

# REBECCA E. ADRIAN, Ph.D.

ARC DECRA Fellow  
Formerly R.E. Koch

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## EDUCATION

- 2012-2017 Ph.D. in Biology; Auburn University, Auburn, AL, USA  
2007-2011 B.S. in Ecology, Evolution, and Biodiversity; University of California, Davis, CA, USA

## MAJOR RESEARCH PROJECTS

- 2017-current **ARC DECRA postdoctoral research**, Monash University, Clayton, VIC, Australia  
Project: Physiological effects of mitochondrial genetic variation  
Host: Damian K. Dowling
- 2012-2017 **Dissertation research**, Auburn University, Auburn, AL, USA  
Project: Exploring the role of carotenoid pigments in physiological function and color signals  
Advisor: Geoffrey E. Hill
- 2009-2011 **Undergraduate research**, University of California, Davis, CA, USA  
Project: Investigating female mate choice for mechanical sounds in male Greater Sage-Grouse  
Advisor: Gail L. Patricelli

## PUBLICATIONS

*Impact Factors from InCites Journal Citation Reports 2018*  
*Citation numbers from Google Scholar, August 2020*

19. Dowling, D.K., and **R.E. Adrian** (2019), "Challenges and Prospects for Testing the Mother's Curse Hypothesis," *Integrative and Comparative Biology* 59(4): 875-889.  
IF: 3.1; Citations: 7
- Under R.E. Koch:*
18. **Koch, R.E.**, and G.E. Hill (2019), "Loss of Carotenoid Plumage Coloration is Associated with Loss of Choice for Coloration in Domestic Canaries," *Frontiers in Ecology and Evolution* 7:106.  
IF: 2.7; Citations: 0
17. **Koch, R.E.**, A.N. Kavazis, D. Hasselquist, M. Staley, M.B. Toomey, and G.E. Hill (2019), "Testing the resource tradeoff hypothesis for carotenoid-based signal honesty using genetic variants of the domestic canary," *Journal of Experimental Biology* 222:jeb188102.  
IF: 3.0; Citations: 3
16. Lynn, B.M, B. Addison, A.G.D. Bean, K.L. Buchanan, O.L. Crino, J.R. Eastwood, A.S. Flies, R. Hamede,

- G.E. Hill, M. Klaasen, **R.E. Koch**, J.M. Martens, C. Napolitano, E.J. Narayan, L. Peacock, A.J. Peel, A. Peters, N. Raven, A. Risely, M.J. Roast, L.A. Rollins, M. Ruiz-Aravena, D. Selechnik, H.S. Stokes, B. Ujvari, and L. Grogan (2019), "Extreme competence: keystone hosts of infection," *Trends in Ecology and Evolution* 34(4):303-314.  
IF: 15.2; Citations: 13
15. **Koch, R.E.**, J.M. Phillips, M.F. Camus, and D.K. Dowling (2018), "Maternal age effects on fecundity and offspring egg-to-adult viability are not affected by mitochondrial haplotype," *Ecology and Evolution* 8:10722–10732.  
IF: 2.4; Citations: 7
14. **Koch, R.E.** and G.E. Hill (2018), "Behavioural mating displays depend on mitochondrial function: a potential mechanism for linking behavior to individual condition," *Biological Reviews* 93(3):1387-1398.  
IF: 10.2; Citations: 8
13. **Koch, R.E.**, A.N. Kavazis, D. Hasselquist, W.R. Hood, Y. Zhang, and G.E. Hill (2018), "No evidence that carotenoid pigments boost either immune or antioxidant defenses in a songbird," *Nature Communications* 9(491).  
IF: 11.8; Citations: 24
12. **Koch, R.E.** and G.E. Hill (2018), "Do carotenoid-based ornaments entail resource tradeoffs? An evaluation of theory and data," *Functional Ecology* 31(1):9-21.  
IF: 5.0; Citations: 23
11. **Koch, R.E.**, C.J. Josefson, and G.E. Hill (2017), "Mitochondrial function, ornamentation, and immunocompetence," *Biological Reviews* 92(3):1459-1474.  
IF: 10.2; Citations: 34
10. Weaver, R.J., **R.E. Koch**, and G.E. Hill (2017), "What maintains signal honesty in animal color displays used in mate choice?" *Philosophical Transactions of the Royal Society B - Biological Sciences* 372(20160343).  
IF: 6.1; Citations: 44
9. Toomey, M.B., R.J. Lopes, P.M. Araújo, J.D. Johnson, M. Gazda, S. Afonso, P.G. Mota, **R.E. Koch**, G.E. Hill, J.C. Corbo, and M. Carneiro (2017), "The high-density lipoprotein receptor, SCARB1, is required for carotenoid coloration in birds," *Proceedings of the National Academy of Sciences* 114(20):5219–5224.  
IF: 9.6; Citations: 44
8. **Koch, R.E.** and G.E. Hill (2017), "An assessment of techniques to manipulate oxidative stress in animals," *Functional Ecology* 31(1):9-21.  
IF: 5.0; Citations: 38
7. **Koch, R.E.**, G.E. Hill, and K.J. McGraw (2016), "Effects of diet on plumage coloration and carotenoid deposition in red and yellow domestic canaries (*Serinus canaria*)," *The Wilson Journal of Ornithology* 128 (2), 328-333.  
IF: 0.6; Citations: 6
6. **Koch, R.E.**, A.E. Wilson, and G.E. Hill (2016), "The importance of carotenoid dose in supplementation studies with songbirds," *Physiological and Biochemical Zoology* 89(1):61-71.  
IF: 1.9; Citations: 11

