



## Lauren O'Connell

Assistant Professor of Biology

 Curriculum Vitae available Online

### Bio

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#### BIO

Lauren O'Connell is an Assistant Professor in the Department of Biology at Stanford University. She studies amphibians to learn how animals adapt their behavior and physiology to changing environments. She received her Ph.D. from the University of Texas at Austin and then started her own lab at Harvard University as a Bauer Fellow before joining the Stanford faculty in 2017. Projects in the lab include investigating parent-offspring interactions and the physiology of chemical defenses in poison frogs.

#### ACADEMIC APPOINTMENTS

- Assistant Professor, Biology
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

#### HONORS AND AWARDS

- Frank A. Beach Award, Society for Behavioral Neuroendocrinology (2018)
- For Women in Science Fellowship, L'Oreal USA (2015)
- Capranica Prize, International Society for Neuroethology (2013)
- Young Investigator Award, International Society for Neuroethology (2012)
- Early Career Award, Society for Social Neuroscience (2011)

#### BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, International Society for Neuroethology (2008 - present)
- Member, Society for the Study of Evolution (2015 - present)

#### PROFESSIONAL EDUCATION

- Ph.D., University of Texas at Austin , Cellular and Molecular Biology (2011)
- B.S., Cornell University , Biological Sciences (2006)
- A.A., Tarrant County Community College , Natural Sciences (2004)

#### COMMUNITY AND INTERNATIONAL WORK

- Spatial cognition in reptiles and toads, Australia
- Maternal behavior in poison frogs, Madagascar

- How poison frogs get their toxins, Ecuador

## LINKS

- Lab Website: <https://oconnell.stanford.edu/>

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

The O'Connell lab studies how genetic and environmental factors contribute to biological diversity and adaptation. We are particularly interested in understanding (1) how behavior evolves through changes in brain function and (2) how animal physiology evolves through repurposing existing cellular components.

#### Behavior

(1) How do neonates communicate nutritional need to parents? How do parents interpret the cries of their infants? Communication between parents and offspring is required for survival in altricial animals, like mammals (including humans), birds, and some amphibians. Yet we understand very little about the co-evolution of parent-offspring communication from a mechanistic perspective. We are studying the neural basis of parent-offspring communication in poison frogs species where tadpoles beg mothers for meals.

(2) How do poison frogs navigate their environment? Poison frogs transport their tadpoles from the leaf litter to pools of water. In some species, mothers place tadpoles individually in small plants and then return to feed each tadpole every few days for several months. These behaviors are energetically expensive and cognitively demanding, as not only do frog parents need to remember where these pools are located, but some moms frequently return to feed their tadpoles. We are investigating the neural basis of species differences in spatial cognition as a function of sex differences in parental behavior.

(3) Does the convergent evolution of pair bonding across vertebrates rely on similar neural mechanisms? Social bonds, such as pair bonds, are critical for mental health. In order to identify generalizable and thus translatable principals, we are studying the underlying mechanisms of pair bonding across phylogenically diverse taxa, including butterflyfish, poison frogs, skinks, quail, and voles. This project re-traces the deep, ~450 million years of evolutionary history of vertebrate pair bonding and aims to identify fundamental neural principles that might inform the human condition.

#### Physiology

(1) How does variation in diet and habitat influence poison frog toxicity? Some poison frog species carry toxic chemicals to avoid predation. Poison frogs do not make their own toxins, but rather sequester toxins from the ants and mites in their diet. Thus, the frogs' ability to defend themselves is tightly linked to their environment. We are studying the trophic ecology of poison frog toxicity by linking together information about habitat, diet, and toxins across many populations and species.

(2) How do frogs sequester toxic small molecules from their diet to serve as chemical defenses? Poison frogs have developed special physiological mechanisms that allow them to uptake and store lipophilic alkaloids from their diet. To accomplish this, they need proteins for alkaloid transport throughout the body and modifications to ion channels that allow toxin resistance. We are studying the evolution of toxin sequestration from an organismal physiology perspective to characterize the toxin uptake system in poison frogs.

