

# SANDRA WINTERS

RESEARCH ASSOCIATE at the UNIVERSITY OF BRISTOL

[sandra.winters@bristol.ac.uk](mailto:sandra.winters@bristol.ac.uk)

+44 0738.878.6209

+1 240.491.6262

Research interests:

evolutionary ecology • adaptive coloration • visual ecology  
complex signals • optimal phenotypes • computer vision

(Updated September 2021)

## ACADEMIC POSITIONS

---

**Research Associate** (2019-present)

Camo Lab, School of Biological Sciences, *University of Bristol*, Bristol, UK

Supervisors: Innes Cuthill, Roland Baddeley, Nick Scott-Samuel

BBSRC funded project “Concealing 3D Objects”

## EDUCATION

---

**Ph.D.** in Biological Anthropology, *New York University*, New York, NY, USA 2019

**M.A.** in Biological Anthropology, *New York University*, New York, NY, USA 2015

**M.S.** in Primate Behavior, *Central Washington University*, Ellensburg, WA, USA 2011

**B.S.** in Psychology & Anthropology, *University of Maryland*, College Park, MD, USA 2008

## PUBLICATIONS

---

Google scholar: [goo.gl/84wbvo](https://goo.gl/84wbvo) ORCID: [0000-0002-9561-5950](https://orcid.org/0000-0002-9561-5950)

In preparation

**Winters S**, Allen WL, Dubuc C, Higham JP. Linking mating signal form and function in primates. Manuscript in prep.

**Winters S & Higham JP.** Simulated evolution of mating signal diversification in a primate radiation. In prep for resubmission.

**Winters S**, Kamilar JM, Webster TH, Bradley BJ, Higham JP. Primate camouflage in the eyes of felids, raptors, and conspecifics. In prep for resubmission.

Peer-reviewed journal articles

- [12] Higham JP, Kimmock CM, Mandalaywala TM, Heistermann M, Cascio J, Petersdorf M, **Winters S**, Allen WL, Dubuc C. 2021. Female ornamentation: is red skin coloration attractive to males, and related to condition, in female rhesus macaques? *Behavioral Ecology* 32:236-247. [doi.org/10.1093/beheco/araa121](https://doi.org/10.1093/beheco/araa121)
- [11] Ghazanfar AA, Kelly LM, Takahashi DY, **Winters S**, Terrett R, Higham JP. 2020. Domestication phenotype linked to vocal behavior in marmoset monkeys. *Current Biology* 30:5026-5032. [doi.org/10.1016/j.cub.2020.09.049](https://doi.org/10.1016/j.cub.2020.09.049)
- [10] **Winters S**, Allen W, Higham JP. 2020. The structure of species discrimination signals across a primate radiation. 2020. *eLife* 9:e47428. [doi.org/10.7554/eLife.47428](https://doi.org/10.7554/eLife.47428)
- Guenon image database: [doi.org/10.5281/zenodo.3572780](https://doi.org/10.5281/zenodo.3572780)  
Occlude-reclassify project code: [doi.org/10.5281/zenodo.3574512](https://doi.org/10.5281/zenodo.3574512)  
C. mona looking time trials: [doi.org/10.5281/zenodo.3572791](https://doi.org/10.5281/zenodo.3572791)  
C. nictitans looking time trials: [doi.org/10.5281/zenodo.3572789](https://doi.org/10.5281/zenodo.3572789)  
Looking time trial project code: [doi.org/10.5281/zenodo.3574529](https://doi.org/10.5281/zenodo.3574529)
- [9] Minkner MMI, **Winters S**, Young C, Weiß B, Ganswindt A, Barrett L, Henzi P, Higham JP, Widdig A. 2020. Male characteristics as predictors of genital color and display variation in vervet monkeys. *Behavioral Ecology and Sociobiology* 74:14. [doi.org/10.1007/s00265-019-2787-4](https://doi.org/10.1007/s00265-019-2787-4)
- [8] Rigai L, Higham JP, **Winters S**, Garcia C. 2019. The redder the better? Skin coloration indicates quality in female Japanese macaques. *Behavioral Ecology and Sociobiology* 73:103. [doi.org/10.1007/s00265-019-2712-x](https://doi.org/10.1007/s00265-019-2712-x)
- [7] Dominy NJ, **Winters S**, Pease DE, Higham JP. 2018. Dr. Seuss and the real Lorax. *Nature Ecology and Evolution* 2:1196-1198. [doi.org/10.1038/s41559-018-0628-x](https://doi.org/10.1038/s41559-018-0628-x)
- [6] Petersdorf M, Dubuc C, Georgiev AV, **Winters S**, Higham JP. 2017. Is male rhesus macaque facial coloration under intrasexual selection? *Behavioral Ecology* 28:1472-1481. [doi.org/10.1093/beheco/arx110](https://doi.org/10.1093/beheco/arx110)
- [5] Rigai LR, MacIntosh AJJ, Higham JP, **Winters S**, Shimizu K, Mouri K, Suzumura T, Furuichi T, Garcia C. 2017. Testing for links between face color and age, dominance status, parity, weight, and intestinal nematode infection in a sample of female Japanese macaques. *Primates* 58:83-91. [doi.org/10.1007/s10329-016-0575-6](https://doi.org/10.1007/s10329-016-0575-6)
- [4] Dubuc C, Allen WL, Cascio J, Lee S, Maestriperi D, Petersdorf M, **Winters S**, Higham JP. 2016. Who cares? Experimental attention biases provide new insights into a mammalian sexual signal. *Behavioral Ecology* 27:68-74. [doi.org/10.1093/beheco/arv117](https://doi.org/10.1093/beheco/arv117)

