

CHRISTA A. BAKER (she/her)

Assistant Professor, Dept. of Biological Sciences

Genetics | Comparative Biomedical Sciences | Comparative Medicine Institute | Biotechnology | Bioinformatics |

Center for Human Health and the Environment

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EDUCATION

- 2015 **Washington University in St. Louis**, St. Louis, MO
PhD, Neuroscience
- 2006 **University of Pennsylvania**, Philadelphia, PA
Bachelor of Science in Engineering, Bioengineering, cum laude

RESEARCH EXPERIENCE

- 2015-2022 **Princeton University, Princeton Neuroscience Institute**, Princeton, NJ
Jane Coffin Childs Postdoctoral Research Fellow, Lab of Dr. Mala Murthy
- 2009-2015 **Washington University in St. Louis, Department of Biology**, St. Louis, MO
Graduate Student, Lab of Dr. Bruce Carlson
- 2006-2009 **Johns Hopkins University, Department of Otolaryngology**, Baltimore, MD
Research Technologist, Lab of Dr. David Ryugo
- 2005 **Ohio State University, Department of Mechanical Engineering**, Columbus, OH
NSF Research Experience for Undergraduates Fellow, Lab of Dr. A.T. Conlisk

HONORS AND AWARDS

- 2024 C.J. Herrick Award in Neuroanatomy, American Association for Anatomy
- 2016-2019 Jane Coffin Childs Memorial Fund Postdoctoral Fellowship
- 2016-2018 NSF Postdoctoral Research Fellowship in Biology, declined
- 2015 Finalist, James L. O'Leary Prizes for Excellence in Neuroscience Research
- 2013-2015 Ruth L. Kirchstein National Research Service Award, National Institutes of Health
- 2013-2015 Early Career Representative to the International Society for Neuroethology Council
- 2013 Society for Neuroscience Travel Award Nominee for St. Louis Chapter
- 2012-2014 Student Representative to the Neuroscience Steering Committee, Washington University in St. Louis
- 2011 Honorable Mention, National Science Foundation Graduate Research Fellowship
- 2010-2012 Cognitive, Computational, and Systems Neuroscience Training Grant
- 2005-2006 Dean's List, University of Pennsylvania
- 2005 Innovation Fund Grant, Weiss Tech House, University of Pennsylvania

FUNDING

- 2026-2031 NSF-CMB-2611286, PI: Baker (\$1,500,000 in total costs)
- 2025 NC State University College of Sciences Research Initiative Award (\$9,000 in total costs)
- 2025 Interdisciplinary Undergraduate Research and Mentoring Award (\$2,000 in total costs)
- 2024-2027 NSF Postdoctoral Research Fellowship in Biology (PRFB) to Dr. Alexandra Venuto (\$240,000 in total costs)
- 2024-2026 GAANN Molecular Biotechnology PhD Fellowship to Ms. Emma Droste (\$52,636 in total costs)
- 2016-2019 Jane Coffin Childs Memorial Fund Fellowship (\$160,500 in total costs)
- 2016-2018 NSF Postdoctoral Research Fellowship in Biology (\$138,000 in total costs), declined
- 2013-2015 Ruth L. Kirchstein Predoctoral National Research Service Award, National Institutes of Health (\$60,078 in total costs)
- 2010-2012 Cognitive, Computational, and Systems Neuroscience Training Grant
- 2005 Innovation Fund Grant, Weiss Tech House, University of Pennsylvania (\$1,000 in total costs)

TEACHING EXPERIENCE

- 2025-present North Carolina State University, Raleigh, NC
Co-Instructor, *Special Topics in Biology and Physics: Physics and the Brain*
- 2024-present Cold Spring Harbor Labs, Cold Spring Harbor, NY
Lecturer, *Drosophila* Neurobiology: Genes, Circuits, and Behavior course
- 2023-present North Carolina State University, Raleigh, NC
Instructor, *Special Topics in Biology: Acoustic Communication*

Summer 2017, 2018 Princeton Undergraduate Preparatory Program, Princeton, NJ
Guest lecturer, *Fundamental Neuroscience and Optogenetics Lab*

Fall 2016, 2018 Princeton University, Princeton Neuroscience Institute, Princeton, NJ
Guest lecturer, *Cellular Neuroscience*

Fall 2012, 2014 Washington University in St. Louis, Department of Physical Therapy, St. Louis, MO
Guest lecturer, *Movement Science III – Biocontrol Mechanisms*

Spring 2014 Washington University in St. Louis, Department of Biology, St. Louis, MO
Guest lecturer, *Introduction to Neuroethology*

Fall 2012 Washington University in St. Louis, Department of Biology, St. Louis, MO
Head Teaching Assistant, *Neurophysiology Lab*

Fall 2010 Washington University in St. Louis, Department of Biology, St. Louis, MO
Teaching Assistant, *Neurophysiology Lab*

PUBLICATIONS

Pang R, **Baker CA**, Murthy M, Pillow J (2025). Inferring neural population codes for *Drosophila* acoustic communication. *PNAS* 122: e2417733122.

