
NAME: Abebe, Mulugeta Semework

eRA COMMONS USER NAME (credential, e.g., agency login): semework

POSITION TITLE: Research Scientist

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Alemaya University, Ethiopia	B.Sc.	06/1992	Agronomy/Physiology
Georgia State University, GA	M.Sc.	05/2000	Neurobiology
SUNY Downstate Medical Center, NY	Ph.D.	05/2011	Somatosensory neuroprosthesis (BMI)
Columbia University, NY		09/2011 - 09/2016	Postdoctoral scientist
Columbia University, NY		09/2016-	Associate Research Scientist

A. Personal Statement

I am currently investigating why, where and how we have the as yet unexplained environmental memory (EM), discovered by the Goldberg lab. EM refers to our capacity to remember objects in our surroundings that are not relevant to immediate action or reward. I hope to get insights on how and why such memory is compromised in patients, such as those affected by spatial neglect. I am well positioned and motivated to carry out the proposed work. I came to Columbia after getting my Ph.D. in Neural Science and Behavior (Brain Machine Interface) from SUNY Downstate Medical Center, Brooklyn, NY. gave me extensive training in animal procedures including monkey and rat cortical and thalamic electrode array implantation surgeries, and monkey behavioral training. I am proficient in Matlab, Windows & xPC Target, and have a working knowledge of programing in C++. I have implemented the theory of Linear Granger Causality (LGC) in my data and learned that functional interactions are very dynamic and depend on stimulus conditions. My post-doctoral training in my current research setting has exposed me to more focused approaches such as one that springs from my Ph.D. work in Brain Machine Interface where I tried to create a primate eye-tracking system. I learned that attention could be reliably mapped onto a reward-tagged target than onto randomly flashed objects. This is similar to the LIP priority map I would like to tie to EM. I am confident my studies will expand my scientific repertoire by familiarizing me with specific procedures for: 1) Setting up saccadic tasks designed to study area 3a, LIP and parahippocampal (PH) complex neurons. 2) Recording and analyzing large-scale neural data and investigating functional circuitries 3) Designing and implementing methods of inactivating individual brain areas. My prior work has led me to a few publications. I have presented my results in various meetings. Columbia University has applied for a patent for one of my inventions, a compound that has helped me and colleagues do our experiments better and has taught me that industriousness and hard work are important for accomplishing my goals. My record shows that I have demonstrated effective knowledge and work ethics which have prepared me well to undertake the proposed research. I look for opportunities that will help me to learn from more experienced researchers and to achieve my general professional scientific goals, as well as specific ones aimed at alleviating problems associated with brain defects.

B. Positions and Honors

Positions and Employment

1992 - 1996 Lecturer, Alemaya University, Dire Dawa, Ethiopia

1995 - 1996	Student Researcher, Ben-Gurion University, Beer Sheva, Israel
1998 - 1999	Technical Assistant, Golden Harvest, Marietta, GA
1999 - 2004	Service Order Directory Clerk, BellSouth, Atlanta, GA
2004 - 2011	Neural Science and Behavior PhD Candidate, SUNY Downstate Medical Center, Brooklyn, NY
9/2011 -09/2014	Post-doctoral Research Scientist, Columbia University Medical Center, New York, NY
9/2014 -09/2016	Research Scientist, Columbia University Medical Center, New York, NY
9/2016 -	Associate Research Scientist, Columbia University Medical Center, New York, NY

Other Experience and Professional Memberships

Positions in scientific societies

2004 -	Member, Society for Neuroscience
06/2014-	Member, Columbia University Medical Center Post-doc Society
07/2014 -	Member, New York City-wide Post-doc council
02/2015 -	Editor, Columbia University Post-doc newsletter

Honors

1992	Bachelor of Science with Honors in Agronomy/Physiology, Alemaya University, Dire Dawa, Ethiopia
1996	Master of Science with Honors in Physiology/Biochemistry (Defense pending), Ben-Gurion University, Beer Sheva, Israel, 1996