- [3] Rigai LR, MacIntosh AJJ, Higham JP, **Winters S**, Shimizu K, Mouri K, Furuichi T, Garcia C. 2015. Multimodal advertisement of pregnancy in free-ranging female Japanese macaques (*Macaca fuscata*). *PLoS One* 10:e0135127. [doi.org/10.1371/journal.pone.0135127](https://doi.org/10.1371/journal.pone.0135127)
- [2] **Winters S**, Dubuc C, Higham JP. 2015. Perspectives: the looking time experimental paradigm in studies of animal visual perception and cognition. *Ethology* 121:625-640. [doi.org/10.1111/eth.12378](https://doi.org/10.1111/eth.12378)
- [1] Dubuc C, **Winters S**, Allen WL, Brent LNJ, Cascio J, Maestripieri D, Ruiz-Lambides AV, Widdig A, Higham JP. 2014. Sexually selected skin colour is heritable and related to fecundity in a non-human primate. *Proceedings of the Royal Society B: Biological Sciences* 281:20141602. [doi.org/10.1098/rspb.2014.1602](https://doi.org/10.1098/rspb.2014.1602)

#### Book sections

- [4] **Winters S**, Petersdorf M, Higham JP. Charles Darwin and sexual selection in relation to sex in the colors of monkeys. 2019. In: *Darwin's Roadmap to the Curriculum: Evolutionary Studies in Higher Education*, Wilson DS, Geher G, Head H, Sokol-Chang R (eds). Oxford University Press. p 97-116. [doi.org/10.1093/oso/9780190624965.003.0006](https://doi.org/10.1093/oso/9780190624965.003.0006)
- [3] **Winters S**. Aposematism. 2018. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J & Shackelford TK (eds). Springer, Cham. [doi.org/10.1007/978-3-319-47829-6\\_313-10/978-3-319-47829-6\\_313-1](https://doi.org/10.1007/978-3-319-47829-6_313-10/978-3-319-47829-6_313-1)
- [2] **Winters S**. Ornamentation. 2018. In: *Encyclopedia of Animal Cognition and Behavior*, Vonk J & Shackelford TK (eds). Springer, Cham. [doi.org/10.1007/978-3-319-47829-6\\_315-1](https://doi.org/10.1007/978-3-319-47829-6_315-1)
- [1] Higham JP & **Winters S**. Color and mate choice in non-human animals. 2016. In: *Handbook of Color Psychology*, Elliott AJ, Fairchild MD, (eds). Cambridge University Press: Cambridge, UK. p 502-530. [doi.org/10.1017/CBO9781107337930.025](https://doi.org/10.1017/CBO9781107337930.025)

#### Book & conference reviews

- [3] **Winters S** & Higham JP. 2015. Martin Stevens: Sensory Ecology, Behaviour, and Evolution. *International Journal of Primatology* 36:205-208. [doi.org/10.1007/s10764-015-9811-y](https://doi.org/10.1007/s10764-015-9811-y)
- [2] **Winters S**, Dunayer ES, Petersdorf M, Simons ND, Tinsman J. 2015. Primatology and conservation in Hanoi, Vietnam. *Evolutionary Anthropology* 23:201-204. [doi.org/10.1002/evan.21429](https://doi.org/10.1002/evan.21429)
- [1] Higham JP, Amann AL, Bryer MAH, Thompson NA, **Winters S**. 2013. Review of The Evolution of Primate Societies (Eds. John C. Mitani, Josep Call, Peter M. Kappeler, Ryne A. Palombit, and Joan B. Silk). *International Journal of Primatology* 34:1298-1303. [doi.org/10.1007/s10764-013-9731-7](https://doi.org/10.1007/s10764-013-9731-7)