5. **Koch, R.E.**, and G.E. Hill (2015), “Rapid evolution of bright monochromatism in the Atlantic canary (*Serinus canaria*),” *The Wilson Journal of Ornithology* 127(4):615-621.  
IF: 0.6; Citations: 6
4. Archmiller, A.A., E. Bauer, **R.E. Koch**, B.K. Wijayawardena, A. Anil, J.J. Kottwitz, A.S. Munsterman, and A.E. Wilson (2015), “Formalizing the definition of meta-analysis in *Molecular Ecology*,” *Molecular Ecology* 24: 4042-4051.  
IF: 5.9; Citations: 14
3. **Koch, R.E.**, A.H. Krakauer, and G.E. Patricelli (2015), “Investigating female mate choice for mechanical sounds in male Greater Sage-Grouse,” *The Auk: Ornithological Advances* 132: 349-358.  
IF: 2.7; Citations: 13
2. **Koch, R.E.**, and G.E. Hill (2015), “A millennium of stasis in avian ornamentation? Implications for sexual selection theory,” *Ideas in Ecology and Evolution* 8:70-75.  
IF: Not listed; Citations: 0
1. I.S. Pearse, L.M. Porensky, L.H. Yang, M.L. Stanton, R. Karban, L. Bhattacharyya, R. Cox, K. Dove, A. Higgins, C. Kamoroff, T. Kirk, C. Knight, **R.E. Koch**, C. Parker, H. Rollins, and K. Tanner (2012), “Complex consequences of herbivory and interplant cues in three annual plants,” *PLoS One* 7: e38105.  
IF: 2.8; Citations: 17

## FUNDING AND AWARDS

### RESEARCH and TRAVEL GRANTS

*Total earned: \$484,417 (USD)*

- |           |  |
|-----------|--|
| 2018      | <b>Australian Research Council Discovery Early Career Researcher Award</b> (\$304,361)<br>Project Title: “The effects of mitochondrial genetic variation on physiology and behaviour”<br>Success Rate: 17%                           |
| 2015      | <b>National Science Foundation Doctoral Dissertation Improvement Grant</b> (\$19,141)<br>Project Title: “Forging a context for female mate choice for carotenoid ornaments”<br>Success Rate: 30% (within Behavioral Systems Cluster) |
| 2012-2015 | <b>National Science Foundation Graduate Research Fellowship Award</b> (\$132,000)<br>Success Rate: 7% (among first-time applicants)  |
| 2020      | Monash University Faculty of Science Award for Excellence in Research by an Early Career Researcher (\$3,616)  |
| 2019      | Monash University School of Biological Sciences Early Career Research Development Award (\$6,788)  |
| 2019      | Monash University School of Biological Sciences National Conference Award (\$339)  |
| 2018      | Monash University School of Biological Sciences Advancing Diversity in Biology Award (\$5,340)   |

- 2018 Monash University Faculty of Science Advancing Women's Success Grant (\$2,532)
- 2017 Wilson Ornithological Society Louis Agassiz Fuertes Grant (\$2,500)
- 2016 Sigma Xi Grant-in-Aid of Research (\$1,000)
- 2014 Society for Integrative and Comparative Biology Grant-in-Aid of Research (\$1,000)
- 2014 Auburn University Graduate School Research Award (\$300)
- 2014 Animal Behavior Society Research Grant (\$1,100)
- 2014 Sigma Xi Grant-in-Aid of Research (\$500)
- 2013 American Ornithologists' Union research award (\$2,500)
- 2013-2016 Auburn University College of Science and Mathematics Travel Awards (\$250 x 4)