Baker CA, Guan X-J, Choi M[#], Murthy M. (2024) The role of *fruitless* in specifying courtship behaviors across divergent *Drosophila* species. *Science Advances* 10: eadk1273. [#], undergraduate co-author.

Venuto A, **Baker CA**. (2024) Developmental neuroscience: Building sex-specific adult circuitry from common larval origins. *Current Biology* 34:R288-R291. *Dispatch*.

Dorkenwald S, Matsliah A, Sterling AR, Schlegel P, Yu S, McKellar CE, Lin A, Costa M, Eichler K, Yin Y, Silversmith S, Schneider-Mizelle C, Jordan CS, Brittain D, Halageri A, Keuhner K, Ogedengbe O, Morey R, Gager J, Kruk K, Perlman E, Yang R, Deutsch D, Bland D, Sorek M, Lu R, Macrina T, Lee K, Bae JA, Mu S, Nehoran B, Mitchell E, Popovych S, Wu J, Jia Z, Castro M, Kemnitz N, Ih D, Bates AS, Eckstein N, Funke J, Collman F, Bock DD, Jefferis GSXE, Seung S, Murthy M, **The FlyWire Consortium**. (2024) Neuronal wiring diagram of an adult brain. *Nature* 634: 124-138.

Schlegel P, Yin Y, Bates AS, Dorkenwald S, Eichler K, Brooks P, Han DS, Gkantia M, dos Santos M, Munnely EJ, Badalamente G, Serratos Capdevila L, Sane VA, Fragniere AMC, Kiassat. L, Pleijzier MW, Stürner T, Tamimi IFM, Dunne CR, Salgarella I, Javier A, Fang S, Perlman E, Kazimiers T, Jagannathan SR, Matsliah A, Sterling AR, Yu S, McKellar CE, **The FlyWire Consortium**, Costa M, Seung HS, Murthy M, Hartenstein V, Bock DD, Jefferis GSXE. (2024) Whole-brain annotation and multi-connectome cell typing of *Drosophila*. *Nature* 634: 139-152.

Baker CA, McKellar C, Pang R, Nern A, Dorkenwald S, Pacheco DA, Eckstein N, Funke J, Dickson BJ, Murthy M. (2022) Neural network organization for courtship-song feature detection in *Drosophila*. *Current Biology* 32:3317-3333.

Dorkenwald S*, McKellar C*, Macrina T*, Kemnitz N*, Lee K*, Lu R*, Wu J*, Popovych S, Mitchell E, Nehoran B, Jia Z, Bae JA, Mu S, Ih D, Castro M, Ogedengbe O, Halageri A, Kuehner K, Sterling AR, Ashwood Z, Zung J, Brittain D, Collman F, Schneider-Mizell C, Jordan C, Silversmith W, **Baker CA**, Deutsch D, Encarnacion-Rivera L, Kumar S, Burke A, Bland D, Gager J, Hebditch J, Koolman S, Moore M, Morejohn S, Silverman B, Willie K, Willie R, Yu S, Murthy M, Seung HS. (2021) FlyWire: online community for whole-brain connectomics. *Nature Methods* 19:119-128. *, equal authors.

Baker CA, Clemens J, Murthy M. (2019) Acoustic pattern recognition and courtship songs: insights from insects. *Annual Review of Neuroscience* 42:1.

Baker CA, Carlson BA. (2019) Electric Signals. In: Choe JC (Ed), *Encyclopedia of Animal Behavior* (2nd ed), vol 1, pp. 474-485. Elsevier, Academic Press.

Baker CA, Ma L[#], Casareale CR[#], Carlson BA. (2016) Behavioral and single-neuron sensitivity to millisecond variations in temporally patterned electric communication signals. *Journal of Neuroscience* 36:8985-9000. [#], undergraduate co-author.

Baker CA, Huck KR[#], Carlson BA. (2015) Peripheral sensory coding through oscillatory synchrony in weakly electric fish. *eLife* 4:e08163 [featured in PhysOrg, Electronics Weekly, Newswise, Futurity, redOrbit]. [#], undergraduate co-author.

Baker CA, Carlson BA. (2014) Short-term depression, temporal summation, and onset inhibition shape interval tuning in midbrain neurons. *Journal of Neuroscience* 34:14272-14287.