### Published abstracts

- [7] Higham JP, Allen WA, **Winters S**. 2018. The evolution of guenon face patterns. *Primate Research Supplement* 34:48. [doi.org/10.14907/primate.34.0\\_48\\_2](https://doi.org/10.14907/primate.34.0_48_2)
- [6] Rigaiil L, MacIntosh AJJ, Higham JP, **Winters S**, Furuichi T, Garcia C. 2017. Face colour indicates female reproductive state but not individual characteristics in Japanese macaques (*Macaca fuscata*). *Folia Primatologica* 88:100-101. [doi.org/10.1159/000479094](https://doi.org/10.1159/000479094)
- [5] Rigaiil LR, MacIntosh AJJ, Higham JP, **Winters S**, Shimizu K, Mouri K, Furuichi T, Garcia C. 2015. Female Japanese macaques advertise pregnancy in multiple modalities. *Folia Primatologica* 86:346. [doi.org/10.1159/000435825](https://doi.org/10.1159/000435825)
- [4] Rigaiil LR, MacIntosh AJJ, Higham JP, **Winters S**, Shimizu K, Mouri K, Furuichi T, Garcia C. 2015. Multiple sexual signals of pregnancy in Japanese macaques. *Primate Research Supplement* 31:72. [doi.org/10.14907/primate.31.0\\_72\\_2](https://doi.org/10.14907/primate.31.0_72_2)
- [3] Milich KM, Dubuc C, **Winters S**, Allen WL, Rosenfield KA, Graham S, Higham JP, Maestripieri D. 2015. Red-hot males: sexual strategies of high-ranking male rhesus macaques (*Macaca mulatta*). *American Journal of Physical Anthropology* 156(S60):225-226. [doi.org/10.1002/ajpa.22718](https://doi.org/10.1002/ajpa.22718)
- [2] **Winters S**, Kamilar JM, Webster TH, Bradley BJ, Higham JP. 2014. Primate camouflage as seen by felids, raptors, and conspecifics. *American Journal of Physical Anthropology* 153(S58):275. [doi.org/10.1002/ajpa.22488](https://doi.org/10.1002/ajpa.22488)
- [1] Simons ND, **Winters S**, Lorenz JG. 2014. Comparative analysis of length polymorphisms in the promoter region of the serotonin transporter gene (SLC6A4) in Cercopithecidae. *American Journal of Primatology* 73(S1):83. [doi.org/10.1002/ajp.20978](https://doi.org/10.1002/ajp.20978)

## **FUNDING**

---

### Fellowships

2015-2017 MacCracken Fellowship, *New York University*

2012-2015 NSF IGERT Training Fellowship, *New York University*

### Competitive Research Grants

Doctoral Dissertation Research Improvement Grant (**\$22,611**), 2016, *National Science Foundation*

General Small Grant (**\$1,250**), 2015, *American Society of Primatologists*

Graduate Student Summer Research Fellowship (**\$3,500**), 2010, *Central Washington University*

### Institutional Research Awards

NYCEP Research Award (**\$3,000**), 2015, *New York Consortium in Evolutionary Primatology*

NYCEP Research Award (**\$3,498**), 2014, *New York Consortium in Evolutionary Primatology*

### Travel Awards

Animal Behavior Society Graduate Student Travel Grant (**\$500**), 2019  
International Society for Behavioral Ecology Travel Award (**\$500**), 2018  
International Society for Behavioral Ecology Travel Award (**\$1,250**), 2016  
New York University Dean's Student Travel Grant (**\$500**), 2016  
New York University Student Senators Council's Conference Fund Award (**\$630**), 2014  
New York University Dean's Student Travel Grant (**\$500**), 2014

## **TEACHING EXPERIENCE**

---

### Adjunct Instructor

Human Evolution, New York University (22 undergraduates): 2018  
Human Origins Laboratory, New York University (2 x 22 undergraduates): 2018, 2014  
Human Evolution Laboratory, New York University (2 x 22 undergraduates): 2017, 2014

