

Richard K Simpson

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RESEARCH INTERESTS

I am a behavioral and evolutionary ecologist that uses a combination of field work, museum studies, and electron microscopy to understand the mechanisms, functions, evolution, and diversity of exaggerated animal traits and animal signals.

EDUCATION

- 2018** PhD in Animal Behavior; Arizona State University
 "The evolution of hummingbird coloration and courtship displays" (Advisor: Dr. Kevin McGraw)
- 2012** BS in Biology with honors; Trinity University
 "Migration distance and sexual dichromatism: how selection on female coloration drives dichromatism in wood warblers" (Advisor: Dr. Troy Murphy)

ACADEMIC POSITIONS

2018-Present Post-doctoral Fellow University of Windsor

PUBLICATIONS AND MEDIA

Peer-Reviewed Journal Articles

*Denotes undergraduate authorship

13. **Simpson, RK**, Mistakidis, AF, Doucet, SM. Diverse selection pressures drive color and contrast evolution in wood-warblers. *In Review at Evolution*.
12. *Reed, S, **Simpson, RK**, McGraw, KJ. Feather morphological predictors of angle-dependent color changes in parrot plumage. *In Review at Journal of the Royal Society Interface*.
11. **Simpson, RK** & McGraw, KJ. Variable courtship signal evolution produces complex interactions in hummingbird visual traits. *Accepted at The American Naturalist*.

10. *Saini, C, Hutton, P, Gao, S, **Simpson, RK**, Giraudeau, M, Sepp, T, Webb, E, McGraw, KJ. 2019. Exposure to artificial light at night increases innate immunity during development in a precocial bird. *Journal of Comparative Biochemistry and Physiology A*. 233: 84-88.
9. **Simpson, RK** & McGraw, KJ. (2019) Experimental trait mis-matches uncover specificity of evolutionary links between multiple signaling traits and their interactions in hummingbirds. *Evolution*, 73: 436-451.
Media Coverage: [Evolution Digest](#)
8. **Simpson, RK** & McGraw, KJ. (2018) It's not just what you have but how you use it: solar-positional and behavioral effects on hummingbird color appearance during courtship. *Ecology Letters*, 21: 1413-1422.
Media Coverage: [Science](#) ([Science video](#)), [Forbes](#)
7. **Simpson, RK** & McGraw, KJ. (2018) Multiple signaling in a variable environment: expression of song and color traits as a function of ambient sound and light. *Biotropica*, 50: 531-540
6. **Simpson, RK** & McGraw, KJ. (2018) Two ways to display: male broad-tailed hummingbirds exhibit different dynamic color tactics based on sun orientation. *Behavioral Ecology*, 29: 637-648.
Media Coverage: [Oxford University Press Tumblr](#)
5. **Simpson, RK**. (2017) Courtship and territorial behaviors of three hummingbird species in Arizona. *Arizona Birds 2017: 1-7*.
4. Ligon, RA, **Simpson, RK**, Mason, NA, Hill, GE, McGraw, KJ. (2016) Evolutionary innovation and diversification of carotenoid-based pigmentation in finches. *Evolution*, 70: 2839-2852.
3. Hutton, P[^], Seymoure, BM, Ligon, RA, McGraw, KJ, **Simpson, RK**. (2015) Dynamic color communication. *Current Opinion in Behavioral Sciences*, 6: 41-49.
[^]All authors contributed equally
2. **Simpson, RK**, Johnson, MA, Murphy, TG. (2015) Migration and the evolution of sexual dichromatism: evolutionary loss of female coloration with migration among wood-warblers. *Proceedings of the Royal Society B.*, 282: 2015375.
Media Coverage: [Science](#), [Nature](#), [IFL Science](#), [Phys.org](#), [Nature World News](#), [Richard Dawkins Foundation](#)
1. Murphy, TG, West, JA, Pham, TT, Cevallos, LM, **Simpson, RK**, Tarvin, KA. (2014) Same trait, different signals: unlike females, male goldfinches do not signal status with bill color. *Animal Behaviour*, 93: 121-127.

