

## CURRICULUM VITAE

**Dhakshin Ramanathan, MD., Ph.D**

### **Contact**

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### **Medical Licensing**

License number A113882, license date 09/01/2010, exp 09/01/2018  
DEA number: fr6062765, exp 04/30/2019  
Board-certified in Psychiatry 09/24/2015, American Board Psychiatry and Neurology

### **Education and Research**

#### **2013 - 2016 Psychiatry Research Fellow**

Departments of Psychiatry and Neurology  
University of California, San Francisco, SFVA Medical Center  
*Advisor:* Karunesh Ganguly MD., PhD

**Project 1:** Neural replay in M1 during slow-wave sleep mediates consolidation of motor learning

**Project 2:** Role of low-frequency oscillations in organizing neural activity in learning and injury

**Project 3:** Plasticity of cortico-striatal oscillatory dynamics during skilled motor learning.

#### **2009 - 2013 Psychiatry Post-Graduate Residency**

University of California, San Francisco  
Department of Psychiatry  
*Research Advisor:* Dr. Daniel Mathalon, MD., PhD

**Project:** Resting-state connectomics related to cognitive function in patients with schizophrenia

#### **2001 - 2009 MD., Ph.D., Medical Scientist Training Program / Neurosciences**

University of California San Diego  
*Ph.D. Dissertation:* Neural Correlates Underlying Motor Map Plasticity and Skilled Motor Behavior

*Advisor:* Dr. Mark Tuszynski, MD., PhD Dept. of Neurosciences

**Project 1:** Re-organization of complex movement representations in cortex after brain injury.

**Project 2:** Basal-forebrain cholinergic system required for behaviorally mediated map plasticity.

**Project 3:** Role of cholinergic systems in mediating development of motor systems.

#### **1997-2001 B.S., Biological Sciences, with Honors**

Stanford University  
Honors research conducted with Dr. Jeff Wine

### **Honors and Awards**

2016 Burroughs Wellcome Fund Career Award for Medical Scientists  
2016 VA Career Development Award  
2013 Advanced Fellow Psychiatry /Neurosciences Award  
2013 UC San Francisco Department of Psychiatry Research Award  
2011 NIMH Outstanding Resident Research Award  
2009 UC San Diego Neurology Award for Outstanding Medical Student  
2006 American Heart Association Pre-Doctoral Research Fellow Award  
2004 Merck Research Fellow Award  
2000 NIH Summer Fellow Research Award  
1999 Stanford Summer Research Award

### **Patents**

1. Co-inventor. Closed-Loop Stimulation to Enhance Motor Recovery After Stroke. (provisional patent submission pending).

## **Professional Memberships**

2005 – present Member, Society for Neurosciences.

Peer Reviewer Brain Stimulation, PLOS One, International Journal of Psychophysiology

## **Peer-Reviewed Publications**

1. **Ramanathan, D. S.**, Guo, L., Gulati T, Hishinuma A.,Ganguly K (2016). Electrical Stimulation Targeting Low-Frequency Oscillations Improves Motor Function After Stroke (in prep).
2. **Ramanathan, D. S.**, Gulati, T., & Ganguly, K. (2015). Sleep-Dependent Reactivation of Ensembles in Motor Cortex Promotes Skill Consolidation. *PLoS Biol*, 13(9), e1002263.
3. Gulati, T., Won, S. J., **Ramanathan, D. S.**, Wong, C. C., Bodepudi, A., Swanson, R. A., & Ganguly, K. (2015). Robust neuroprosthetic control from the stroke perilesional cortex. *The Journal of Neuroscience*, 35(22), 8653-8661.
4. Wong CC, **Ramanathan D.S**, Gulati T, Won SJ, Ganguly K. *J Neurosci Methods*. 2015 May 15;246:30-7.
5. **Ramanathan D.S**, Conner J.M., Anilkumar A.A., Tuszynski M.H. Cholinergic Systems are Essential for Late Stag Stage Maturation and Refinement of Motor Cortical Circuits. *J Neurophysiol*. 2015 Mar 1;113(5):1585-97.
6. Gulati T., **Ramanathan D.S**, Wong C., Ganguly K. Reactivation of emergent task-related ensembles during slow-wave sleep after neuroprosthetic learning. *Nature Neuroscience*. 2014; 17(8):1107-1113.
7. **Ramanathan D.S**, Conner J.M., Tuszynski M.H. The Basal Forebrain Cholinergic System is Selectively Required for Behaviorally-Mediated Cortical Map Plasticity. *Journal of Neuroscience*. 2009; 29(18):5992-6000.
8. Martinez A., **Ramanathan, D.S**, Foxe J., Javitt D., and Hillyard S.A. The Role of Spatial Attention in the Selection of Real and Illusory Objects. *Journal of Neuroscience*. 2007; 27(30):7963-7973.
9. **Ramanathan, D.S**, Conner J.M., and Tuszynski M.H. A form of motor cortical plasticity that correlates with recovery of function after brain injury. *Proc Natl Acad Sci U S A*. 2006; 103(30):11370-11375.