### Teaching Assistant

Quantitative Methods, New York University (15 graduate students): 2016  
Genetics Laboratory, Central Washington University (2 x 30 undergraduates): 2010  
Sociocultural Anthropology & Linguistics, University of Maryland College Park (20 undergraduates): 2007

### Guest lectures

"Darwin and the origin of evolution by natural selection"  
Human Origins, New York University (120 undergraduates), 2018  
  
"Primate diet, predation, and ecology"  
Human Evolution, New York University (120 undergraduates), 2017  
  
"Introduction to R Programming"  
"Mixed models"  
Quantitative Methods, New York University (15 graduate students), 2016  
  
"Studying primates in biological anthropology"  
Departmental Seminar, New York University (10 graduate students), 2014  
  
"Approaches in Behavioral Ecology I: Observation"  
Primate Behavioral Ecology, New York University (20 undergraduates), 2013  
  
"Forensic anthropology"  
Introduction to Biological Anthropology, Central Washington University (60 undergraduates), 2010

## **INVITED TALKS**

---

“Linking visual signal form and function in primates: facial variability in guenons and rhesus macaques” (4 May 2018)

*New York Consortium in Evolutionary Primatology*, New York, NY, USA

“The evolution of guenon face patterns as diverse mating signals” (27 April 2018)

*New York University*, New York, NY, USA

“Guenon face patterns and the maintenance of primate reproductive isolation” (13 October 2016)

*Yale University*, New Haven, CT, USA

“Primate camouflage in the eyes of felids, raptors, and conspecifics” (7 March 2014)

*New York Consortium in Evolutionary Primatology*, New York, NY, USA

## **SUPERVISING & MENTORING**

---

Undergraduate interns supervised in the Camo Lab at University of Bristol:

Arina Huang (2019)

Undergraduate thesis projects co-supervised:

Lisa Ramirez (New York University; 2018-2019)

Allegra Depasquale (City University of New York; 2015-2016)

Undergraduate students mentored in the NYU Diversity Undergraduate Research Incubator:

Noelle Desir (2018)

Lisa Ramirez (2018)

Undergraduate interns supervised in the Primate Reproductive Strategies Lab at NYU:

Janki Tailor (2018)

Elise Blegen (2017)

Constanza Galindo (2016)

Allegra Depasquale (2015)

Alex Samaras (2015)

Paul Brown (2014)

## **AWARDS**

---

Sherwood Washburn Award (Best Student Podium Presentation), 2014

*American Association of Physical Anthropology*

## CONFERENCE PRESENTATIONS

---

(visuals for presentations since 2014 available at [www.sandrawinters.net/presentations](http://www.sandrawinters.net/presentations))

- 2019 Winters S & Higham HP. Simulating the evolution of inter-specific mating signal diversity: a machine learning approach [podium presentation]. Joint meeting of the 36<sup>th</sup> *International Ethological Conference* and the 56<sup>th</sup> *Annual Conference of the Animal Behavior Society*, Chicago, USA.
- 2017 Winters S, Allen WL, Higham JP. Analyzing visual signals using biologically-inspired computer vision algorithms [podium presentation]. Joint meeting of the 35<sup>th</sup> *International Ethological Conference* and the 2017 *Summer Meeting of the Association for the Study of Animal Behaviour*, Estoril, Portugal.
- 2016 Winters S & Higham JP. Visual biases and the evolution of species discrimination in guenons [podium presentation]. Joint meetings of the 26<sup>th</sup> *Congress of the International Primatology Society* and the 39<sup>th</sup> *Meeting of the American Society of Primatologists*, Chicago, IL, USA.
- Winters S & Higham JP. Visual biases and the evolution of species discrimination in guenons [podium presentation]. 16<sup>th</sup> *International Behavioral Ecology Congress*, Exeter, UK.
- 2015 Winters S, Kamilar JM, Webster TH, Bradley BJ, Higham JP. Primate camouflage as seen by felids, raptors, and conspecifics [poster]. 52<sup>nd</sup> *Annual Conference of the Animal Behavior Society*, Anchorage, AK, USA.
- 2014 Winters S, Allen WL, Higham JP. Machine learning reveals facial regions critical for species recognition in guenons [poster]. 25<sup>th</sup> *Congress of the International Primatological Society*, Hanoi, Vietnam.
- Winters S, Allen WL, Higham JP. Machine learning reveals facial regions critical for species recognition in guenons [poster]. 15<sup>th</sup> *International Behavioral Ecology Congress*, New York, NY, USA.
- Winters S, Kamilar JM, Webster TH, Bradley BJ, Higham JP. Primate camouflage as seen by felids, raptors, and conspecifics [podium presentation]. 83<sup>rd</sup> *Annual Meeting of the American Association of Physical Anthropologists*, Calgary, Canada.
- 2011 Winters S & Sheeran SK. Maternal response to infant disability: a case study of traumatic injury to an infant Tibetan macaque (*Macaca thibetana*) [podium presentation]. *Society for Psychological Anthropology Conference*, Spokane, WA, USA.
- Winters S, Sheeran LK, Wagner S, Li J, Matheson M. Social recruitment in Tibetan macaques (*Macaca thibetana*) at Mt. Huangshan, China [podium presentation]. 64<sup>th</sup> *Northwest Anthropology Conference*, Moscow, ID, USA.