## **MERIT AWARDS**

- 2018 Top presentation at the Faculty of Science Early Career Researcher "Seven-minute Symposium"
- 2017 Finalist, W.D. Hamilton Award for Outstanding Student Presentation, Society for the Study of Evolution, Evolution Conference
- 2017 Auburn University Distinguished Dissertation Award
- 2017 Auburn University Outstanding Doctoral Student Award
- 2017 Nominated, Outstanding Graduate Teaching Assistant Award (AU Biological Sciences Departmental Awards)
- 2016 Kenneth Otis Distinguished Graduate Fellowship for Outstanding Achievement in Physiology/Molecular Biosciences (AU Biological Sciences Departmental Awards)
- 2015 Margaret McNeal Arant Memorial Award for Outstanding Achievement in Zoology (AU Biological Sciences Departmental Awards)
- 2013 Finalist, Raymond B. Huey Best Student Presentation Award (SICB Conference)
- 2011 Graduated undergraduate class with Highest Honors (top 2%)
- 2011 Outstanding Senior Award (Evolution, Ecology, and Biodiversity)
- 2011 Departmental Citation (Evolution, Ecology, and Biodiversity)
- 2010 Honorable Mention, UC Davis Prized Writing Competition
- 2009 Inducted to Phi Kappa Phi, Gamma Sigma Delta, and Phi Sigma Honors Societies
- 2009 Asmundson Poultry Science Achievement Award
- 2007-2011 UC Davis Regents Scholarship
- 2007-2009 UC Davis NCAA Division I Intercollegiate Swimming Scholarship

## **INVITED PRESENTATIONS**

- 2019 Presentation entitled "Mitochondrial function underlies behavioural display performance" at the

symposium “Constraints on animal mating displays: linking production mechanisms to signal function” at the 2019 Animal Behavior Society and International Ethological Congress joint conference; Chicago, IL, USA. Hosted by Prof Jeff Podos (University of Massachusetts).

- 2018 Presented talk entitled “Mitochondria as integrators of immune function” at the Host Competence Workshop; Centre for Integrative Ecology, Deakin University, Geelong, VIC, Australia. Hosted by Profs Kate Buchanan (Deakin University) and Lynn Martin (University of South Florida).
- 2015 Presented talk entitled “Testing the resource tradeoff hypothesis for carotenoid signal honesty in canaries” at the meeting of the Molecular Ecology, Microbial Ecology and Evolutionary Genetics unit; Department of Biology, Lund University, Lund, Sweden. Hosted by Prof Dennis Hasselquist (Lund University).

## CONFERENCE PRESENTATIONS

- Adrian, R.E., and D.K. Dowling. The Australasian Evolution Society Conference, “Mitochondrial genetics, Mother’s Curse, and climbing performance in the fruit fly,” November 2019
- Koch Adrian, R.E., and D.K. Dowling. The Society for Integrative and Comparative Biology Conference, “Dropping like flies: Testing the role of mitochondrial genetic variation in negative geotaxis response,” January 2019.
- Koch, R.E., and D.K. Dowling. The Australian and New Zealand Society for Comparative Physiology and Biochemistry Conference, “Dropping like flies: Testing the role of mitochondrial genetic variation in negative geotaxis response,” December 2018.
- Koch, R.E., and G.E. Hill. Evolution, “Immune and antioxidant performance of carotenoid-free canaries questions a longstanding hypothesis for the evolution and maintenance of colored signals,” June 2017.
- Koch, R.E., and G.E. Hill. The Society for Integrative and Comparative Biology Conference, “Exploring the role of carotenoid pigments in immune and antioxidant function using carotenoid- and ornament-free birds,” January 2017.
- Koch, R.E. and G.E. Hill. North American Ornithological Conference, “Exploring the role of carotenoid pigments in immune and antioxidant function using carotenoid- and ornament-free birds,” August 2016.
- Koch, R.E. and G.E. Hill. Evolution, “Exploring the evolutionary function of carotenoid signals using a carotenoid-free bird,” June 2016.
- Koch, R.E., and G.E. Hill. The Animal Behavior Society Conference, “Female preference for song, color, and their interaction in the domestic canary,” June 2015.
- Koch, R.E., A.E. Wilson, and G.E. Hill. The Society for Integrative and Comparative Biology Conference, “The impact of carotenoid intake on the physiological effects of supplementation in ornamented bird species,” January 2015.
- Koch, R.E. and G.E. Hill. International Society for Behavioral Ecology, “Searching for evidence of runaway

sexual selection in historical bird illustrations,” August 2014

Koch, R.E. and G.E. Hill. The Society for Integrative and Comparative Biology Conference, “Effects of domestication on dichromatism in the island canary,” January 2014.