Popular Articles

- 2018** **Simpson, RK**. How do male hummingbird dance moves alter their appearance? Oxford University Press Blog guest-post. ([link](#))
- 2014** **Simpson, RK**. Ask A Biologist Top Question: Why do leaves change color? ([link](#))
- Simpson, RK**. Biology Bits: Feathers. ASU's Ask A Biologist. ([link](#))

Popular Media

- 2019** **Consultant for:** Attenborough's Life in Colour (BBC Nature documentary by Humble Bee Pictures, *in production*)
- 2018** **Consultant for:** The Mating Game (BBC Nature documentary by Silverback Films, *in production*)
- 2017** **Credited in:** How animals can change colors (Science Insider video; [link](#))
- 2016** **Credited in:** Super Hummingbirds (PBS Nature documentary by Coneflower Studios; [link](#))
- 2014** **Featured in:** Strum, M. Faint of Heart Need Not Apply. ASU's School of Life Sciences Magazine. 10, 1:19-23

CURRENT PROJECTS

5. The evolution of hummingbird color diversity and courtship displays

- **Collaborators:** Dr. Kevin McGraw, Dr. Stephanie Doucet, Dr. Russell Ligon
- **Ongoing work:** Transmission and scanning electron microscopy of feathers; photographic color analysis across all hummingbirds; manuscript preparation (3 intended)

4. Selection on wood-warbler song and color evolution

- **Collaborators:** Dr. Sephanie Doucet, Dr. Dan Mennill, Dr. David Wilson, Allison Mistakidis (MSc)
- **Products in progress:** **Simpson, RK**, Wilson, DR, Mistakidis, AF, Mennill, DJ, Doucet, SM. Sympatry drives plumage and song divergence in Parulidae warblers. *Intended for Proceedings of the Royal Society B.*

3. Urban environmental effects on development and physiology of color

- **Collaborators:** Dr. Kevin McGraw, Dr. Tuul Sepp, Dr. Mathieu Giraudeau, Pierce Hutton (PhD student), and Emily Webb (PhD student)
- **Ongoing work:** High-performance liquid chromatography of blood and organ samples; photographic color analysis; hormone assays; manuscript preparation (5 intended)
- **Products in progress:** **Simpson, RK** & McGraw, KJ. Effects of human-induced rapid environmental change on sexual selection. *Intended for Behavioral Ecology and Sociobiology.*

2. Coloration and sexual dimorphism in jumping spiders

- **Collaborators:** Dr. Lisa Taylor, Laurel Lietzenmayer (PhD student)
- **Products in progress:** Lietzenmayer, LB, **Simpson, RK**, Taylor, LA. A comparative student of male coloration, sexual size dimorphism, and male size in salticids. *Intended for Biology Letters.*

1. Understanding color variation in male and female peafowl

- **Collaborators:** Dr. Jessica Yorzinski, Alexis Earl (Masters student)

- **Ongoing work:** Male tail feather size measurements; peahen plumage color analysis; manuscript preparation (2 intended)

GRANTS & FELLOWSHIPS

Fellowships

ASU = Arizona State University

2017	ASU Graduate College Completion Fellowship	\$13000
2017-2013	ASU School of Life Sciences Summer Fellowship (4)	\$6800
2016	ASU School of Life Sciences Animal Behavior Graduate Summer Fellowship	\$6082
2012	ASU/Smithsonian Tropical Research Institute Fellowship	\$9988

Research Awards

2017	United States Agency for International Development Global Development Research Scholar	\$8995
	National Science Foundation: Doctoral Dissertation Improvement Grant (IOS-1702016)	\$20085
2017-2014	ASU College of Liberal Arts and Sciences Graduate Excellence Award (3)	\$650
2016	ASU Research and Training Initiative Graduate Training Fellowship	\$2000
	American Museum of Natural History Frank M. Chapman Memorial Fund	\$1000
2016, 2014	ASU Research and Training Initiative Fieldwork Grant (2)	\$3000
2015	T and E Inc. Grants for Conservation Biology Research	\$2573
	ASU Graduate and Professional Student Association Jumpstart Grant	\$500
	ASU Research and Training Initiative Facilities Grant	\$1500
	Arizona Field Ornithologist Gale Monson Research Grant	\$1000
2014	ASU Graduate and Professional Student Association Research Grant	\$1600
	Animal Behavior Society Student Research Grant	\$1100
	Society for Integrative and Comparative Biology Grants in Aid of Research	\$1000
2014-2013	Sigma Xi: Arizona State University Chapter Grants-In-Aid of Research (2)	\$700
2013	Society for the Study of Evolution: Rosemary Grant Award	\$2250

Travel Awards

2018, 2016	International Society for Behavioral Ecology Travel Grant (2)	\$2200
2017	Animal Behavior Society Travel Grant	\$500
2017-2013	ASU School of Life Sciences Travel Award (4)	\$1600
2016-2014	ASU Graduate and Professional Student Association Travel Grant (3)	\$2748
2014	International Ornithological Conference Travel Grant	\$800