Winters S & Sheeran SK. Maternal response to infant disability: a case study of traumatic injury to an infant Tibetan macaque (*Macaca thibetana*) [podium presentation]. *64<sup>th</sup> Northwest Anthropology Conference*, Moscow, ID, USA.

Winters S, Simons N, Lorenz. Polymorphisms in the promoter region of the serotonin transporter gene in cercopithecine primates [podium presentation]. *64<sup>th</sup> Northwest Anthropology Conference*, Moscow, ID, USA.

2010 Winters S. Enrichment use in captive orangutans at Smithsonian National Zoological Park [poster]. *63<sup>rd</sup> Northwest Anthropology Conference*, Ellensburg, WA, USA.

## **TECHNICAL SKILLS**

---

Programming	Languages: MATLAB, R, Python, Java, Visual Basic, NetLogo, JavaScript, HTML
	Skills: machine learning, computer vision, image processing & analysis, artificial neural networks, agent-based modeling, data wrangling
Statistics	generalized linear mixed models, phylogenetic comparative methods
Laboratory	DNA extraction (saliva), PCR, gel electrophoresis, ELISA enzyme immunoassays
Field	standardized image collection, looking time experiments, audio playback experiments, behavioral data collection, collection of biological samples (e.g. swabs, hair samples), ecological data collection, handling anesthetized primates

## **PROFESSIONAL SERVICE**

---

Ad-hoc peer reviewer: *The American Naturalist*, *American Journal of Primatology*, *Animal Behavior and Cognition*, *Animal Behaviour*, *Animal Cognition*, *Behavioral Ecology, Ecology & Evolution*, *Evolution*, *Integrative Zoology*, *Journal of Mammalian Evolution*, *Journal of the Royal Society Interface*, *PLoS One*, *Proceedings of the Royal Society B: Biological Sciences*, *Scientific Reports* (review metrics: [publons.com/a/1189818](https://publons.com/a/1189818))

## **PROFESSIONAL AFFILIATIONS**

---

American Association of University Women (2016-present)  
American Society of Primatologists (2010-2016)  
Animal Behavior Society (2011-present)  
International Primatological Society (2010-2017)  
International Society for Behavioral Ecology (2014-present)  
Northeastern Evolutionary Primatologists (2014-2019)  
Society for the Study of Evolution (2018-present)



## **CERTIFICATIONS**

---

Wilderness First Aid (2016)  
USA Driving License (2002-present)

## **REFERENCES**

---

Prof. Innes Cuthill (postdoc supervisor): I.Cuthill@bristol.ac.uk  
Prof. Nick Scott-Samuel (postdoc supervisor): N.E.Scott-Samuel@bristol.ac.uk  
Dr. Roland Baddeley (postdoc supervisor): Roland.Baddeley@bristol.ac.uk  
Dr. James P. Higham (PhD supervisor): jhigham@nyu.edu  
Prof. Tamra Mendelson (PhD committee member): tamram@umbc.edu  
Prof. Martin Stevens (PhD committee member): martin.stevens@exeter.ac.uk

## **CONTACT INFORMATION**

---

Address: Life Sciences Building  
24 Tyndall Avenue  
Bristol, BS6 5TZ  
United Kingdom  
Email: sandra.winters@bristol.ac.uk  
Phone: +44 0738.878.6209 (UK)  
+1 240.491.6262 (USA)  
Website: sandrawinters.net  
Twitter: @SandraWinters22  
Skype: sandywinters  
Zoom: sandra.winters@bristol.ac.uk