Koch, R.E. and G.E. Hill. The Animal Behavior Society Conference, “Searching for evidence of runaway selection in bird art and museum specimens,” July 2013.

Koch, R.E. and G.E. Hill. The Society for Integrative and Comparative Biology Conference, “Searching for evidence of runaway selection in art and literature,” January 2013.

Koch, R.E., A.H. Krakauer, and G.L. Patricelli. Animal Behavior Society, “Within and among male variation in the mechanical sounds of the greater sage-grouse (*Centrocercus urophasianus*),” July 2011.

## PROFESSIONAL SERVICE

**Co-organized scientific workshop titled “Cellular metabolism for ecologists”** at the Centre for Integrative Ecology, Deakin University. Invited and hosted 15 Australian and international scientists for two days of presentations and discussions on how mitochondrial bioenergetics is best quantified and applied to research questions in behavioural, evolutionary, and physiological ecology. Currently leading a manuscript for submission to *Trends in Ecology and Evolution* based on the ideas developed in the workshop.

### **Reviewed 44 submitted manuscripts for 23 journals since 2015**

**Journals:** *Functional Ecology*, *Physiological and Biochemical Zoology*, *Molecular Ecology*, *The American Naturalist*, *The Auk: Ornithological Advances*, *Proceedings of the Royal Society B: Biological Sciences*, *Journal of Experimental Biology*, *Wilson Journal of Ornithology*, *The Ostrich*, *Journal of Ethology*, *Current Zoology*, *Oecologia*, *Ibis*, *Journal of Animal Ecology*, *Conservation Physiology*, *Bioessays*, *Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology*, *Scientific Reports*, *Animal Reproduction Science*, *Frontiers in Ecology and Evolution*, *The Science of Nature*, *Behavioral Ecology*, *Journal of Biogeography*

**Ranked 91 percentile for number of reviews over last 12 months among evolutionary biologists**  
(publons.com/author/1420113)

## TEACHING and LEADERSHIP

2016-2017 **Graduate Teaching Assistant, Ornithology**, Auburn University, Auburn, AL, USA.  
Designed and taught a laboratory course filled with short lectures, hands-on activities (birdwatching, specimen preparation), and regular graded feedback.

2014-2017 **Graduate Coordinator, Miller Writing Center**, Auburn University, AL, USA.  
Led staff workshops on working as a consultant with writers from technical disciplines, and launched the now-annual university-wide NSF Graduate Research Fellowship Program application workshop. Guided weekly small-group discussions among staff.

2014-2017 **Treasurer, Biological Sciences Graduate Student Association**, Auburn University, Auburn,

AL, USA.

Worked with local designers and vendors to produce fundraising and community-building products, organized student travel grants, and designed and updated departmental bulletin boards.

- 2013-2017 **Writing Consultant**, Miller Writing Center, Auburn University, Auburn, AL, USA.  
Tutored undergraduates and graduate students of all levels, disciplines, and backgrounds in effective writing and communication.
- 2016 **Graduate Research Assistant**, Auburn University Museum of Natural History, Auburn, AL, USA.  
Developed a new digital collection of high-quality bird photographs with known date and location data, to be viewable online for public access as well as scientific assessment.
- 2015-2016 **Graduate Teaching Assistant, Principles of Biology**, Auburn University, Auburn, AL, USA.  
Prepared lecture introductions, demonstrated lab techniques, graded short-answer assignments, and worked one-on-one and in small groups with undergraduate students on lab activities and lessons in fundamental biology.
- 2015-2016 **Instructor, Communicating in the Sciences**, National Science Foundation Research Experience for Undergraduates (NSF-REU), Auburn University, Auburn, AL, USA.  
Led a small classroom of undergraduate researchers in student-driven lessons on effective scientific communication, including “elevator speeches” to non-scientific audiences, formal PowerPoint oral and poster presentations, and professional websites. Focused on biosystems engineering in 2015, and computational biology in 2016.

