

EDUCATION

- **State University of New York at Buffalo**, Buffalo, New York 2013-2017
Bachelor of Sciences, Biomedical Sciences
Provost Scholar, Honors Scholar (graduated *magna cum laude*)
- **Stuyvesant High School**, New York City 2009-2013
Intel Semi-finalist (2013), High Honors (Biology Department)

Key Research Interests

systems neuroscience, development of cortical circuits, interneurons, epigenetics, neuromodulation

PUBLICATIONS

Published manuscripts

1. Rathje, C. C., Randle, S., Rawri S., Skinner B. M., Nelson, D. E., **Majumdar, A.**, Johnson, E. E. P., Bacon, J., Vlazaki, M., Affara, N. A., Ellis, P. J., Laman, H. (2019) A conserved requirement for Fbxo7 during male germ cell cytoplasmic remodeling. *Frontiers in Physiology*, 1278, 1-16

2. Hayes, S. H., Manohar, S., **Majumdar, A.**, Allman, B. L., & Salvi, R. (2019). Noise-induced hearing loss alters hippocampal glucocorticoid receptor expression in rats. *Hearing research*, 379, 43-51.

Manuscripts in preparation

Batista-Brito, R., **Majumdar, A.**, Nuno, A., and Cardin, J. Loss of ErbB4 in Lhx6 positive interneurons alters network effects. Expected submission date January 2020.

Research Experience

Postgraduate Research Associate

2017- Present

Yale University Department of Neuroscience

Advisor: Dr. Jessica Cardin, Dr. Renata Batista-Brito

Motivating question(s): How does developmental dysregulation in GABAergic interneurons lead to structural and functional deficits in cortical circuits? What are the roles of distinct pyramidal and interneurons populations and neuromodulators in regulation of state-dependent regulation in cortical circuits?

PROJECT #1: Effects of MeCP2 removal in interneurons on cortical circuit function

Description: Investigating the role of MeCP2, a gene implicated in development disorders such as Rett syndrome, in the function of subpopulations of GABAergic interneurons through a combination of behavioral, 1-photon imaging and anatomical analyses. Optimized a protocol for whole brain deletion of MeCP2 using CRISPR/Cas9 viral constructs. Using mesoscale calcium imaging to examine global cortical activity after MeCP2 removal in awake and behaving mice during different behavioral states.

PROJECT #2: Developmental consequences of ErbB4 removal in cortical interneurons

Description: Understanding the structural effects of GABAergic neuron dysregulation due to ErbB4 removal during early development. Independently developed a protocol for sparsely labeling excitatory pyramidal and GABAergic somatostatin neurons to analyze morphological differences in pyramidal and somatostatin-expressing interneurons between ErbB4 mutants and controls.

PROJECT #3: Functional consequences of developmental loss of function in GABAergic VIP-interneurons

Description: Used viral vector methods to conditionally express the potassium rectifying channel, Kir2.1, selectively in VIP interneurons between P0-5. Performed extracellular recordings via tetrode arrays in primary visual cortex of adult mice and measured spontaneous firing rates to understand the functional effects of disruption of VIP interneuron activity during early development.

PROJECT #4: Impact of cholinergic system on visual perception

Description: Training mice on an appetitive visual detection task to examine the role of nicotinic cholinergic receptors on modulation of visual perception by behavioral states.

Utilized stereotaxic surgery, intracerebral virus injections, brain tissue sectioning, digital reconstructions, measurement of neurons, animal colony maintenance, in vivo mesoscale imaging, confocal microscopy, ImageJ cell labeling, immunohistochemistry and histology, in vivo electrophysiology, mouse behavior, signal processing and MATLAB programming techniques.

Summer Research Intern
University of Cambridge Department of Pathology
Advisor: Dr. Heike Laman, Dr. Suzanne Randle

June 2016 – August 2016

Motivating question: Which stage of spermatogenesis is affected in Fbxo7 knockdown mice?

PROJECT: Deciphering the interactions between Fbxo7 and proteasome activity during spermatogenesis
Description: Investigated the reason for sterility in male mice with a knockdown of Fbxo7 protein in both an *in vivo* and *in vitro* system. Developed a protocol for sperm sorting with testis lysates from sterile mice. Identified a critical period when sperm development is affected in Fbxo7 knockdown mice. This work is published in Frontiers in Physiology (see publications section).

Utilized Western blot techniques, cell culture, proteasome assays, FACS sorting.

