (2), 2021, 2022
PLoS Biology - 2016, 2017
PLoS Computational Biology - 2016, 2018
eLife - 2013, 2014, 2015 (3), 2016 (3), 2017 (3), 2019 (4), 2020, 2021, 2022 (2)
eNeuro - 2023 (3)
European Journal of Neuroscience - 2022, 2023
Journal of Neuroscience - 2011, 2016, 2017
Journal of the Acoustical Society of America - 2013
Journal of Neurophysiology - 2010, 2011 (2), 2012, 2015, 2016, 2017, 2018
Frontiers in Neuroscience - 2010, 2016, 2017 (2)
Hearing Research - 2014
Journal of Visualized Experiments - 2012
PLoS ONE - 2011, 2013 (2), 2017
Brain Research - 2012 (2)
Neuroscience - 2016 (3)

Service (continued)

External Grant Reviews:

HHMI Gilliam Fellowships for Advanced Study, February 2023
NIH, K99/R00 Special Emphasis Panel, October 2018
NSF/NIH, CRCNS (Collaborative Research in Computational Neuroscience) panel, March 2017
NSF, Science of Learning panel, April 2017
Beckman Scholars Program, Selection Committee, April 2017
American University in Beirut Internal Grants Office, Proposal Evaluator, December 2017, 2019
Fondation Pour l'Audition (French non-profit organization for hearing research), June 2017
French National Research Agency (ANR), May 2016
NIH, ZRG1 IFCN-T(02), ad hoc member, March 2016
Louisiana State Board of Regents Pilot Funding Program, November 2013
NSF, Processes, Structures and Integrity Program, ad hoc member, September 2012
NSF CAREER Awards panel, ad hoc member, October 2011

†Conference Abstract Reviews:

Computational and Systems Neuroscience (COSYNE) conference, 2011, 2013

Member of Graduate Thesis Committee

Michael Hess, Neuroscience Graduate Program (ongoing)
Nuri Jeong, Neuroscience Graduate Program (ongoing)
Stephanie Prince, Neuroscience Graduate Program (ongoing)
Joseph Del Rosario, Biomedical Engineering Program
Sena Agezo, Neuroscience Graduate Program
Yunmiao Wang, Neuroscience Graduate Program
Rhett Morrisette, Neuroscience Graduate Program
Sara List, Neuroscience Graduate Program
Baohua Zhou, Physics Program
Ahmed Roman, Physics Program
Katherine Overman, Physics Program
Erin King, Neuroscience Graduate Program
Feng Zhu, Neuroscience Graduate Program
Jim Kwon, Neuroscience Graduate Program
Erica Landis, Neuroscience Graduate Program
Rhett Morrisette, Neuroscience Graduate Program
Alex Dunlap, Biomedical Engineering Program
Kara Kittelberger, Neuroscience Graduate Program
Elizabeth Ann Amadei, Biomedical Engineering Program
Katy Shepard, Neuroscience Graduate Program
Wafa Soofi, Biomedical Engineering Program

Member of Undergraduate Honors Thesis Committee

Tess Klugherz (2023) Advisor: Dr. Jill Ward (Cell Biology)
Brian Kim (2023) Advisor: Dr. Yoland Smith (Emory Primate Center)
Yuxuan (Harry) Wu (2023) Advisor: Dr. Astrid Prinz (Biology)
Tony Wang (2023) Advisor: Dr. Chethan Pandarinath (Biomedical Engineering)
Elizabeth O'Gorman (2018) Advisor: Dr. Gordon Berman (Biology)
Celia Greenlaw (2016) Advisor: Dr. Robert Hampton (Psychology)
Minagi Ozawa (2015) Advisor: Dr. Gary Miller (School of Public Health)
Zahra Manji (2015) Advisor: Dr. Thota Ganesh (School of Medicine/Pharmacology)
Nawoo Kim (2015) Advisor: Dr. Nicholas Boulis (School of Medicine/Neurology)
Erdong Chen (2015) Advisor: Dr. Yoland Smith (School of Medicine/Neurology)
Patrick Curtin (2015) Advisor: Dr. David Weinschenker (School of Medicine//Human Genetics)
Nicholas Thompson (2013) Advisor: Dr. Arthur English (School of Medicine/Cell Biology)

Symposia/Meetings Organized

Organizer, “Muscles are the new neurons: opportunities created by high-resolution tools in the motor system” a symposium held at the Simons Foundation headquarters in New York and supported by the Simons-Emory International Consortium on Motor Control, with approximately 40 people attending. (January 24, 2024).

Co-Organizer (with Andrew Pruszynski), “Neural mechanisms of skilled motor control across species, circuits, and behaviors” a symposium held as part of the annual meeting of the Canadian Association for Neuroscience, with approximately 150 people in attendance. (May 29, 2023).

Organizer, “Simons-Emory International Consortium on Motor Control Open House meeting” a symposium held at Emory that included with over 200 researchers from around the world as well as representatives from private philanthropic organizations. (October 3-4, 2022).

Co-organizer (with Chethan Pandarinath), “What could neural dynamics have to say about neural computation, and do we know how to listen?,” an online workshop held by the Simons-Emory International Consortium on Motor Control. This meeting had over 1,200 live attendees and the recorded version has been viewed on YouTube over 5,000 times. (December 4, 2020).

Co-organizer (with Gordon Berman), “Inaugural Simons-Emory Symposium on Motor Control,” a online meeting launching the Simons-Emory International Consortium on Motor Control. This meeting had over 600 live attendees and the recorded version has been viewed on YouTube over 5,000 times. (June 16, 2020).

Co-organizer (with Sarah London), “Birdsong 2019: Females, Fledglings, and Song,” a satellite meeting of the 2019 Society for Neuroscience Conference with approximately 120 attendees from around the world (held at Half Sour, Chicago, IL, October 19, 2019).

Co-organizer (with Timothy Gentner), “Birdsong 2018: Out on a limb (unpublished data and new theories),” a satellite meeting of the 2018 Society for Neuroscience Conference with approximately 160 attendees from around the world (held at UC San Diego on November 2, 2018).

Co-organizer (with William Bialek and Stephanie Palmer), “Quantitative Approaches to Naturalistic Behaviors,” a workshop for 29 neurobiologists, mathematicians, and physicists (held at the Banbury Center, Lloyd, Harbor, New York on September 23-26, 2018).

Organizer and Chair, “Transforming errors into skills: from spike trains to behavior and back again,” a symposium held at the semi-annual Federation of European Neuroscience Unions (FENS) meeting, Berlin, Germany (July 8, 2018). Approximately 300 people attended the symposium.

————— *above this line = organized after 2017 promotion to Associate Professor* —————

Co-organizer and Chair, “New Directions in Motor Control”, a symposium with roughly 200 attendees from around the United States and Canada (held at Emory University on May 18-19, 2017).

Organizer and Chair, “Spike Timing Codes for Motor Control”, a symposium held at the annual Society for Neuroscience (SFN) meeting in San Diego (November 2016). Approximately 300 people attended the symposium.

Co-organizer (with Dr. Robert Liu) of “Learning About the Vocal World”, a symposium with roughly 100 attendees from around the country (held at Emory University on May 20, 2015).