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Visual neuroscience in primates using electrophysiology, natural behavior, and generative AI to understand neural representations

EDUCATION

2001 – 2010 M.D., Ph.D.
 Harvard Medical School (HMS), Harvard Graduate School of Arts and Sciences

1998 – 2001 B.S. in Biology, Chemistry Minor
 University of Utah

PROFESSIONAL APPOINTMENTS

2021– Assistant Professor
 Department of Neurobiology, Harvard Medical School

2018–2021 Assistant Professor
 Department of Neuroscience, Washington University in St. Louis

2016–2017 Postdoctoral Associate
 Massachusetts Institute of Technology

2012–2016 Research Fellow in Neurobiology, Margaret Livingstone laboratory
 HMS, Department of Neurobiology

2010–2012 Pathology Resident
 Massachusetts General Hospital.

PUBLICATIONS

Refereed Journals / Conference Proceedings Articles

Wang B and Ponce CR, Neuronal tuning aligns dynamically with object- and texture manifolds across the visual hierarchy, *Nature Neuroscience*, 2026.

Ramos-Traslosheros G and Ponce CR, Feature segregation by signed weights in artificial vision systems and biological models, *International Conference on Learning Representations*, 2026

Zhang Z, Hartmann TS, Born RT, Livingstone MS and Ponce CR. Brain feature maps reveal progressive animal-feature representations in the ventral stream. *Science Advances* 11, eadq7342, 2025.

Rose O and Ponce CR. A concentration of visual cortex-like neurons in prefrontal cortex. *Nature Communications*, 2024.

Mueller KN, Carter MC, Kansupada JA and Ponce CR. Macaques recognize features in synthetic images derived from ventral stream neurons. *Proceedings of the National Academy of Sciences* 120(10):e2213034120, 2023.

Wang B and Ponce CR, Tuning landscapes of the ventral stream, *Cell Reports*, 2022 (DOI.org/10.1016/j.celrep.2022.111595)

Wang B and Ponce CR, Factorized convolution models for interpreting neuron-guided images synthesis, *Conference on Cognitive and Computational Neuroscience*, 2022 (DOI:10.32470/CCN.2022.1034-0)

Wang B and Ponce CR, High-performance Evolutionary Algorithms for Online Neuron Control, *Genetic and Evolutionary Computation Conference*, 2022 (DOI: 10.32470/CCN.2022.1034-0).

Bardon, Xiao, Ponce, Livingstone and Kreiman, Face neurons encode nonsemantic features, *PNAS*, 119 (16) e2118705119, 2022.

Zhang M, Armendariz M, Xiao W, Rose O, Bendtz K, Livingstone M, Ponce C and Kreiman G. Look twice: A generalist computational model predicts return fixations across tasks and species. *PLoS Computational Biology* 18(11):e1010654, 2022.

Rose O, Johnson JK, Wang B and Ponce CR, Visual prototypes in the ventral stream are attuned to complexity and gaze behavior. *Nature Communications*, Vol. 12, Issue 1, pages 1-16, 2021.

Wang B and Ponce CR, A Geometric Analysis of Deep Generative Image Models and Its Applications. In *Proc. International Conference on Learning Representations*, 2021.

Arcaro MJ, Ponce CR, Livingstone M. The neurons that mistook a hat for a face. *Elife*. 2020; 9:e53798. Published 2020 Jun 10.

Ponce CR, Xiao W, Schade PF, Hartmann TS, Kreiman G, and Livingstone MS (2019) Evolving images for visual neurons using a deep generative network reveals coding principles and neuronal preferences, *Cell*. 2019 May 2;177(4):999-1009

Ponce CR, Lomber SG, Livingstone MS. (2017) Posterior inferotemporal cortex cells use multiple visual pathways for shape encoding. *J. Neurosci*. May 10;37(19):5019-5034.

Arcaro MJ, Schade PF, Vincent JL, Ponce CR and Livingstone, MS. (2017) Seeing faces is necessary for face-domain formation. *Nat Neurosci*, Sept 04; doi: 10.1038/nn.4635.

Ponce CR, Hartmann T, Livingstone MS. (2017) Curvature and end-stopping as organizing principles for ventral stream organization. *J. Neurosci*. December; 2507-16.

Ponce CR, Genecin MP, Perez-Melara G and Livingstone, MS. (2016) Automated chair-training of rhesus macaques. *J Neurosci Methods*, Apr 1; 263:75-80.