Summer Research Intern
University of Cambridge Department of Genetics
Advisor: Dr. Anne Ferguson-Smith, Dr. Anastasiya Kazachenka

June 2015- August 2015

Motivating question: Identifying potential metastable epiallele candidates using manually curated methods

PROJECT: Deciphering and identifying the epigenetic characteristics of repetitive elements in the mammalian genome and their impact on transcription
Description: Analyzed for variation in methylation among murine tissue samples using pyrosequencing methods and assessed for methylation values across CpG sites. Analyzed for correlation between methylation percentages and gene expression levels using real-time PCR to conduct a genome-wide screen for metastable epialleles. This study has been published in Cell (Kazachenka et al., 2018).

Utilized pyrosequencing and RT-PCR techniques.

Undergraduate Research Assistant
University at Buffalo Center for Hearing and Deafness
Advisor: Dr. Sarah Hayes, Dr. Richard Salvi

Sept 2013- May 2017

Motivating question: What are the effects of chronic postnatal stress on hippocampal structures of the brain?

PROJECT: The effects of stress on HPA axis activity and hippocampal glucocorticoid expression in rats
Description: Conducted a study using adult rats exposed to intense noise chronically. Using immunohistochemistry techniques for observing glucocorticoid and mineralocorticoid expression in the hippocampus. Analyzed increased glucocorticoid receptor expression in the hippocampus, a likely cause for reduction in hippocampal cell neurogenesis.

Utilized immunohistochemistry, microscopy and behavior techniques.

High School Research Intern
Memorial Sloan Kettering Cancer Center
Advisor: Dr. Sevin Turcan, Dr. Timothy A. Chan

April 2011- June 2013

Motivating question: How do polychlorinated biphenyls contribute to carcinogenesis in cell lines?

PROJECT: Genomic Instability Induced by Persistent Exposure to Polychlorinated Biphenyls (PCBs).
Description: Used a human embryonic kidney cell line (HEK293) to study the effects of polychlorinated biphenyls. In this study, we used dose-dependent assays to isolate PCB-resistant cell colonies. Isolated cell cultures were used

to study the potential mechanisms for tumorigenesis. Analysis using fluorescence *in situ* hybridization established that continual treatment with PCBs enhances the degree of chromosomal instability.

Utilized fluorescence in situ hybridization (FISH), cell culture techniques, soft agarose assays.

Teaching Experiences

Beyond the Block: Globalizing Science Education, Buffalo, NY & Kolkata, India

Co-founder

January 2015 to May 2017

- Created a [website](#) as a forum where students from different high-needs schools can discuss local issues and films.
- Coordinated letter exchange between students in Kolkata and Buffalo.
- Taught 20 students in Harriet Tubman Academy and Calcutta Rescue how to use technological tools to create videos and other informative, educational material

ISEP Program - Harriet Ross Tubman Middle School, Buffalo, NY

Student Mentor

February 2014 to May 2017

- Assisted students with the Science Olympiad competition and the middle-school biology curriculum.
- Worked with students on a Lexus Eco Challenge competition for 4 months in developing technologies (e.g. prototypes of water filtration device, solar-powered windmill) that would address the challenge of global environmental sustainability.

Calcutta Rescue- School # 1: School for the Destitute, Kolkata, India

Volunteer Teacher

December 2016 to January 2017, December 2014 to January 2015

- Taught a class of 30 students from slums in North Calcutta at School # 1, 20 hours / week.
- Created lessons to guide the students through English grammar and conversational English concepts.
- Taught lessons using a letter-writing activity to eighth-grade Living Environment students in Buffalo, NY.

Conference presentations

1. World's Challenge Competition International Round Participant – **Western University**, June 1st, 2017
2. World's Challenge Competition presentation on Beyond the Block (Winner of second round at university & qualified for international round to held in May 29th, 2017)- **University at Buffalo**, March 3rd, 2017
3. Committee on Teaching about the United Nations (CTAUN) Conference at **UN Headquarters**, 'Interplay of Science Education and Partnerships', January 22nd, 2016

Awards & Honors

Chris Peterson Commitment to Service Award	2017
Fulbright Finalist (Alternate)	2017
Goldwater Nominee	2015
HSBC Scholar Recipient	2015
Provost Scholar	2013
Intel Semifinalist	2013

Research Funding

Honors College Research and Creativity Fund Award	2016
Cambridge Research Fellowship	2015-16

Mentoring

Alejandro Nuno – Yale '21 (Developmental consequences of ErbB4 removal in cortical INs)	2018-present
Wasil Ahmed – Yale '21 (Cortical thickness changes in MeCP2 knockout mice)	2018