Baker CA, Kohashi T, Lyons-Warren AM, Ma X, Carlson BA. (2013) Multiplexed temporal coding of electric communication signals in mormyrid fishes. *Journal of Experimental Biology* 216:2365-2379.

Baker CA, Montey KL, Pongstaporn T, Ryugo DK. (2010) Postnatal development of the endbulb of Held in congenitally deaf cats. *Frontiers in Neuroanatomy* 4:19.

O'Neil JN, Limb CJ, **Baker CA**, Ryugo DK. (2010) Bilateral effects of unilateral cochlear implantation in congenitally deaf cats. *Journal of Comparative Neurology* 518:2382-2404.

Ryugo DK, **Baker CA**, Montey KL, Chang LY, Coco A, Fallon JB, Shepherd RK. (2010) Synaptic plasticity after chemical deafening and electrical stimulation of the auditory nerve. *Journal of Comparative Neurology* 518:1046-1063.

MANUSCRIPTS SUBMITTED AND IN PREPARATION

Wagoner K, **Baker CA**, Diaz B. Physics experiments as real-time models for the brain. *In revision*.

Diaz B, **Baker CA**, Wagoner K. Investigating a transdisciplinary science-integration Physics and the Brain course for undergraduate STEM students: A case study using community of practice. *In revision*.

Pathak A, Okanlawon M, Iyer A, Mason K[#], Droste E, Darp A, **Baker CA**. Connectomic and transcriptomic heterogeneity in the auditory periphery of *Drosophila*. *In preparation*. [#], undergraduate co-author.

Venuto A, Hill B[#], Pathak A, Darp A, Grodeon JT, Abril-De Nicola S[#], Henson A[#], **Baker CA**. Neural basis of divergent acoustic communication strategies in male *Drosophila*. *In preparation*. [#], undergraduate co-author.

SELECTED PRESENTATIONS AND POSTERS

talks:

Baker CA. (2025) Mechanisms underlying acoustic communication behaviors in *Drosophila* species. *Workshop on Neural Circuits & Behavior of Drosophila*, Crete, Greece. (talk)

Baker CA, Guan X-J, Choi M, Murthy M. (2024) The role of *fruitless* in specifying courtship behaviors across divergent *Drosophila* species. *Triangle Fly Symposium*. (talk)

Baker CA, Guan X-J, Choi M, Murthy M. (2023) The evolving role of *fruitless* in courtship behaviors of divergent species of *Drosophila*. *Janelia Neuro-Evo Conference*. (talk)

Baker CA, Guan X-J, Choi M, Murthy M. (2021) Divergence in the role of *fruitless* in specifying male courtship behaviors in *Drosophila virilis*. *Cold Spring Harbor Neurobiology of Drosophila conference*. (talk)

Baker CA, Guan X-J, Choi M, Murthy M. (2019) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *European Drosophila Research Conference*. (talk)

Baker CA, Guan X-J, Fletcher M, Murthy M. (2017) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *J.B. Johnston Club for Evolutionary Neuroscience*. (talk)

Baker CA, Huck K, Carlson BA. (2016) Evolutionary divergence in peripheral sensory coding strategies in mormyrid weakly electric fishes. *Janelia Junior Scientist Workshop on Evolution of Behavior*. (talk)

Baker CA, Huck K, Carlson BA. (2014) Evolutionary divergence in peripheral sensory coding strategies in mormyrid weakly electric fishes. *J.B. Johnston Club for Evolutionary Neuroscience*. (talk)

Baker CA, Huck K, Carlson BA. (2013) Evolutionary divergence in peripheral sensory coding strategies in mormyrid weakly electric fishes. *J.B. Johnston Club for Evolutionary Neuroscience*. (talk)

posters:

Baker CA, McKellar CM, Nern A, Dickson BJ, Murthy M. (2020) Uncovering the neural mechanisms that generate selectivity for song features in *Drosophila*. *Cold Spring Harbor Neuronal Circuits conference*. (virtual poster)

Baker CA, McKellar CM, Nern A, Dickson BJ, Murthy M. (2019) Uncovering the neural mechanisms that generate selectivity for song features in *Drosophila*. *Neurobiology of Drosophila*. (poster)

Baker CA, McKellar CM, Nern A, Dickson BJ, Murthy M. (2019) Uncovering the neural mechanisms that generate selectivity for song features in *Drosophila*. *European Drosophila Research Conference*. (poster)

Baker CA, Guan X-J, Choi, M, Murthy M. (2019) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *New Genetic Tools for Non-Model Organisms*. (poster)

