Mark A. Nicholas

Doctoral Candidate, Carnegie Mellon University
mnichola@andrew.cmu.edu
Orcid ID: 0000-0003-4554-1129

4400 5th Avenue, Rm 243
Pittsburgh, PA, 15213
(412) 268-4190

EXPERIENCE AND EDUCATION

Doctoral Candidate - Carnegie Mellon University 2020 - Present
Thesis: Corticalstriatal function during movement and trial and error learning in a dynamic environment
Advisor: Dr. Eric A. Yttri, Department of Biological Sciences
Center for the Neural Basis of Cognition

Research Associate II – Eric Yttri Lab, Carnegie Mellon University 2017 - 2020
Promoted from Research Associate I in 2019

Postbaccalaureate Intramural Research Training Fellow - NIMH 2015 - 2017
Laboratory of Neuropsychology, Section on Neurobiology and Learning and Memory
Advisor: Dr. Elisabeth A. Murray

Research Assistant – Sandra Kuhlman Lab, Carnegie Mellon University 2012 - 2015
Project: Corticocortical feedback-mediated facilitation is cell-type specific and gated by nucleus basalis activity

Bachelor of Science - Carnegie Mellon University 2011 - 2015
Major: Neuroscience, College Honors, Department of Biological Sciences

AWARDS AND HONORS

Mellon College of Science Rookie of the Year Finalist 2018, 2019
One of 6 employees nominated from the entire college
National Institutes of Health Postbaccalaureate Intramural Research Training Award 2015, 2016
Mellon College of Science College Honors, Carnegie Mellon University 2015
Senior Leadership Recognition, Carnegie Mellon University 2015
"This recognition is reserved for those students who have made an unparalleled impact on our community, leaving CMU a better place as a result of their leadership, vision and initiative"
Small Undergraduate Research Grant, Carnegie Mellon University 2015
Howard Hughes Medical Institute Summer Researcher Grant 2013, 2014

PUBLICATIONS

1. Kaskan PM*, **Nicholas MA***, Dean, AM, Murray, EM. (2022). *Attention to stimuli of learned versus innate biological value rely on separate neural systems.* Journal of Neuroscience (* contributed equally)

2. Saleh MS*, Ritchie SM*, **Nicholas MA***, Gordon HL*, Yuan B, Hu C, Jahan S, Bezbaruah R, Reddy JW, Chamanzar M, Yttri EA, Panat RP. (2022). *A 3D Nano-Printed, Highly Customizable High-Density Microelectrode Array Platform.* Science Advances. (* contributed equally)

3. Belsey P, **Nicholas MA**, Yttri EA. (2020). *Open-source joystick manipulandum for decision-making, reaching, and motor control studies in mice.* eNeuro.

4. Saleh MS, Ritchie S, **Nicholas MA**, Bezbaruah R, Panat R, Yttri EA. (2019). *CMU Array: A 3D Nano-Printed, Customizable Ultra-High-Density Microelectrode Array Platform.* bioRxiv.

5. Belsey P, **Nicholas MA**, Yttri EA. (2019). *Build a better mouse task: can an open-source rodent joystick enhance reaching behavior outcomes through improved monitoring of real-time spatiotemporal kinematics?* bioRxiv.

6. Kaskan PM, Dean MA, **Nicholas MA**, Mitz AR, Murray EA. (2018). *Gustatory responses in macaque monkeys revealed with fMRI: comments on taste, taste preference and internal state.* NeuroImage.

7. Pafundo DE, **Nicholas MA**, Zhang R, Kuhlman SJ. (2016). *Top-Down-Mediated Facilitation in the Visual Cortex Is Gated by Subcortical Neuromodulation.* The Journal Of Neuroscience.

8. **Nicholas MA**, Pafundo DE. (2014). *Can we reorganize the cortex to restore vision in amblyopes?* The Triple Helix.

PUBLICATIONS IN PREPARATION

1. **Nicholas MA**, Yttri EA. *Causal dissection of cortical-striatal interactions governing the neural circuit control of reaching during goal directed behaviors.*

2. Hsu AI, **Nicholas MA**, Yttri EA. *Naturalistic action encoding across corticostriatal motor axis.*

PRESENTATIONS

1. Panat RP, Ritchie SM, **Nicholas MA**, Gordon HL, Yuan B, Hu C, Jahan S, Bezbaruah R, Reddy JW, Chamanzar M, Yttri EA. (2022). *3D Printed Customizable Neural Probes.* 12th International Conference on Microelectrode Arrays for Life Sciences 2022, Poster.

