

# Margaret Henderson, Ph.D

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## EDUCATION

- 2021 – present    **Postdoctoral Research Associate**  
Neuroscience Institute & Machine Learning Department  
Carnegie Mellon University, Pittsburgh, PA  
Supervisors: Dr. Leila Wehbe and Dr. Michael Tarr
- 2015 – 2021    **Ph.D in Neurosciences with a Specialization in Computational Neurosciences**  
University of California, San Diego, La Jolla, CA  
Supervisor: Dr. John Serences
- 2011 – 2015    **B.S. in Biological Sciences**  
Concentration in Neurobiology and Behavior  
Cornell University, College of Agriculture and Life Sciences, Ithaca, NY  
Summa Cum Laude with Distinction in Research

## PUBLICATIONS

**Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2022). Low-level tuning biases in higher visual cortex reflect the semantic informativeness of visual features. *bioRxiv (under review)*.

<https://doi.org/10.1101/2022.08.04.502850>

Jinsi, O.\*, **Henderson, M.M.\***, & Tarr, M.J. (2022). Why is human vision so poor in early development? The impact of initial sensitivity to low spatial frequencies on visual category learning. *bioRxiv (under review)*. <https://doi.org/10.1101/2022.06.22.497205>

Jain, N., Wang, A., **Henderson, M.M.**, Lin, R., Prince, J.S., Tarr, M.J., & Wehbe, L. (2022). Food for thought: selectivity for food in human ventral visual cortex. *bioRxiv (under review)*.

<https://doi.org/10.1101/2022.05.22.492983>

**Henderson, M.M.**, Rademaker, R.L., & Serences, J.T. (2022). Flexible utilization of spatial- and motor-based codes for the storage of visuo-spatial information. *eLife*. <https://doi.org/10.7554/eLife.75688>

**Henderson, M.M.**, & Serences, J.T. (2021). Biased orientation representations can be explained by experience with non-uniform training set statistics. *Journal of Vision*. <https://doi.org/10.1167/jov.21.8.10>

**Henderson, M.M.\***, Vo, V.A.\*, Chunharas, C., Sprague, T.C., & Serences, J.T. (2019). Multivariate analysis of BOLD activation patterns recovers graded depth representations in human visual and parietal cortex. *eNeuro*. <https://doi.org/10.1523/ENEURO.0362-18.2019>

**Henderson, M.M.** & Serences, J.T. (2019). Human frontoparietal cortex represents behaviorally relevant target status based on abstract object features. *Journal of Neurophysiology*.

<https://doi.org/10.1152/jn.00015.2019>

**Henderson, M.M.**, Gardner, J., Raguso, R.A., & Hoffman, M.P. (2017). Trichogramma ostrinae (Hymenoptera: Trichogrammatidae) response to relative humidity with and without host cues. *Biocontrol Science and Technology*. <https://doi.org/10.1080/09583157.2016.1262327>

\* These authors made equal contributions.

**Henderson, M.M.**, Pinskiy, V., Tolpygo, A., Savoia, S., Grange, P., & Mitra, P. (2014). Automated placement of stereotactic injections using a laser scan of the skull. *arXiv*.  
<https://doi.org/10.48550/arXiv.1410.5914>

## *SELECTED PRESENTATIONS*

**Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2022). Informative associations between feature, spatial, and category selectivity in human visual cortex. Poster at Conference on Cognitive Computational Neuroscience, San Francisco, CA. <https://doi.org/10.32470/CCN.2022.1043-0>

Luo, A., Wehbe, L., Tarr, M.J., & **Henderson, M.M.** (2022). The Neural Representation of Real-World Object Size in Natural Images. Poster at Conference on Cognitive Computational Neuroscience, San Francisco, CA. <https://doi.org/10.32470/CCN.2022.1136-0>

**Henderson, M.M.**, Tarr, M.J., & Wehbe, L. (2022). Interpretable mid-level encoding models of human visual cortex reveal associations between feature and semantic tuning for natural scene images. Poster at Vision Sciences Society meeting, St. Pete Beach, FL.

**Henderson, M.M.**, & Serences, J.T. (2020). Anisotropic representation of orientation by convolutional neural networks. Talk at Vision Sciences Society meeting, held virtually.

**Henderson, M.M.**, Rademaker, R.L., & Serences, J.T. (2019). Complementary strategies for encoding information in working memory. Nanosymposium talk at Society for Neuroscience meeting, Chicago, IL.

**Henderson, M.M.** & Serences, J.T. (2019). Orientation representations in convolutional neural networks are more discriminable around the cardinal axes. Poster at Conference on Cognitive Computational Neuroscience, Berlin, Germany. <https://doi.org/10.32470/CCN.2019.1122-0>

**Henderson, M.M.**, Rademaker, R.L., & Serences, J.T. (2019). Complementary visual and motor-based strategies for encoding information in working memory. Talk at Vision Sciences Society meeting, St. Pete Beach, FL.

**Henderson, M.M.**, Serences, J.T. (2017). Occipital and parietal cortex encode representations of match between a viewed and sought object during visual target search. Poster at Vision Sciences Society meeting, St. Pete Beach, FL.

**Henderson, M.M.**, Vo, V.A., Chunharas, C., Sprague, T.C., & Serences, J.T. (2016). Reconstructing 3D stimuli using BOLD activation patterns recovers hierarchical depth processing in human visual and parietal cortex. Poster at Vision Sciences Society meeting, St. Pete Beach, FL.