Service Awards

2017	ASU Graduate and Professional Student Association Assembly Service Award	\$500
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2015 ASU Graduate and Professional Student Association Grad Challenge \$15000

MENTORSHIP EXPERIENCE

Undergraduate Thesis Committees

*From underrepresented group

2015-2018 *Steven Reed*; “Angle dependence in parrot feathers and interesting pigment-structure interactions within them”; **Arizona State University**
- Now PhD student in Applied Mathematics at Arizona State University

Independent Projects

2018 *Liliana Yisela Quispe Flores**; “Flower preferences of tropical dry forest hummingbirds in Peru”; **Universidad Nacional Agraria La Molina (Peru)**
- Now works for environmental consulting company in Peru

2013-2017 *Jessica Givens**; “Relationships between courtship behavior, morphology, and coloration in Anna’s hummingbirds”; **Arizona State University**
- Now MSc student in Science and Technology Policy at Arizona State University

Undergraduate Volunteers – students have helped me with fieldwork and data analysis

Arizona State University (13): Sayah Bogor*; Christina Piarowski*; Alysia Apple*; Avery Underwood*; Ashley Agolo*; Jade Gates*; Allison Hayes*; Rachel Wuest*; Bailey Ash; Nishel Sargent*; Savanna Soldevere*; Stephanie Takcik*; Savannah Westerfield*

University of California – Davis (1): Ushrayinee Sarker*

Universidad Nacional de San Agustín de Arequipa (1): Carla Maria Llerena Quiroz*

TEACHING EXPERIENCE

Workshops

University of Windsor

- Statistical, color, and phylogenetic analyses in R (meets weekly; 2018-Present)

University of Florida

- Phylogenetic analyses in R (2017)

Arizona State University

- An introduction to using R (2017)

Guest Lectures

University of Windsor

- The evolution of courtship signals and signal interactions (*in Animal communication*)

Arizona State University

- Neotropical bird biology (*in Fundamentals of Tropical Biology*)

- Diversity and communication: project ideas talk (*in Fundamentals of Tropical Biology*)
- Mating behavior and intra-sexual selection (*in Animal Behavior*)
- One-factor ANOVA: confidence intervals, post hoc-tests (*in Biometry*)
- Analysis of variance (*in Biometry*)
- Avian social behavior (*in Ornithology*)
- Avian natural history (*in Vertebrate Zoology*)

Co-taught Courses

Arizona State University

- Seminar on Evolution of Animal Breeding Systems book (with Kevin McGraw)
- Seminar on Evolution of Insect Mating Systems book (with Ronald Rutowski)

Teaching Assistantships

Arizona State University

- Fundamentals of Tropical Biology (study abroad) - *assisted with hikes & student projects*
- Biometry (BIO 415/614) - *taught & graded two laboratory sections teaching R*
- Ornithology (BIO 471) - *taught & graded laboratory section, which included bird hikes*
- Vertebrate Zoology (BIO 370) - *taught & graded two dissection laboratory sections*
- Animal Behavior (BIO 331) - *assisted with lectures & graded class material*
- Animal Behavior (online; BIO 331) – *mentored & graded student projects*
- Conservation of Biodiversity (BIO 322) - *graded class material*

Trinity University

- Integrated Biology 1 (BIO 1311) - *laboratory & lecture assistant*
- Integrated Biology 2 (BIO 1312) - *laboratory & lecture assistant*

PROFESSIONAL PRESENTATIONS

Invited Seminars

- 2018** **Simpson, RK.** The evolution of complex courtship traits: covariation and interactions between hummingbird displays, plumage, and color appearance. *University of Western Ontario, London, ON, Canada.*
- Simpson, RK.** The evolution of complex visual courtship signals and signal interactions in hummingbirds. *University of Windsor, Windsor, ON, Canada*
- Simpson, RK.** Evolución de la coloración y cortejos de apareamiento in colibríes (The evolution of hummingbird coloration and courtship displays). *Universidad Nacional de San Agustín de Arequipa, Arequipa, Peru*
- 2017** **Simpson, RK.** The evolution of hummingbird coloration and courtship displays. *University of Florida, Gainesville, FL, USA.*