2. **Nicholas MA**, Yttri EA. (2021). *Motor cortex but not parietal lesions severely impair reaching, spontaneous motor decisions and striatal dynamics*. Swedish Basal Ganglia Society, poster.

3. **Nicholas MA**, Yttri EA. (2021). *Motor cortex but not parietal lesions severely impair reaching, spontaneous motor decisions and striatal dynamics*. The Society for Neuroscience, poster.

4. **Nicholas MA**. (2020). *Cortical contributions to movement and striatal activity.* Great Hall Of Brain Science Seminar. Carnegie Mellon, talk.

5. **Nicholas MA**, Belsey P, Yttri EA. (2019). *Causal dissection of cortical-striatal interactions governing the neural circuit control of reaching.* The Society for Neuroscience, poster.

6. Hodge AT, **Nicholas MA**, Dudman JT, Yttri EA. (2019). *Striatal stimulation reinforces, but does not select, naturalistic untrained behavior*. The Society for Neuroscience, poster.

7. **Nicholas MA**, Belsey P, Yttri EA. (2019). *Causal dissection of cortical-striatal interactions governing the neural circuit control of reaching.* CMU Department of Biological Sciences Elizabeth Jones Retreat 2019, poster.

8. Panat R, Saleh MS, Ritchie S, **Nicholas MA**, Bezbaruah R, Yttri EA. (2019). *CMU array: A fully-customizable, ultra-high density invasive electrode for large-scale recording and optical stimulation enabled through nanoparticle 3D printing.* The Society for Neuroscience, talk.

9. **Nicholas MA**. (2019). *Causal dissection of cortical-striatal interactions governing the neural circuit control of reaching during goal directed behaviors*. Great Hall Of Brain Science Seminar. Carnegie Mellon, talk.

10. Saleh MS, Ritchie S, **Nicholas MA**, Bezbaruah R, Yttri EA, Panat R. (2019). *CMU Array: A Customizable Ultra-High-Density Optic-Fiber Paired Neural Interface by Nanoparticle 3D Printing.* Biomedical Engineering Society 2019 Annual Meeting, poster.

11. Belsey P, **Nicholas MA**, Yttri EA. (2019). *Semi-Automated Training Platform for Studying Reaching Behavior in a Mouse Model Organism.* Carnegie Mellon Meeting of the Minds Poster Presentation, poster.

12. Saleh MS, Bezbaruah R, **Nicholas MA**, Reddy J, Chamanzar M, Yttri EA, Panat R. (2019). *Customizable Ultra-High-Density Optic-Fiber Paired Neural Interfaces by Nanoparticle 3D Printing.* 2019 9th International IEEE/EMBS Conference on Neural Engineering (NER), poster.

13. Saleh MS, **Nicholas MA**, Bezbaruah R, Reddy J, Chamanzar M, Yttri EA, Panat R. (2018). *3D Printed Ultra-High Density, High Aspect Ratio Microelectrode Arrays for Next-Generation Neural Probes and Drug Delivery Applications*. 2018 Materials Research Society, poster.

14. Saleh MS, **Nicholas MA**, Bezbaruah R, Yttri EA, Panat, R. (2018). *Microscale 3D Printing by Additive Nanoparticle Assembly for Energy Storage Systems and Biomedical Devices.* International Mechanical Engineering Congress & Exposition® 2018, poster.

15. **Nicholas MA**, Saleh MS, Hodge, AT, Panat R, Yttri EA. (2018). *Customizable, 3D-printed, thousand-channel probes for neural recording and photostimulation.* Cell-NERF Symposium, Neurotechnologies, talk.

16. Kaskan PM, Dean MA, **Nicholas MA**, Mitz AR, Ungerleider LG, Murray EA. (2016) *Gustatory responses in macaque monkeys revealed with fMRI.* The Society for Neuroscience, poster.

17. **Nicholas MA**, Dean MA, Hwang J, Kaskan PM, Murray EA. (2016) *The role of the amygdala in attending to reward predictive visual images.* 18th Annual NIMH DIRP Fellows' Scientific Training Day, poster.

18. Kaskan PM, Dean MA, **Nicholas MA**, Mitz AR, Murray EA. (2015) *Gustatory responses in macaque monkeys revealed with fMRI*. 17th Annual NIMH DIRP Fellows' Scientific Training Day, poster.

19. **Nicholas MA**, Pafundo DE, Kuhlman SJ. (2015) *Corticocortical feedback-mediated facilitation is cell-type specific and gated by nucleus basalis activity.* Carnegie Mellon Meeting of the Minds Poster Presentation, poster.