Baker CA, Guan X-J, Fletcher M, Murthy M. (2017) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *Neurobiology of Drosophila*. (poster)

Baker CA, Guan X-G, Murthy M. (2016) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *Genome Engineering: The CRISPR/Cas 9 Revolution*. (poster)

Baker CA, Guan X-J, Murthy M. (2016) Specification of male versus female acoustic communication behaviors in *Drosophila virilis*. *Society for Neuroscience*. (poster)

Baker CA, Huck K, Carlson BA. (2016) Evolutionary divergence in peripheral sensory coding strategies in mormyrid weakly electric fishes. *Janelia Junior Scientist Workshop on Evolution of Behavior*. (poster)

Baker CA, Huck K, Carlson BA. (2014) Phase and amplitude modulations of oscillatory sensory receptors mediate detection of high-frequency group communication signals in an electric fish. *International Congress of Neuroethology*.

Baker CA, Ma X, Carlson BA. (2014) Spike-timing-dependent plasticity shapes interval selectivity of electrosensory midbrain neurons. *Society for Neuroscience*. (poster)

Baker CA, Ma L, Casareale CR, Carlson BA. (2013) Behavioral and single-neuron sensitivity to millisecond timing variations in communication signals of weakly electric fish. *Society for Neuroscience*. (poster)

Baker CA, Ma X, Carlson BA. (2012) Differences in short-term synaptic depression of excitatory and inhibitory pathways contribute to temporal pattern recognition. *International Congress of Neuroethology*. (poster)

Nardos B, Crawford DC, **Baker CA**, Israel EJ, Roman CM, Encarnacion CH, Herzog ED, Thoroughman KA. (2010) The Amazing Brain Carnival: a graduate student-designed brain awareness experience for the public. *Society for Neuroscience*. (poster)

Baker CA, Montey KL, Pongstaporn T, Ryugo DK. (2009) Development of the endbulb of Held in congenitally deaf cats. *Association for Research in Otolaryngology*. (poster)

INVITED TALKS

- 2026 Mechanisms of Acoustic Communication, Gordon Research Conference, Newry, Maine
- 2026 San Juan Winter School on Connectomics and Brain Simulation, San Juan, Puerto Rico
- 2025 Analysis and Modeling of Connectomes meeting, Janelia Research Campus
- 2025 University of Tennessee Knoxville, NeuroNET seminar series
- 2024 American Association for Anatomy annual meeting
- 2023 Duke University, Biology/Neurobiology
- 2023 North Carolina State University, Complex Matter & Biophysics seminar series
- 2023 North Carolina State University, Genetics & Genomics Academy retreat
- 2022 Connectomics Conference, Berlin, Germany
- 2022 Johns Hopkins University Applied Physics Laboratory

2022 Arizona State University, Neuroscience
 2022 North Carolina State University, Biological Sciences
 2022 University of Southern California, Biological Sciences
 2022 University of Nevada – Las Vegas, Psychology
 2022 Washington University of Medicine in St. Louis, Neuroscience
 2022 Boston University, Biology
 2021 West Virginia University, Biomedical Engineering
 2021 University of Queensland, Queensland Brain Institute
 2021 University of Texas – Southwestern Medical Center, Neuroscience
 2021 University of Maryland, Biology
 2021 NIH Brain Connectivity Workshop
 2020 Emerging Models Symposium, Florida Atlantic University Program in Neurogenetics, *cancelled (COVID-19)*
 2019 European *Drosophila* Research Conference, Engineering non-*melanogaster* drosophilids and other insects workshop
 2019 Jane Coffin Childs Fellows Symposium
 2018 Columbia University, NeuroLunch series
 2018 Princeton University, Molecular Biology
 2014 Princeton University, Princeton Neuroscience Institute
 2014 Michigan State University
 2014 University of Pittsburgh

MENTORING

Postdoctoral Scholars

2023-present Alexandra Venuto, PhD

Graduate Students

2025-present Venkatesa Jayaraman (Electrical and Computer Engineering Master's)
 2025-present Jacob Grodeon (Bioinformatics PhD)
 2024-2025 Aniket Darp (Computer Science Master's)
 2024 Sarah Jeffers (Biology PhD rotation)
 2023-2025 Ayush Pathak (Computer Science Master's)
 2022-present Emma Droste (Genetics PhD)