### PROJECTS

- Spatial cognition in rainforest frogs - Stanford University, Centro Jambatu
- Evolution of chemical defenses in poison frogs - Stanford University
- Evolution of pair bonding in vertebrates - Stanford University

## Teaching

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### COURSES

2019-20

- Evolution: BIO 85 (Win)
- How Does Your Brain Work?: THINK 15 (Aut)
- Organismal Biology Lab: BIO 161 (Aut)

#### 2018-19

- How Does Your Brain Work?: THINK 15 (Aut)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Callie Chappell

#### Postdoctoral Faculty Sponsor

Julie Butler, Marie Therese Fischer, Jessica Nowicki, Andrius Pasukonis, Eugenia Sanchez Gutierrez

#### Doctoral Dissertation Advisor (AC)

Aurora Alvarez-Buylla, Stephanie Caty, Nora Moskowitz, Daniel Shaykevich

#### Doctoral (Program)

Stephanie Caty, Nora Moskowitz

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)

## Publications

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### PUBLICATIONS

- **Multi-glomerular projection of single olfactory receptor neurons is conserved among amphibians.** *The Journal of comparative neurology*  
Weiss, L., Jungblut, L. D., Pozzi, A. G., Zielinski, B. S., O'Connell, L. A., Hassenklover, T., Manzini, I.  
2020
- **Studying convergent evolution to relate genotype to behavioral phenotype.** *The Journal of experimental biology*  
Gallant, J. R., O'Connell, L. A.  
2020; 223 (Pt Suppl 1)
- **Hormonal and neural correlates of care in active versus observing poison frog parents.** *Hormones and behavior*  
Fischer, E. K., O'Connell, L. A.  
2020: 104696
- **Bringing immersive science to undergraduate laboratory courses using CRISPR gene knockouts in frogs and butterflies.** *The Journal of experimental biology*  
Martin, A., Wolcott, N. S., O'Connell, L. A.  
2020; 223 (Pt Suppl 1)
- **Mechanisms of Convergent Egg Provisioning in Poison Frogs.** *Current biology : CB*  
Fischer, E. K., Roland, A. B., Moskowitz, N. A., Vidoudez, C., Ranaivorazo, N., Tapia, E. E., Trauger, S. A., Vences, M., Coloma, L. A., O'Connell, L. A.  
2019
- **The neural basis of tadpole transport in poison frogs.** *Proceedings. Biological sciences*  
Fischer, E. K., Roland, A. B., Moskowitz, N. A., Tapia, E. E., Summers, K., Coloma, L. A., O'Connell, L. A.  
2019; 286 (1907): 20191084
- **Molecular physiology of chemical defenses in a poison frog.** *The Journal of experimental biology*  
Caty, S. N., Alvarez-Buylla, A., Byrd, G. D., Vidoudez, C., Roland, A. B., Tapia, E. E., Budnik, B., Trauger, S. A., Coloma, L. A., O'Connell, L. A.  
2019