Invited Public Presentations

- 2018** **Simpson, RK.** Mini-talk: Complex color communication. *Science on Tap: Birds and Beers II at Walkerville Brewery with University of Windsor, Windsor, ON, Canada.*
- 2017** **Simpson, RK.** Evolution of hummingbird visual signals. *Appleton-Whittell Research Ranch of the Audubon Society Potluck and Presentations, Elgin, AZ, USA.*
- Simpson, RK.** The evolution of hummingbird coloration and courtship displays. *Maricopa Audubon Society Meeting, Scottsdale, AZ, USA.*

Conference Presentations

*Denotes undergraduate authorship

- 2018** **Simpson, RK** & McGraw, KJ. Evolution of signaling interactions between plumage coloration and courtship displays in hummingbirds. *International Society for Behavioral Ecology, Minneapolis, MN, USA.*
- 2017** **Simpson, RK** & McGraw, KJ. The co-evolution of hummingbird coloration and courtship displays. *Animal Behavior Society Meeting, Toronto, ON, Canada.*
- 2016** **Simpson, RK**, *Givens, JL, McGraw, KJ. Evolutionary patterns of hummingbird coloration. *Society for Integrative and Comparative Biology Meeting, Portland, OR, USA.*
- Simpson, RK**, Seymoure, BM, Moeller, KT. Conspicuousness of the venomous Gila monster as a function of age. *International Society for Behavioral Ecology post-conference symposium on Anti-predator Coloration, Penryn, United Kingdom.*
- Simpson, RK** & McGraw, KJ. Evolution of hummingbird coloration and courtship displays. *Arizona Field Ornithologist Meeting, Yuma, AZ, USA.*
- 2015** **Simpson, RK.** Speed talk on hummingbird color and courtship evolution. *School of Life Sciences Graduate Seminar, Arizona State University, Tempe, AZ, USA*
- Simpson, RK.** The evolution of hummingbird visual signals. *Science on the Sonoita Plain, Elgin, AZ, USA*
- 2014** **Simpson, RK.** Migration distance and sexual dichromatism: a new hypothesis. *School of Life Sciences Graduate Seminar, Arizona State University, Tempe, AZ, USA.*
- Simpson, RK** & McGraw, KJ. The role of a fluctuating environment on multimodal signals. *Society for Integrative and Comparative Biology Meeting, Austin, TX, USA.*
- Simpson, RK**, Johnson, MA, Murphy, TG. The evolution of sexual dichromatism: wood-warblers exhibit increased dichromatism with greater migration distance. *International Society of Behavioral Ecology, New York, NY, USA.*
- Simpson, RK** & McGraw, KJ. The role of a fluctuating environment on multimodal signals. *International Ornithological Congress, Tokyo, Japan.*
- 2013** **Simpson, RK.** Dynamic environments, multi-modal signaling, and the role of receiver preferences. *Gamboa Seminar Series, Gamboa, Panama.*
- Simpson, RK.** Dynamic environments, multi-modal signaling, and the role of receiver preferences. *Tupper Behavior Seminar Series, Panama City, Panama.*
- Simpson, RK** & McGraw, KJ. The role of a fluctuating environment on multimodal signals. *Animal Behavior Society Meeting, Boulder, CO, USA.*

Conference Posters

- 2019** **Simpson, RK**, McGraw, KJ, Doucet, SM. The evolution of complex courtship traits: covariation and interactions between hummingbird displays, feather structure, and color appearance. *Society for Integrative and Comparative Biology, Tampa, FL, USA.*
- 2017** *Givens, JL, **Simpson, RK**, McGraw, KJ. Male Anna's hummingbirds (*Calypte anna*) orient their shuttle display towards the sun. *School of Life Sciences Undergraduate Research Program Symposium, Arizona State University, Tempe, AZ, USA.*
- *Reed, S, **Simpson, RK**, McGraw, KJ. Peculiar plumage produces angle-dependence across parrot phylogeny. *School of Life Sciences Undergraduate Research Program Symposium, Arizona State University, Tempe, AZ, USA.*
- 2016** *Givens, JL, **Simpson, RK**, McGraw, KJ. Relationships between courtship behavior, morphology, and structurally based plumage coloration in Anna's hummingbirds (*Calypte anna*). *School of Life Sciences Undergraduate Research Program Symposium, Arizona State University, Tempe, AZ, USA.*
- Simpson, RK**, McGraw, KJ. The evolution of hummingbird coloration and courtship displays. *International Society for Behavioral Ecology, Exeter, United Kingdom.*
- 2015** *Givens, JL, **Simpson, RK**, McGraw, KJ. Does insect availability affect nectar feeder visitation rates in Anna's hummingbirds (*Calypte anna*)? *School of Life Sciences Undergraduate Research Program Symposium, Arizona State University, Tempe, AZ, USA.*
- 2011** Keller, S, **Simpson, RK**, Ribble, D, Elaydi, S, Hasfura, R. Niche modeling using mathematical models. *Joint Mathematics Meeting, New Orleans, LA, USA.*
- Keller, S, **Simpson, RK**, Hasfura, R, Elaydi, S, Ribble, R. Modeling mammalian geographic ranges using georeferenced environmental data and mathematical models. *Texas Mammologist Society, Junction, TX, USA.*
- Simpson, RK**, Johnson, MA, Murphy, TG. The loss of female ornamentation: does the cost of migration favor sexual dichromatism in wood-warblers? *Joint Meeting of the Animal Behavior Society & International Ethological Conference, Bloomington, IA USA*
- 2010** **Simpson, RK** & Ribble, D. Changing geographic distributions of mammals around Bexar County, Texas. *Southwestern Association of Naturalists, Junction, TX, USA.*