C. Contributions to Science

1. My Ph.D. (Brain Machine Interface, Somatosensory Neuroprosthesis, at SUNY Downstate Medical Center, Brooklyn, NY) research focused on finding ways to send feedback from brain machine interfacing (BMI) devices to the brain by using electrical stimulation to replicate natural brain activity. I found that compared to the cortex, the ventral posterolateral (VPL) thalamus could be an equal or better candidate for creating natural sensations via somatosensory neuroprosthesis. I also used Linear Granger causality (LGC) analysis to investigate information flow between the cortex and the VPL thalamus and discovered stimulus-dependent dynamic interactions. These studies are important to understand neural processes that go awry in illnesses and interrupted neural pathways.
 - a. Chhatbar, P., vonKraus, L., Semework, M., and Francis, J. T. (2010). *A Bio-friendly and Economical Technique for Chronic Implantation of Multiple Microelectrode Arrays*. J Neurosci Methods. 2010 May 15;188(2):187-94.
 - b. Semework, M. and M. DiStasio. (2014). *Short-term dynamics of causal information transfer in thalamocortical networks during natural inputs and microstimulation for somatosensory neuroprosthesis*. Front Neuroeng 7: 36.
 - c. Semework, M. (2015). *Microstimulation: techniques, basic principles and somatosensory neuroprosthesis approaches*. Critical Reviews in Biomedical Engineering. 2015;43(1):61-95. PMID: 26351023
 - d. Song W, Semework M. (2015). *Tactile representation in somatosensory thalamus (VPL) and cortex (S1) of awake primate and the plasticity induced by VPL neuroprosthetic stimulation*. Brain Res. Sep 5. 2015. pii: S0006-8993(15)00697-6. doi: 10.1016/j.brainres.2015.08.046. PMID: 26348987
2. Another very important consideration in any scientific endeavor is how ethical issues can play significant roles. I have thus investigated and published on ethical considerations of application of microsimulation for critical brain structures such as the thalamus. Moreover, I strongly believe that, just as the general public, and research animals, the psychological well-being of researchers and medical professionals is an integral part of human progress.
 - a. Semework, M., Subrata, S. (2011). *Major safety and ethical concerns in brain stimulation*. Ethics in biology, engineering, & medicine 2(4). 305-316.
 - b. Semework, M. (Submitted). (2015). "Jerk, but Genius!": Humane treatment of humans in research and medicine. AJOB Neuroscience, 2015.

3. In addition to my scientific focus of understanding spatial memory (environmental memory) in LIP (see first publication below) and parahippocampus (PH), my current work involves a very exciting mix of scientific procedures and technical approaches which constantly help in improving my skills and contributions to the scientific and patient community.
- a. Semework, M., S. C. Steenrod, Goldberg, M. E. (In submission). (2016). *A neural substrate for environmental memory in lateral intraparietal area (LIP)*. JNS.
 - b. Patent applied by Columbia Tech Ventures (Reference: IR CU13187). (2015). *Marker paste for medical and industrial imaging (MRI, CT, X-Ray) and visualization of materials and external body surfaces*.
 - c. Semework M. (2015). *A Customizable Multimodality Imaging Compound That Relates External Landmarks to Internal Structures*. J Nucl Med Technol. 2015 Dec;43(4):267-74. doi: 10.2967/jnmt.115.162404.

Complete List of Published Work in MyBibliography

<http://www.ncbi.nlm.nih.gov/pubmed/?term=mulugeta+semework>

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

3 R01 EY014978-06 Supplement grant (Dr. Michael E. Goldberg) 09/19/14 -

The neurophysiology of visual search.

The goal of this study is to study a signal in the monkey lateral intraparietal area (LIP), and investigate the monkey's probability of success in performing a difficult task.

Role: Postdoctoral researcher

Zegar Family Foundation grant

07/01/15-06/30/18

Remembering the World Around Us

The goal of this grant is to study environmental memory in the parahippocampal gyrus and parietal cortex.

Role: Postdoctoral researcher

Role: Postdoctoral researcher

Completed Research Support

Brain & Behavior Research Foundation (NARSAD) 2013 Young Investigator Award 01/01/14-01/01/2016

The goal of this grant is to study environmental memory in area TF of the parahippocampal gyrus.

Role: Postdoctoral researcher