- **Understanding the Loss of Maternal Care in Avian Brood Parasites Using Preoptic Area Transcriptome Comparisons in Brood Parasitic and Non-parasitic Blackbirds** *G3-GENES GENOMES GENETICS*  
Lynch, K. S., O'Connell, L. A., Louder, M. M., Balakrishnan, C. N., Fischer, E. K.  
2019; 9 (4): 1075–84
- **Understanding the Loss of Maternal Care in Avian Brood Parasites Using Preoptic Area Transcriptome Comparisons in Brood Parasitic and Non-parasitic Blackbirds.** *G3 (Bethesda, Md.)*  
Lynch, K. S., O'Connell, L. A., Louder, M. I., Balakrishnan, C. N., Fischer, E. K.  
2019
- **Conserved transcriptomic profiles underpin monogamy across vertebrates** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Young, R. L., Ferkin, M. H., Ockendon-Powell, N. F., Orr, V. N., Phelps, S. M., Pogany, A., Richards-Zawacki, C. L., Summers, K., Szekely, T., Trainor, B. C., Urrutia, A. O., Zachar, G., O'Connell, et al  
2019; 116 (4): 1331–36
- **Conserved transcriptomic profiles underpin monogamy across vertebrates.** *Proceedings of the National Academy of Sciences of the United States of America*  
Young, R. L., Ferkin, M. H., Ockendon-Powell, N. F., Orr, V. N., Phelps, S. M., Pogany, A., Richards-Zawacki, C. L., Summers, K., Szekely, T., Trainor, B. C., Urrutia, A. O., Zachar, G., O'Connell, et al  
2019
- **Evolution of affiliation: patterns of convergence from genomes to behaviour.** *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*  
Fischer, E. K., Nowicki, J. P., O'Connell, L. A.  
2019; 374 (1777): 20180242
- **Diversity within diversity: Parasite species richness in poison frogs assessed by transcriptomics** *MOLECULAR PHYLOGENETICS AND EVOLUTION*  
Santos, J. C., Tarvin, R. D., O'Connell, L. A., Blackburn, D. C., Coloma, L. A.  
2018; 125: 40–50
- **Protection from UV light is an evolutionarily conserved feature of the haematopoietic niche** *NATURE*  
Kapp, F. G., Perlin, J. R., Hagedorn, E. J., Gansner, J. M., Schwarz, D. E., O'Connell, L. A., Johnson, N. S., Amemiya, C., Fisher, D. E., Woelfle, U., Trompouki, E., Niemeyer, C. M., Driever, et al  
2018; 558 (7710): 445–+
- **Circuit Architecture Underlying Distinct Components of Parental Care** *TRENDS IN NEUROSCIENCES*  
Fischer, E. K., O'Connell, L. A.  
2018; 41 (6): 334–36
- **Variation in social systems within Chaetodon butterflyfishes, with special reference to pair bonding** *PLOS ONE*  
Nowicki, J. P., O'Connell, L. A., Cowman, P. F., Walker, S. W., Coker, D. J., Pratchett, M. S.  
2018; 13 (4): e0194465
- **Seasonal changes in diet and chemical defense in the Climbing Mantella frog (Mantella laevisgata).** *PloS one*  
Moskowitz, N. A., Roland, A. B., Fischer, E. K., Ranaivorazo, N., Vidoudez, C., Aguilar, M. T., Caldera, S. M., Chea, J., Cristus, M. G., Crowdis, J. P., DeMessie, B., desJardins-Park, C. R., Effenberger, et al  
2018; 13 (12): e0207940
- **Y Radiation of the polymorphic Little Devil poison frog (Oophaga sylvatica) in Ecuador** *ECOLOGY AND EVOLUTION*  
Roland, A. B., Santos, J. C., Carriker, B. C., Caty, S. N., Tapia, E. E., Coloma, L. A., O'Connell, L. A.  
2017; 7 (22): 9750–62
- **Interacting amino acid replacements allow poison frogs to evolve epibatidine resistance** *SCIENCE*  
Tarvin, R. D., Borghese, C. M., Sachs, W., Santos, J. C., Lu, Y., O'Connell, L. A., Cannatell, D. C., Harris, R., Zakon, H. H.  
2017; 357 (6357): 1261–65
- **Developmental morphology of granular skin glands in pre-metamorphic egg-eating poison frogs** *ZOOMORPHOLOGY*  
Stynoski, J. L., O'Connell, L. A.  
2017; 136 (2): 219–24
- **Modification of feeding circuits in the evolution of social behavior** *JOURNAL OF EXPERIMENTAL BIOLOGY*

