

## **Richard K Simpson**

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**Citizenship:** United States

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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.

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### **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)

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### **ACADEMIC POSITIONS**

**2018-Present**                      Post-doctoral Fellow                      University of Windsor

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### **PUBLICATIONS**

#### **Peer-Reviewed Journal Articles**

9. **Simpson, RK** & McGraw, KJ. (2018) Experimental trait mis-matches uncover specificity of evolutionary links between multiple signaling traits and their interactions in hummingbirds. *Evolution*, *Accepted*.
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, GM, 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

- 2017** **Credited in:** Why some things are shiny? (INSIDER Science video; [link](#))
- 2016** **Credited in:** Super Hummingbirds (PBS Nature documentary on hummingbirds; [link](#))
- 2014** **Featured in:** Strum, M. Faint of Heart Need Not Apply. ASU's School of Life Sciences Magazine. 10, 1:19-23

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## CURRENT PROJECTS

### 6. 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)
- **Products in progress: Simpson, RK & McGraw, KJ.** Variable courtship signal evolution produces complex interactions in hummingbird visual traits. *In Review at The American Naturalist.*

#### 5. Natural and sexual 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, Mistakidis, AF, Doucet, SM.** Natural, sexual and environmental selection all drive wood warbler color diversity and sexual dichromatism. *Intended for American Naturalist.*
- **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.*

#### 4. 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: Saini, C, Hutton, P, Gao, S, Simpson, RK, Giraudeau, M, Sepp, T, Webb, E, McGraw, KJ.** Exposure to artificial light at night increases innate immunity during development in a precocial bird; *Intended for J. of Comparative Physiology B.*
- **Simpson, RK & McGraw, KJ.** Effects of human-induced rapid environmental change on sexual selection. *Intended for Behavioral Ecology and Sociobiology.*

#### 3. Coloration and sexual dimorphism in jumping spiders

- **Collaborators:** Dr. Lisa Taylor, Laurel Lietzenmayer (PhD student)
- **Products in progress: Lietzenmayer, LB, Simpson, RK, Taylor, LA.** It helps to be red: a comparative study of male coloration, sexual size dimorphism, and male size in Salticids. *Intended for Biology Letters.*

#### 2. Understanding color variation in male and female peafowl

- **Collaborators:** Dr. Jessica Y, Alexis Earl (Masters student)
- **Ongoing work:** Male tail feather size measurements; peahen plumage color analysis; manuscript preparation (2 intended)

#### 1. Angle-dependence in parrot wing and tail feathers

- **Collaborators:** Dr. Kevin McGraw, Steven Reed (undergraduate)
- **Products in progress: Reed, S, Simpson, RK, McGraw, KJ.** Feather morphological predictors of angle-dependent color changes in parrot plumage. *Intended for Journal of the Royal Society Interface.*

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## GRANTS & FELLOWSHIPS

**Fellowships**

ASU = Arizona State University

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

**Research Awards**

<b>2017</b>	United States Agency for International Development Global Development Research Scholar	\$8995
	National Science Foundation: Doctoral Dissertation Improvement Grant (IOS-1702016)	\$20085
<b>2017-2014</b>	ASU College of Liberal Arts and Sciences Graduate Excellence Award (3)	\$650
<b>2016</b>	ASU Research and Training Initiative Graduate Training Fellowship	\$2000
	American Museum of Natural History Frank M. Chapman Memorial Fund	\$1000
<b>2016, 2014</b>	ASU Research and Training Initiative Fieldwork Grant (2)	\$3000
<b>2015</b>	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
<b>2014</b>	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
<b>2014-2013</b>	Sigma Xi: Arizona State University Chapter Grants-In-Aid of Research (2)	\$700
<b>2013</b>	Society for the Study of Evolution: Rosemary Grant Award	\$2250

**Travel Awards**

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

**Service Awards**

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

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## 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\*

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## TEACHING EXPERIENCE

**Workshops****University of Windsor**

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

**University of Florida**

- Phylogenetic analyses in R

**Arizona State University**

- An introduction to using R

**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*

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## 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

- 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.*

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## SERVICE

### Journal referee for:

Animal Behaviour

Behavioral Ecology

Evolution

Nature Communications

Proceedings of the Royal Society B

Behaviour

Behavioral Ecology and Sociobiology

Journal of Avian Biology

PLoS One

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 7<sup>th</sup> & 8<sup>th</sup> 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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