**Henderson, M.M.**, Gardner, J., & Raguso, R.A. (2015). Determining the optimal relative humidity conditions for release of the pest control agent *Trichogramma ostriniae*. Poster at Cornell Biology Honors Program Final Symposium, Ithaca, NY.

## *AWARDS AND HONORS*

Distinguished Postdoctoral Fellowship from CMU Neuroscience Institute (2021-2023)  
NIMH Predoctoral Fellowship in Cognitive Neuroscience, Institute for Neural Computation (2018-2019)  
NSF GRFP honorable mention (2016)  
Cornell University Academic Excellence Award (2015)

Cornell Hatch Supplement Grant (2012)  
Alpha Xi Delta Slaymaker-Kinsey Award for Academic Achievement (2012)

## *TEACHING & MENTORSHIP*

### **Mentoring/Supervising students, Carnegie Mellon (2021 - ongoing).**

Co-supervised the Honors Thesis project of a student in CMU Psychology Department (Omisa Jinsi), focused on neural network modeling. Weekly meetings including hands-on supervision. Student was awarded a competitive prize for her work.

### **Mentoring/Supervising students, UCSD (2016 – 2021).**

Trained undergraduate students to collect behavioral, eye-tracking, and EEG data for ongoing projects, as well as basic programming and data analysis skills. Hold journal-club style meetings to discuss relevant papers and involve students in the research process. Supervised the Honors Thesis project of one student.

Mentees include: Kelvin Lam (Honors Program; went on to a PhD program at UC Santa Barbara), Yonghoon Chun (received a Psychology Department Undergraduate Research Fellowship; currently a PhD student at Dartmouth), Vanessa Cancio, Ben Carfano, Shruti Nishith, Julie Eitzen.

### **Project Advisor, UCSD Neurosciences Graduate Program Bootcamp (2018).**

Led a week-long project for incoming Ph.D. students, in which they collected fMRI data and carried out a multivariate encoding model analysis in MATLAB. Presented lectures covering the basics of fMRI physics, experimental design, and analysis, guided students through data analysis and presentation of results.

### **Teaching assistant for Data Analysis in MATLAB, UCSD (2016)**

Teaching assistant for graduate level course taught by John Serences. Reviewed student code & algorithmic solutions to weekly problem sets on advanced topics in data analysis, such as bootstrapping & permutation statistics, time-frequency analysis, pattern classification, and nonlinear curve & surface fitting.

### **Study group leader for Biology Scholars Program, Cornell University (2014)**

Led weekly study groups for students in the Cornell Biology Scholars Program, an initiative aimed at improving the experience of under-represented students in biology. Prepared review lectures, hands-on educational activities, quizzed, exam prep materials.

## *SERVICE & OTHER ACTIVITIES*

### **Organizing Carnegie Mellon brAln Seminars (2021 – ongoing).**

Co-organized a multi-university weekly seminar series on topics at the intersection of neuroscience and artificial intelligence. Responsibilities included selecting and inviting speakers, hosting and introducing presentations.

### **Career Development Committee, UCSD Neurosciences Graduate Program (2017–2020).**

Facilitate career-building opportunities for graduate students, including networking workshops and Q&A panels with speakers from academic and non-academic career paths.

### **Paths to PhDs Panelist, UCSD Psychology Department (2019).**

Served as a panelist at event for psychology undergraduates, answered questions about graduate school applications, gave advice for choosing programs and advisors.

### **Neurosciences Seminar Series Committee, UCSD Neurosciences Graduate Program (2017–2018)**

Organize weekly Neuroscience Seminar Series – includes selecting list of invited speakers (28/year), inviting speakers, arranging travel, assigning student hosts.

## *OTHER ACADEMIC TRAINING*

Computational Neuroscience: Vision, Cold Spring Harbor Laboratory summer course (2018).

## *PROFESSIONAL ACTIVITIES*

Academic Memberships: Vision Sciences Society (2016–present), Society for Neuroscience (2015–2019)  
Ad-hoc reviewer: Conference on Cognitive Computational Neuroscience, eNeuro, Nature Neuroscience, Nature Communications Biology

## *OTHER RESEARCH EXPERIENCE*

**UC San Diego**, La Jolla, CA (2016).

Rotation in the lab of Dr. Takaki Komiyama.

Collected GCaMP calcium imaging data from premotor cortex of awake, behaving mice during learning of a lever press task. Performed surgeries to implant cranial windows.

**UC San Diego**, La Jolla, CA (2016).

Rotation in the lab of Dr. Tatyana Sharpee.

Applied dimensionality reduction techniques (maximum noise entropy, maximally informative dimensions) to various data sets, including floral scent profiles and calcium imaging data.

**Cornell University**, Ithaca, NY (2012–2015).

Undergraduate thesis research, advised by Dr. Robert Raguso and Jeffrey Gardner.

Designed and carried out behavioral experiments investigating the use of the parasitic wasp species *Trichogramma ostrinae* as a biological pest control agent, and influence of environmental conditions such as humidity on parasitism efficacy. Awarded an internal Cornell grant to fund this project.

**Cold Spring Harbor Laboratory**, Cold Spring Harbor, NY (2014).

Undergraduate summer research program, advised by Dr. Partha Mitra.

Worked on developing a graphical software interface in MATLAB to automate the placement of stereotactic tracer injections, for use in the Mouse Brain Architecture Project. Tested the interface and described findings in a pre-print publication.

**Uppsala University**, Uppsala, Sweden (2013)

Research assistant for Dr. Magne Friberg.

Used GC/MS analysis to identify compounds present in floral and leaf emissions of the flower *Primula farinose*. Compared scent emissions between geographic locations and phenotypic morphs.