- Fischer, E. K., O'Connell, L. A.  
2017; 220 (1): 92–102
- **Ant and Mite Diversity Drives Toxin Variation in the Little Devil Poison Frog** *JOURNAL OF CHEMICAL ECOLOGY*  
McGugan, J. R., Byrd, G. D., Roland, A. B., Caty, S. N., Kabir, N., Tapia, E. E., Trauger, S. A., Coloma, L. A., O'Connell, L. A.  
2016; 42 (6): 537–51
  - **Convergent Substitutions in a Sodium Channel Suggest Multiple Origins of Toxin Resistance in Poison Frogs** *MOLECULAR BIOLOGY AND EVOLUTION*  
Tarvin, R. D., Santos, J. C., O'Connell, L. A., Zakon, H. H., Cannatella, D. C.  
2016; 33 (4): 1068–81
  - **Lenomyrmex hoelldobleri: a new ant species discovered in the stomach of the dendrobatid poison frog, Oophaga sylvatica (Funkhouser)** *ZOOKEYS*  
Rabeling, C., Sosa-Calvo, J., O'Connell, L. A., Coloma, L. A., Fernandez, F.  
2016: 79–95
  - **Poison frogs as a model system for studying the neurobiology of parental care** *CURRENT OPINION IN BEHAVIORAL SCIENCES*  
Roland, A. B., O'Connell, L. A.  
2015; 6: 76–81
  - **Social odors conveying dominance and reproductive information induce rapid physiological and neuromolecular changes in a cichlid fish** *BMC GENOMICS*  
Simoes, J. M., Barata, E. N., Harris, R. M., O'Connell, L. A., Hofmann, H. A., Oliveira, R. F.  
2015; 16: 114
  - **Neural control of maternal and paternal behaviors** *SCIENCE*  
Dulac, C., O'Connell, L. A., Wu, Z.  
2014; 345 (6198): 765–70
  - **Evolutionary Development of Neural Systems in Vertebrates and Beyond** *JOURNAL OF NEUROGENETICS*  
O'Connell, L. A.  
2013; 27 (3): 69–85
  - **Sex differences and similarities in the neuroendocrine regulation of social behavior in an African cichlid fish** *HORMONES AND BEHAVIOR*  
O'Connell, L. A., Ding, J. H., Hofmann, H. A.  
2013; 64 (3): 468–76
  - **Prostaglandin F2 alpha facilitates female mating behavior based on male performance** *BEHAVIORAL ECOLOGY AND SOCIOBIOLOGY*  
Kidd, M. R., Dijkstra, P. D., Alcott, C., Lavee, D., Ma, J., O'Connell, L. A., Hofmann, H. A.  
2013; 67 (8): 1307–15
  - **Neuroendocrine Mechanisms Underlying Sensory Integration of Social Signals** *JOURNAL OF NEUROENDOCRINOLOGY*  
O'Connell, L. A., Rigney, M. M., Dykstra, D. W., Hofmann, H. A.  
2013; 25 (7): 644–54
  - **Aromatase regulates aggression in the African cichlid fish Astatotilapia burtoni.** *Physiology & behavior*  
Huffman, L. S., O'Connell, L. A., Hofmann, H. A.  
2013; 112-113: 77-83
  - **Female preference for males depends on reproductive physiology in the African cichlid fish Astatotilapia burtoni** *GENERAL AND COMPARATIVE ENDOCRINOLOGY*  
Kidd, M. R., O'Connell, L. A., Kidd, C. E., Chen, C. W., Fontenot, M. R., Williams, S. J., Hofmann, H. A.  
2013; 180: 56–63
  - **Neurochemical profiling of dopaminergic neurons in the forebrain of a cichlid fish, Astatotilapia burtoni** *JOURNAL OF CHEMICAL NEUROANATOMY*  
O'Connell, L. A., Fontenot, M. R., Hofmann, H. A.  
2013; 47: 106–15
  - **Androgens coordinate neurotransmitter-related gene expression in male whiptail lizards** *GENES BRAIN AND BEHAVIOR*  
O'Connell, L. A., Mitchell, M. M., Hofmann, H. A., Crews, D.  
2012; 11 (7): 813–18