## MENTORSHIP

- 2017-present Co-supervisor of Ph.D. student Ekta Kochar (M.S., Indian Institute of Science)  
  
Project title: “The role of interactions between mitochondrial and nuclear genes in determining fitness outcomes”
- 2014-2017 **Project: Testing the physiology function of carotenoid pigments in canaries with knock-down carotenoid mutations**  
Activities: Experimentally injecting vaccines or immune stimulants; extracting blood samples; measuring body temperature through the vent; weighing and banding; dosing oral medication; maintaining colony through husbandry; genetic sexing through PCR and gel electrophoresis.  
Students: Jared Avrard, Matthew Whitacre, Sarah Malone, Laura Beth Towery, Shannon Nguyen, Ashley Smith, Kasie Mobley, Erin Dye, Heath Scott, Samuel Jeffers, Davis Kelly, Carson Williford, Garon Bailey, Rachel Twigg, Aundrea Westfall
- 2015-2016 **Project: Mate choice for song, color, and their interaction in the domestic canary**  
Activities: Preparing and recording experimental mate choice trials between canaries of varying color and song phenotypes; maintaining canary colony through husbandry; extracting behavioural data from video (creating an ethogram).  
Students: Will Goldin, Shannon Lambert, Mary Alys McCulloch, Jared Avrard, Matthew

Whitacre; Misty Thomas, Erica Farrell, and Tara McAdam (graduate students in Education)

- 2015 **Project: Fat composition of wild house finches with and without *Mycoplasma gallisepticum* infection**  
 Activities: Using a SOXHLET apparatus to extract fat from homogenized house finch samples; dessicating, weighing, and recording data from samples.  
 Students: Kayla Atchison, Sungil Kim
- 2014-2015 **Project: Characterizing disease status, ornamental coloration, and mitochondrial carotenoid content of wild house finches** (in collaboration with Ph.D. students Molly Staley and Roy Ge)  
 Activities: Capturing wild house finches using traps around birdfeeders and mist nets; extracting blood samples and dissecting target tissues (liver, breast muscle); performing tracheal swabs; scoring plumage coloration and eye infection status using standardized metrics  
 Students: Hilary Rizk, Danielle Gadzala, Lauren Rambo
- 2014-2015 **Project: Honors Organismal Biology student mentorship**  
 Activities: Students gained at least hours of hands-on experience with ornithological research over the semester: bird capture in traps and mist-nets, captive bird colony husbandry, color banding, blood sampling, genetic sexing with gel electrophoresis, and museum specimen preparation and classification  
 Students: Five per year
- 2014 **Project: Assessing plumage dichromatism in color-bred domestic canaries**  
 Activities: Quantifying plumage coloration of feather samples using a spectrophotometer and OOIBase software  
 Student: Lauren Rambo
- 2013-2014 **Project: Searching for evidence of runaway sexual selection in historical illustrations**  
 Activities: Locating and extracting images of 100-1000 year old natural history illustrations of birds from online databases; comparing historical avian phenotypes to their modern appearances in field guides; quantifying ornamental plumage coloration in historical illustrations using ImageJ and comparing results to those of modern conspecifics.  
 Students: Jennifer Weber, Kayla Rivera, Gail Leddon, Charlie Byrum, Amelia Plemons

## STUDENT and COMMUNITY OUTREACH

- 2017 **Judged graduate student oral presentations** at the Monash University Genetics, Ecology, and Zoology post-graduate research conference.
- 2014-2017 **Judged biology and behavior science fair projects** of elementary and high school students from the state of Alabama at the annual Greater East Alabama Regional Science and Engineering Fair (GEARSEF) held on Auburn University's campus.
- 2016 **Presented an invited one-hour seminar** on the genetics of coloration in canaries and other domestic birds to hobbyist bird fanciers and breeders at the National Finch and Softbill Society's