20. **Nicholas MA**, Pafundo DE, Kuhlman SJ. (2014) *Top-Down Control of Visual Response in Mouse.* Howard Hughes Medical Institute Seminar Presentation, talk.

PROFESIONAL MEMBERSHIPS

Swedish Basal Ganglia Society 2019 - Present
Society for Neuroscience 2016 - Present

OUTREACH AND VOLUNTEERING

Cortico-Basal Ganglia Journal Club, creator, organizer 2018 - Present

Organize and lead a weekly journal club about motor control, learning and decision making and related topics with members around the Pittsburgh neuroscience community. Along with traditional journal club presentations, I've organized an "In Depth Mini Series" where we discuss 3-4 papers a week for multiple consecutive weeks to explore a

given topic in the field. With our transition to virtual presentations, we have also invited external speakers to share their work as well.

What can we learn from putting electrodes in all parts of the brain? - Science Scavenger Hunt 2022

Outreach event to teach undergraduate students about research being done in the Department of Biological Science, roughly 40 students

A unifying hypothesis behind skilled motor actions 2022

Interviewed by the Carnegie Mellon newspaper, The Tartan, following a departmental talk to share my findings studying how cortex and striatum work together to produce skilled motor actions

How we use optogenetics to study how the brain controls behavior? - Science Scavenger Hunt 2021

Outreach event to teach undergraduate students about research being done in the Department of Biological Science, roughly 80 students

Colloquium Committee, Center for the Neural Basis of Cognition 2021 - Present

Organize invited speakers to present to the department

How do neurons talk to each other and how do we listen? - Science Scavenger Hunt 2019

Outreach event to teach undergraduate students about research being done in the Department of Biological Science, roughly 60 students

Department of Biological Science Invited Alumni Career Panel 2019

Shared how my undergraduate education has helped me in academic research with roughly 100 students

GFP in the brain: What is a neuron - Science Scavenger Hunt 2014

Outreach event to teach high school and undergraduate students about histology, microscopy and single neuron morphology, roughly 50 students

Mellon College of Science Mentor 2013 - 2017

Mentored a group of 8 undergraduate students starting before their first year and through their time at the university. I held weekly group meeting during their first semester to discuss available resources and then met individually at least once a semester following to help in their progress.

TEACHING

Advance Systems Neuroscience Instructor Spring 2022

Taught graduate students systems neuroscience through primary literature with an additional focus on critical reasoning, discussion and presentation and communication of scientific content, roughly 15 students

Modern Biology Teaching Assistant Fall 2020

Assisted during lectures, held weekly Office Hours, created course content and graded material, roughly 150 students

Experimental Neuroscience Teaching Assistant Spring 2015

Taught undergraduate students both neuroscience methodology and content in a hands on laboratory environment. Taught some lectures, created course content and graded material, roughly 20 students

GRADUATE MENTEES (8):

Hailey Gordon (MS)	2020 - 2022
Julia Badyna (PhD)	2020
Benjamin George (PhD - rotation)	2020
Alexander Hsu (PhD)	2018 - 2020
Gary Wilkins (PhD - rotation)	2018

Brendan Gallager (PhD - rotation)	2018
Andrew Buzza (MS)	2017 - 2019
Alexander Hodge (PhD)	2017 - 2020

UNDERGRADUATE MENTEES (15):

Mckenna Brown	2022-Present
Anand Yallapragada	2020 - 2021
Syan Lopez	Summer 2020
Claudia Li	Summer 2020
Arula Ratnakar	2019 - 2021
Kevin Handoko	Summer 2019
Vijeeth Guggila	Summer 2019
Hana Song	2018 - 2019
Jean Namgoong	2018 - 2021
Kanika Seth	2017 - 2021
Alexandra DiTommaso	2018 - 2019
Maddy Acurio	2018 - 2019
Virgina White	2017 - 2019
Parley Belsey	2017 - 2019
Alyssa Brandt	2017 - 2018

TECHNICAL SKILLS

Computer: MATLAB, Python, C++, Java, MonkeyLogic, Adobe Illustrator, Adobe Photoshop, ImageJ
Wet Lab: Acute Electrophysiology, Histology, Animal care of rodent and non-human primates, Rodent husbandry
Surgical: Intracranial Implant, Chronic Electrode Implant, Transcardial Perfusion, Intracranial Injections, Intracranial Window Implant, Craniotomies