- **Distribution of nonapeptide systems in the forebrain of an African cichlid fish, *Astatotilapia burtoni*** *JOURNAL OF CHEMICAL NEUROANATOMY*  
Huffman, L. S., O'Connell, L. A., Kenkel, C. D., Kline, R. J., Khan, I. A., Hofmann, H. A.  
2012; 44 (2): 86-97
- **Evolution of a Vertebrate Social Decision-Making Network** *SCIENCE*  
O'Connell, L. A., Hofmann, H. A.  
2012; 336 (6085): 1154-57
- **Isotocin regulates paternal care in a monogamous cichlid fish** *HORMONES AND BEHAVIOR*  
O'Connell, L. A., Matthews, B. J., Hofmann, H. A.  
2012; 61 (5): 725-33
- **Rising StARs: Behavioral, hormonal, and molecular responses to social challenge and opportunity** *HORMONES AND BEHAVIOR*  
Huffman, L. S., Mitchell, M. M., O'Connell, L. A., Hofmann, H. A.  
2012; 61 (4): 631-641
- **Social Status Predicts How Sex Steroid Receptors Regulate Complex Behavior across Levels of Biological Organization** *ENDOCRINOLOGY*  
O'Connell, L. A., Hofmann, H. A.  
2012; 153 (3): 1341-51
- **The Vertebrate mesolimbic reward system and social behavior network: A comparative synthesis** *JOURNAL OF COMPARATIVE NEUROLOGY*  
O'Connell, L. A., Hofmann, H. A.  
2011; 519 (18): 3599-3639
- **The distribution of an AVT V1a receptor in the brain of a sex changing fish, *Epinephelus adscensionis*** *JOURNAL OF CHEMICAL NEUROANATOMY*  
Kline, R. J., O'Connell, L. A., Hofmann, H. A., Holt, G., Khan, I. A.  
2011; 42 (1): 72-88
- **Genes, hormones, and circuits: An integrative approach to study the evolution of social behavior** *FRONTIERS IN NEUROENDOCRINOLOGY*  
O'Connell, L. A., Hofmann, H. A.  
2011; 32 (3): 320-35
- **Neural distribution of the nuclear progesterone receptor in the tungara frog, *Physalaemus pustulosus*** *JOURNAL OF CHEMICAL NEUROANATOMY*  
O'Connell, L. A., Ding, J. H., Ryan, M. J., Hofmann, H. A.  
2011; 41 (3): 137-47
- **Neuronal Nitric Oxide Synthase as a Substrate for the Evolution of Pseudosexual Behaviour in a Parthenogenetic Whiptail Lizard** *JOURNAL OF NEUROENDOCRINOLOGY*  
O'Connell, L. A., Matthews, B. J., Crews, D.  
2011; 23 (3): 244-53
- **Molecular characterization and brain distribution of the progesterone receptor in whiptail lizards** *GENERAL AND COMPARATIVE ENDOCRINOLOGY*  
O'Connell, L. A., Matthews, B. J., Patel, S. B., O'Connell, J. D., Crews, D.  
2011; 171 (1): 64-74
- **Characterization of the Dopaminergic System in the Brain of an African Cichlid Fish, *Astatotilapia burtoni*** *JOURNAL OF COMPARATIVE NEUROLOGY*  
O'Connell, L. A., Fontenot, M. R., Hofmann, H. A.  
2011; 519 (1): 75-92
- **Characterization of the Dopamine System in the Brain of the Tungara Frog, *Physalaemus pustulosus*** *BRAIN BEHAVIOR AND EVOLUTION*  
O'Connell, L. A., Matthews, B. J., Ryan, M. J., Hofmann, H. A.  
2010; 76 (3-4): 211-25