## **Conference Presentations**

1. **Ramanathan DS**,et. al. *Reorganization of Low-Frequency Oscillation Dyamics During Skilled Motor Learning*. Society for Neuroscience 2016, (Nanosymposium talk).
2. Lemke S., **Ramanathan DS** et. al.,*Interactions Between Motor Cortex and Dorsolateral Striatum During Skilled Motor Learning*. Society for Neuroscience 2016.
3. Guo L., **Ramanathan DS**, et. al. *A Neural-Interface to Boost Motor Function After Stroke*. Society for Neuroscience 2016.
4. **Ramanathan DS**., et al. *Oscillatory Dynamics in Motor Cortex Associated with Recovery After Stroke*. Society for Neuroscience 2015.
5. Gulati T., **Ramanathan DS**, et al.,. *Microstructure of Replay Events Predicts Motor Cortical Rescaling*. Society for Neuroscience 2015.
6. **Ramanathan DS**., et al., *Skilled Motor Learning Results in Increased Replay of Task-Related Neural Ensembles During Subsequent Slow-Wave Sleep*. Society for Neuroscience. 2014.
7. Gulati T., **Ramanathan DS** et al., *Reactivation of Emergent Task-Related Ensembles During Slow-Wave Sleep After Neuroprosthetic Learning*. Society for Neuroscience 2014.
8. **Ramanathan DS**., et al. (2013, May). *Role of Ventral Prefrontal Cortex in Reorientation vs. Regulation of Emotional Distractors During Concurrent Cognitive Task [abstract]*. 68<sup>th</sup> annual meeting of Society of Biological Psychiatry, San Francisco, CA.
9. **Ramanathan DS**, Conner J.M., Tuszynski M.H. *Requirement of a Functional Cholinergic System for Normal Development of Cortical Motor Systems*. Society for Neurosciences, 2010.
10. **Ramanathan DS**, Conner J.M., Tuszynski M.H. *A Novel Form of Cortical Plasticity Correlates With Recovery After Brain Injury*. Society for Neurosciences, 2005.
11. **Ramanathan DS**, Martinez A., Hillyard SA., *Electrophysiological analysis of object-based selective attention*. Cognitive Neuroscience Society Meeting, 2004.

## Invited Talks

1. What Does Psychogenic Mean Anyway? A Case of a non-Neurologic Movement Disorder. UCSF Dept of Psychiatry Grand Rounds presentation. 1/31/2012.
2. Was Bleuler Right? How to Understand Deficits in Networks, Oscillations and Plasticity in Schizophrenia. UCSF Dept of Psychiatry Senior Talk. 02/19/2013
3. Dysfunction in Large-Scale Patterns of Anti-Correlated Activity Underlies Negative Symptoms in Schizophrenia. 5/13/2014
4. Role of Neural Replay During Sleep-Spindles in Mediating Motor Memory Consolidation. UCSD Center for Neural Repair. 09/12/2015.
5. Brief Review of Neuromodulatory Therapies for Depression, UCSF Department of Psychiatry Intensive Services Grand Rounds, 11/19/2015

## Research Support

### Active

Career Development Award, VA ORD Ramanathan 07/2016 – 06/2021  
*Enhancing Neural Circuit Plasticity to Promote Recovery After TBI* **\$1,364,404/5 years**

This project is focused on characterizing large-scale circuit disruptions after TBI-injuries in rodents and using BCI-based neuro-feedback technologies to directly target and ameliorate these dysfunctions, with the goal of improving behavioral functioning.

**Role: Principal Investigator**

Career Award for Medical Scientists, Burroughs-Wellcome Fund 07/2017 – 07/2022  
*Probing Role of Spindle-Oscillations in Procedural Memory Consolidation* **\$700,000/5 years**

This project is focused on investigating how spindle-oscillations mediate procedural memory consolidation in a rodent model; and investigates deficits in this process in a rodent model of schizophrenia (using a MAM neurodevelopmental model).

**Role: Principal Investigator**

NARSAD Early Investigator Award, Brain and Behavior Research Foundation (awarded) 07/2017 – 07/2019  
**\$70,000/2 years**

This project is focused on investigating how spindle-oscillations mediate procedural memory consolidation in a rodent model; and investigates deficits in this process in a rodent model of schizophrenia (using a MAM neurodevelopmental model).

**Role: Principal Investigator**

### Past

Advanced Fellowship in Neurosciences, VA ORD Ramanathan 07/2013 – 07/2016  
**\$210,000/3 years**

Fellowship funding to cover salary/benefits for advanced training in neurosciences research and further clinical training in psychiatry (as a fellow).

## Teaching Experience

**2015 -2016**

Teaching Assistant, UCSF Brain, Mind and Behavior class.

**2013-2016**

Clinical teaching/supervision of medical students and junior residents in SFVA general psychiatry clinic (have supervised > 30 medical students)

**2006-2007**

Teaching Assistant for Basic Neurology 401

**2000 – 2001**

MCAT instructor, Princeton Review

**1998-2001**

Teacher/President of SEED (Science and Environmental Education). Taught weekly basic science courses to 3<sup>rd</sup> – 5<sup>th</sup> grade students at Costano Elementary School.