- annual meeting.
- 2016 **Taught a mini-course for 4<sup>th</sup>-6<sup>th</sup> graders** on the calorie content of food using a rudimentary calorimeter in AU's Getting Under The Surface (GUTS) program (part of a graduate course in animal energetics).
- 2016 **Hosted an outreach table** of preserved bird, egg, and nest specimens at the AU Museum of Natural History to introduce hundreds of middle school students to the world of birds as part of the "AU Explore" program.
- 2015 **Hosted a hands-on demonstration table** at the Junior Mad Scientist event at Auburn University; helped 4<sup>th</sup>-6<sup>th</sup> grade students create models of animal and plant cells using cookies, frosting, and candy to illustrate cell biology in a tasty way.
- 2014 **Presented as a panelist** on the Society for Women in Science and Mathematics (SWSM) forum that invited underprivileged but talented female high school students from Alabama to learn about how to succeed in the fields of science and mathematics.
- 2014 **Taught a workshop** on bird identification and biology to a group of 6<sup>th</sup>-12<sup>th</sup> grade boy scouts from around the state of Alabama; to qualify the boy scouts for their Merit Badge in Bird Study, I led students on a birdwatching trip around the Auburn campus, explained aspects of bird physiology, behavior, and ecology.
- 2013-2014 **Judged marketing presentations and engineering project proposals** of middle and high school students from the Southeastern U.S. as part of the B.E.S.T. Robotics Competition.
- 2013 **Led two guest lectures** on sexual selection, bird coloration, and ornithology research to non-scientific community members as part of the Osher Lifelong Learning Institute (OLLI).
- 2012 **Co-led a workshop** to provide 4<sup>th</sup>-6<sup>th</sup> grade students with hands-on experience in bird coloration research (measuring color on house finch specimens, analyzing data) as a part of the Getting Under The Surface (GUTS) program.

## PRE-DOCTORAL FIELD and LABORATORY EXPERIENCE

- 2012 **Warbler Field Biologist** (lead supervisor: Sara Kaiser), Hubbard Brook Research Forest, Smithsonian Migratory Bird Center & Cornell Lab of Ornithology, USA.  
Tracked behavioral and environmental cues to locate highly camouflaged black-throated blue warbler nests, resight color-banded birds, and map territories as part of long-term research.
- 2009-2012 **Sage-Grouse Behavior Field and Lab Technician** (supervisors: Gail Patricelli and Alan Krakauer), Patricelli Lab, Department of Evolution and Ecology, University of California, Davis, USA.  
Annotated spectrogram recordings of greater sage-grouse calls and ran MATLAB programs to localize and process the resulting data. Extracted behavioral data from video. Trained undergraduate volunteers. Monitored mating success and display behavior in the high elevation sage-brush plains of Wyoming.
- 2011-2012 **Feather Development Research Assistant** (supervisor: Teresa Feo), Patricelli Lab, Department of Evolution and Ecology, University of California, Davis, USA.  
Handled captive cockatiel, parrots, quail, and chickens, assisted in bird skin tattooing, feather plucking, and data organization in a study on modeling feather growth.

- 2011 **Crossbill Field Assistant** (supervisor: Beth Schultz), Hahn Lab, Department of Neurology, Physiology, and Behavior, University of California, Davis, USA.  
Caught, banded, measured, extracted blood from, and recorded song of red crossbills. Assisted in the behavioral observation of radiotransmitter dark-eyed juncos by visually tracking color-banded birds.
- 2011 **Wood Duck Researcher** (supervisor: John Eadie), Eadie Lab, Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, USA.  
Developed an informative and feasible Masters-level experiment to evaluate the counting ability of parasitic Wood Duck hens. Wrote an extensive literature review and research proposal on number conceptualization in parasitic birds.
- 2011 **Pupfish Speciation Intern** (supervisor: Chris Martin), Wainwright Lab, Department of Ecology and Evolution, University of California, Davis, USA.  
Fed pupfish of different sizes and jaw morphologies zebrafish of varying size to gauge adaptive specialization. Used ImageJ to quantify pupfish morphology. Skinned and prepared preserved fish samples for staining.
- 2010 **Egg-laying Chicken Behavior Intern** (supervisor: Gina Alviso), Mench Lab, Department of Animal Science, University of California, Davis, USA.  
Assisted in graduate student investigation of the effects of different substrates on poultry dustbathing success by building an ethogram of behavior from video recording.
- 2010 **Fox Scat Analysis Intern** (supervisor: Hilary Swarts), Lawler Lab, Department of Evolution Ecology, University of California, Davis, USA.  
Sorted component parts of preserved fox scat samples for identification and analysis. Part of a long term research project on the effect of golden eagle invasion on the diets of the endangered Santa Cruz Island fox.
- 2009 **Scrub-Jay Behavior Intern** (supervisor: Teresa Iglesias), Patricelli Lab, Department of Evolution and Ecology, University of California, Davis, USA.  
Collaborated with a partner to use peanuts to train local western scrub-jays to appear in specific locations on a regular daily schedule. Assisted in collecting sound and visual behavior data during experimental trials assessing “funeral” behavior.