Ponce CR, Hunter JN, Pack CC, Lomber SG, Born RT. (2011) Contributions of indirect pathways to visual response properties in macaque middle temporal area MT. *J. Neurosci.* Mar 9; 31(10):3894-903.

Ponce CR, Lomber SG, Born RT. (2008) Integrating motion and depth via parallel pathways. *Nat Neurosci.* Feb; 11(2):216-23.

Born RT, Pack CC, Ponce CR, Yi S. (2006) Temporal evolution of 2-dimensional direction signals used to guide eye movements. *J Neurophysiol.* Jan; 95(1):284-300.

Review articles

Ponce CR, Born RT. (2008) Stereopsis. *Curr Biol.* Sep 23; 18(18): R845-50.

GRANTS AND FELLOWSHIPS (RECENT)

2025-2030 Collaborative Research: CRCNS Research Proposal: Computational and neurophysiological mechanisms underlying natural viewing behavior, NIH NEI R01
2025-2030 The Mechanistic Role of Visual Areas at the Interaction of Social Behavior and Drug Effects in Nonhuman Primates, NIH NIDA R01
2024 Advancing interpretability in primate brains and in artificial networks, NIH Comm. Fnd.
2022-2027 Director's New Innovator Award, National Institutes of Health
2022-2027 CAREER Award, National Science Foundation
2020-2025 Packard Fellowship for Science and Engineering, David and Lucile Packard Foundation
2021-2022 E. Matilda Ziegler Foundation for the Blind Foundation Grant
2019-2020 Center for Brains, Minds and Machines Seed Grant, MIT
2018-2021 Faculty Diversity Scholar, Washington University School of Medicine
2017-2018 Fellow, Center for Brains, Minds and Machines, NSF STC award CCF-1231216

INVITED TALKS / CHAIRS

2026 Albert Einstein College, NY
2025 Kempner Institute for the Study of Natural and Artificial Intelligence, Allston, MA
2025 Morehouse and Harvard Partnership in Neuroscience Growth, HMS
2025 Indian Institute of Science, Bengaluru, India
2025 Brains, Minds, and Machines summer course, Marine Biological Laboratories, Falmouth MA
2025 Seagate Inc., Minneapolis, MN
2025 Cold Spring Harbor Laboratory, Laurel Hollow NY
2025 Allen Institute, Seattle, WA
2024 Georgia Institute of Technology, Emory University
2024 Universidad de Santiago de Chile, Santiago, Chile
2024 NINDS Open Stage Webinar, Invited Presentation, Bethesda MD
2024 New England Neuro Lecture Series, Massachusetts Institute of Technology

2024 Brains, Minds, and Machines summer course, Marine Biological Laboratories, Falmouth MA
2024 Morehouse and Harvard Partnership In Neuroscience Growth, HMS
2024 Women in Neuroscience, University of Texas/Dell Medical School/Ann Richards High School, TX
2024 Research in Encoding and Decoding of Neural Ensembles (AREADNE), Milos, Greece
2024 AI Media Bootcamp, Harvard Medical School
2024 NeuroAI Symposium, Washington University, St. Louis, MO
2024 Center for Brain Science, Harvard University, Cambridge. MA
2024 Summit on Neuroscience and Artificial Intelligence, Pucón, Chile
2024 Stanford University, Palo Alto, California
2024 University of Pennsylvania, Philadelphia, Pennsylvania
2024 Jefferson University, Philadelphia, Pennsylvania
2023 Hanse-Wissenschaftskolleg Institute for Advanced Studies, Delmenhorst, Germany
2023 University of Illinois Urbana-Champaign, Champaign-Urbana, IL
2023 NIH High-Risk, High-Reward Seminar Series, Baltimore, MD
2023 Women in Neuroscience, University of Texas/Dell Medical School/Ann Richards High School, TX
2023 Brains, Minds, and Machines summer course, Marine Biological Laboratories, Falmouth MA
2023 NC A&T Scientific Research Preparatory Program (SRPP) Seminar Series
2023 University of California Davis, Center for Neuroscience, Davis CA
2023 Department of Neurobiology Retreat, Harvard Medical School, Boston MA
2023 Center for Brain Science, Harvard University, Cambridge MA
2023 Department of Psychological and Brain Sciences, Johns Hopkins University, MD
2022 Center for Visual Science, University of Rochester, NY
2022 Real-Time Functional Imaging and Neurofeedback conference, New Haven, CT
2022 Summer Workshop on the Dynamic Brain, Allen Institute and University of Washington
2022 Brains, Minds, and Machines summer course, Marine Biological Laboratories, Falmouth MA
2022 Young Scientists' meeting, Harvard and Ludwig-Maximilians-Universität (LMU), Cambridge MA
2022 Chinese American Kavli Frontiers of Science Symposium, Irvine, California
2022 Armenise-Harvard Foundation Symposium, Varignana, Italy
2022 Neuroscience seminar series, University of Texas-Houston, Texas
2022 Cognitive Neuroimaging Unit, Frederic Joliot Institute for Life Sciences, France
2022 Machine Learning in Medicine Webinar Series, Cornell University and Weill Cornell Medicine
2022 International School of Advanced Studies, Trieste, Italy
2022 Cosyne workshop, Confronting deep learning models of the brain with neuroscience data.
2022 Center for Neural Science, New York University
2022 Department of Ophthalmology and Visual Sciences, Washington University School of Medicine
2021 Department of Cognitive Science Colloquium, Johns Hopkins University
2021 Cosyne workshop, Expanding horizons: Diverse perspectives in computational neuroscience.
2021 Seminar, Blavatnik Institute at Harvard Medical School
2020 Neural Information Processing Systems annual meeting (workshop)
2020 Department of Neurology Grand Rounds, University of Washington
2020 IEEE 3rd International Conference on Multimedia Information Processing and Retrieval
(Keynote speaker), Online
2020 BP Endure Summer Virtual Seminar Series