SERVICE
Journal referee for:

Animal Behaviour

Behavioral Ecology

Evolution

Nature Communications

Behaviour

Behavioral Ecology and Sociobiology

Journal of Avian Biology

PLoS One

Proceedings of the Royal Society B
Integrative Zoology

Science of Nature

Grant Reviewing:

Arizona State University

- 2014-2016** School of Life Sciences faculty, post-doc, and graduate student research grants
2014 School of Life Science Undergraduate Research program applications
2012-2014 Graduate and Professional Student Association travel and research grants

Trinity University

- 2011-2012** Mind Science Foundation research grants

University/Departmental Administration Service:

Arizona State University

- 2017-2018** Graduate and Professional Student Association Supreme Court Justice
- reviewed cases of graduate student code violations
- 2017** School of Life Sciences Ambassador to Alumni Coach
- taught new students in program how to contact alumni successfully
- 2016-2017** School of Life Sciences Ambassador to Alumni
- contacted biology MSc/PhD alumni to reconnect them to our school
- 2016-2017** Graduate and Professional Student Association Assembly Member
- promoted graduate student wellbeing; represented graduate students to the university; oversaw distribution of internal grants to graduate students
- 2015** Graduate and Professional Student Association Assistant Director of New Initiatives - *helped create new graduate student grant to aid with interview travel*
- 2014-2016** School of Life Sciences Research and Training Initiative student representative
- represented graduate students within department; helped students seek out funding sources

Trinity University

- 2011-2012** Biology Club President
- organized student-faculty social event; promoted student needs
- 2010-2011** Biology Club Executive Leader
- organized student-faculty social and outreach events

Public Outreach:

- 2018** Science on Tap: Birds and Beers bird trivia event (Windsor ON)
- lightning talk on bird coloration; helped organize bird trivia
- 2018** London Bug Day outreach event at the London Children's Museum (London ON)
- helped show off neat bugs and run bug-themed activities for children
- 2016** Presenter at pollinator-themed PLANeT Celebration at the Phoenix Desert Botanical Garden (Phoenix, AZ) - *presented information on hummingbirds*

- 2015** Bird Olympics instructor with Audubon Arizona (Phoenix, AZ)
- organized undergraduate student volunteers for children activities
- 2013-2014** Bug-Theater outreach program participant (Phoenix, AZ)
- showcased local insect diversity to children using black lights
- 2012-2014** Graduate Partners in Science Education Mentor (Phoenix, AZ)
- helped 7th & 8th grade students at low-income schools conduct projects for Phoenix Science Fair
- 2012-Present** Ask a Biologist Question Answerer (<http://askbiologist.asu.edu>; Phoenix, AZ)
- answered questions posted online by students K-12
- 2011-2012** Outreach booth at Michelle Lake Audubon Fall Festival (San Antonio, TX)
- organized and ran booth with biology-themed children activities
- 2011** Animal Behavior Society Film Committee Member (San Antonio, TX)
- judged amateur and professional films submitted to society competition
- 2011** Queens University Biological Station Public Science Fair (San Antonio, TX)
- showcased our research to public at field station

PROFESSIONAL SOCIETY MEMBERSHIPS

International Society for Behavioral Ecology
 Society for Integrative and Comparative Biology

Animal Behavior Society
 Society of American Naturalists

REFERENCES

Stephanie Doucet, Associate Professor - Department of Biological Sciences
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