Undergraduate Students: Baker Lab

2026-present Aramenta Owens (Statistics)
 2026-present Gabriel Yen (Biochemistry)
 2026-present Mady Ahmad (Biological Sciences – Integrative Physiology & Neurobiology; Psychology)
 2026-present Habiba Elsalakawi (Biological Sciences – Integrative Physiology & Neurobiology)
 2026-present Shiven Bhaskarabatta (Biomedical Engineering)
 2026-present Allison Emborsky (Biological Sciences + Biochemistry)
 2026 Mario Tornero-Vila (Biological Sciences), joint with Dr. Kasey Wagoner, Physics & Astronomy
 2025-2026 Katie Mason (Honors Thesis: Statistics)
 2025-2026 Jordan Clayton (Biological Sciences), Biological Sciences Outstanding Transfer Student award
 2025 Kendall Lipsteuer (Biological Sciences; CMI/UHP Summer Research Fellow)
 2025 Avery Henson (Biological Engineering)
 2025 Robin Waddell (Biological Sciences)
 2024-2025 Sofia Abril-De Nicola (Biological Sciences)
 2024-2025 Breyton Hill (Honors Thesis: Genetics), Biological Sciences Outstanding Senior Research award
 2023-2026 Emma Payne (Honors Thesis: Zoology)
 2023-2024 Juman Odeh (Biological Sciences)
 2023 Morgan Cumberland (Biological Sciences)

Undergraduate and Graduate Students: Murthy Lab

2022-2023 Sophie Lockwood, awarded Brinster '43 Prize for best undergraduate neuroscience thesis
 2018-2019 Sage Palmedo, awarded Brinster '43 Prize for best undergraduate neuroscience thesis
 2017 Micah Fletcher (PhD rotation)
 2016 Camden Macdowell (PhD rotation)

Undergraduate Students: Carlson Lab

2013 Chelsea Casareale*

2013 Kevin Huck*

2012 Lisa Ma*

*publication co-authors

SERVICE WORK

2024-present Neurogenetics Research Interest Group co-advisor, Genetics and Genomics Academy, NC State
2023-present Reviewer, *Current Biology*, *Nature*, *Nature Communications*, *Current Opinion in Neurobiology*, *Journal of Neuroscience*
2023-present Participant, Genetics & Genomics Scholars Recruitment
2026 Tenure-track Exploratory Committee, Biological Sciences, NC State
2026 Organizing Committee, Dr. Natalia Duque-Wilckens Academic Memorial Symposium, NC State
2026 Poster judge, Triangle Society for Neuroscience Annual Meeting
2026 Poster judge, Integrative Symposium of NC State Training Grants
2025 Reviewer, Center for Human Health & the Environment Pilot Project Program
2024 Grant Review Panelist, NSF
2024 Panelist, Postdoctoral Readiness to Enter the Professorship Program (PREPP)
2014-2022 Co-reviewer, *Cell Reports*, *Current Biology*, *Journal of Neuroscience Methods*, *Journal of Neuroscience*, *Neuron*
2021 Reviewer, *Proceedings of the Royal Society B: Biological Sciences*
2017-2018 Silent Auction Chair, JB Johnston Club for Evolutionary Neuroscience
2017 Judge, Connecticut STEM Foundation High School Science Fair, Darien, CT
2014-2016 International Society for Neuroethology Fellows Selection Committee
2016 Reviewer, *Journal of Experimental Biology*
2013-2015 Early Career Representative to the International Society for Neuroethology Council
2012-2014 Student Representative to the Neuroscience Steering Committee, Washington University in St. Louis

OUTREACH

2025-present Volunteer Neuroscience Educator, BugFest, NC Museum of Natural Sciences, Raleigh, NC
2023-present Volunteer Neuroscience Educator, Brain Night, NC Museum of Natural Sciences, Raleigh, NC
2024 Research Mentor, Environmental Health Research Experiences for Teachers in High-Poverty Schools
2017-2019 Volunteer Neuroscience Educator, Young Women's Conference, Princeton, NJ
2018 Volunteer STEM Educator, Trenton YMCA Summer Camp, Trenton, NJ
2017 Volunteer Neuroscience Educator, STEMCivics High School, Trenton, NJ
2009-2015 Volunteer Neuroscience Educator, Saint Louis Science Center, St. Louis, MO
2009-2011 Volunteer, Young Scientist Program, Neuroscience Teaching Team, St. Louis, MO
2007-2009 Volunteer Math Tutor, Greater Homewood Adult Literacy, Baltimore, MD
2005-2006 Volunteer Math Tutor, Academy of Automotive and Mechanical Engineering, Philadelphia, PA

PROFESSIONAL MEMBERSHIP

2021-present FlyWire Consortium
2013-present Society for Neuroscience
2013-present J. B. Johnston Club for Evolutionary Neuroscience
2012-present International Society for Neuroethology
2023-2025 American Association for Anatomy
2008-2010 Association for Research in Otolaryngology