- 2019 Foreign Language Honor Society Keynote speaker, Ladue Horton Watkins High School
- 2019 Mini-symposium (Co-Chair), SfN Meeting, Chicago
- 2018 Mini-symposium (Co-Chair), SfN Meeting, San Diego
- 2018 National Honor Society in Neuroscience, St. Louis University

CAMPUS TALKS

- 2025 Kempner Institute KRANIUM, Allston, MA
- 2025 Morehouse and Harvard Partnership in Neuroscience Growth, Boston, MA
- 2024 Harvard Therapeutics Graduate Program, Boston, MA
- 2024 Morehouse and Harvard Partnership in Neuroscience Growth, Boston, MA
- 2023 F.M. Kirby Neurobiology Center, Boston Children's Hospital, Boston, MA
- 2019 Cognitive, Computational and Systems Neuroscience Pathway retreat
- 2015 Harvard Department of Neurobiology, laboratory research presentation
- 2014 Harvard School of Public Health, Dept. of Biostatistics, Neurostatistics Working Group

TEACHING

- 2022- Discipline of Neuroscience, Neurobiology 215, Program in Neuroscience, HMS
- 2020 Nano-course for BIO 5651: Neural Systems
- 2019 Guest lecture for BIO 171: Neuroscience Futures 1: How do we learn about the brain?
Guest lecture for BIOL 3411: Principles of the Nervous System

SERVICE

- 2024- Member, Kempner Institute Graduate Admissions Committee
- 2023-2025 Member, Harvard/MIT M.D.-Ph.D. Admissions Committee
- 2023- Member, Committee on Artwork and Cultural Representation, HMS
- 2022- Member, Harvard Medical School Institutional Animal Care and Use Committee
- 2021- Member, Program in Neuroscience Admissions Committee, HMS
- 2021 Program committee member, Conference on Cognitive Computational Neuroscience
- 2020- Journal article reviewer, Cell Reports, Current Biology, Journal of Neuroscience, Nature, Nature Communications, Nature Machine Intelligence, PLoS Computational Biology, Proceedings of the National Academy of Sciences, Science Advances, eLife
- 2020-2021 Co-director, Neuroscience Research Fabrication Center, Washington Univ.
- 2020-2021 Co-organizer, Faculty Seminar Series, Washington Univ.
- 2015-2018 Harvard Medical Institutional Animal Care and Use Committee, alternate member.
- 2015 Massachusetts State Science and Engineering Fair, Cambridge MA, Judge
- 2003-2014 Harvard Mind/Brain/Behavior Initiative, various steering committees
- 2012-2014 Journal reviewing
- 2014-now Mentor for Project Success, an outreach program for summer research.

LANGUAGES

Native Spanish speaker (born and raised in Mexico)

PROFESSIONAL AFFILIATIONS

2003– Society for Neuroscience
2025 FENS