

# Jacob M. Graving

Max Planck Institute for Ornithology  
University of Konstanz  
Department of Collective Behaviour  
Centre for the Advanced Study of Collective Behaviour  
Universitätsstr. 10  
Konstanz, Germany 78464

✉ jgraving@gmail.com  
☎ +49 176 20710858  
🌐 jakegraving.com  
🐦 twitter.com/jgraving  
🔗 github.com/jgraving

## Education

- 2019 (expected)    **Ph.D., Biology**  
Focus: Collective Behavior  
Department of Collective Behaviour, Max Planck Institute for Ornithology  
Chair of Biodiversity and Collective Behaviour, University of Konstanz  
Centre for the Advanced Study Collective Behaviour, University of Konstanz  
International Max Planck Research School (IMPRS) for Organismal Biology
- 2015    **M.S., Biology**  
Focus: Ethology, Neuroscience  
Department of Biological Sciences, Bowling Green State University
- 2013    **B.S., Biology**  
Focus: Ethology, Neuroscience  
Department of Biological Sciences, Bowling Green State University

## Publications

- In Preparation    Li, L., **Graving, J.M.**, Bak-Coleman, J., Nagy, M., Couzin, I.D. Schooling fish save energy by vortex-phase matching.  
**Graving, J.M.**, Chae, D., Naik, H., Couzin, I.D. Fast and robust animal pose estimation using deep neural networks.  
**Graving, J.M.**, Couzin, I.D.. Dimensionality reduction of behavioral data with deep generative models.
- 2018    Alarcón-Nieto, G.\*, **Graving, J.M.\***, Klarevas-Irby, J.A.\*, Maldonado-Chaparro, A.A., Mueller, I., and Farine, D.R. (2018) An automated barcode tracking system for behavioural studies in birds. *Methods in Ecology and Evolution*. bioRxiv preprint: <https://doi.org/10.1101/201590> \*contributed equally
- 2017    **Graving, J.M.**, Bingman, V.P., Hebets, E.A., and Wiegmann, D.D. (2017). Development of site fidelity in the nocturnal amblypygid *Phrynus marginemaculatus*. *Journal of Comparative Physiology A*, 203(5), 313-328.  
Bingman, V.P., **Graving, J.M.**, Hebets, E.A., and Wiegmann, D.D. (2017). Importance of the antenniform legs, but not vision, for homing by the neotropical whip spider *Paraphrynus laevifrons*. *Journal of Experimental Biology*, 220(5), 885-890.  
Press: Discover Magazine, National Geographic
- 2016    Wiegmann, D.D., Hebets, E.A., Gronenberg, W., **Graving, J.M.**, and Bingman, V.P. (2016). Amblypygids: model organisms for the study of arthropod navigation mechanisms in complex environments. *Frontiers in Behavioral Neuroscience*, 10, 47.

## Research

- 2015–2019    **Max Planck Institute for Ornithology,**  
**Department of Collective Behaviour**  
**University of Konstanz, Chair of Biodiversity and Collective Behaviour**

Iain D. Couzin  
“Perception and Motion in Animal Groups”  
Studying how sensory information networks and internal state drive the collective dynamics of animal groups.

2011–2015      **Bowling Green State University, Department of Biological Sciences**  
Daniel D. Wiegmann, Verner P. Bingman  
“Navigation and Sensory Discrimination in Amblypygids”  
Studied how amblypygids, a taxonomic order of nocturnal arachnids, navigate home in the dark.

2013      **Bowling Green State University, Department of Biological Sciences**  
Sheryl L. Coombs  
“The Sensory Basis of Rheotaxis in Fish”  
Studied how fish use multimodal sensory information to orient to flow.

2009      **SETGO Summer Research Scholar, Bowling Green State University**  
Matthew L. Partin  
“Phenotypic Plasticity in Photosynthetic Stony Corals”  
Studied how genetically identical coral propagules adapt their morphology and physiology to changing environments.

## Teaching

2016–      **University of Konstanz, Chair of Biodiversity and Collective Behaviour**  
Lecturer and Project Advisor, Intensive Research Course for Master’s Students  
– Collective Behavior of Locust Swarms  
– Measuring Animal Behavior with Computer Vision  
– Analyzing Behavioral Data  
– Sensing, Perception, and Movement

2013–2015      **Department of Biological Sciences, Bowling Green State University**  
Graduate Assistant  
– Advanced Biostatistics (for Graduate Students)  
– Introduction to Biostatistics  
– Population and Community Ecology  
– Introductory Biology for Non-Science Majors  
– Guest Lecture on “Arthropod Navigation”, Animal Behavior

2009–2012      **Bowling Green State University, Department of Biological Sciences**  
Student Coordinator and Teaching Assistant, Marine Biology Laboratory  
– Introduction to Inland Marine Research  
– Aquarium Husbandry  
– Reef Aquarium Husbandry I and II

2009      **Bowling Green State University, Department of Environmental Science**  
Student Teaching Assistant, Introduction to Environmental Science

## Funding

2013–2015      **Graduate Research Fellowship**  
100% Tuition Waiver and \$45,000 Stipend  
Bowling Green State University

2013      **Undergraduate Research Fellowship**  
\$5000 Stipend, \$800 Research Funds

Bowling Green State University, Center for Undergraduate Research and Scholarship

2009–2011

**T. Richard Fisher Biology Scholarship**

\$8000/year Tuition Scholarship

Bowling Green State University, Department of Biological Sciences

2009

**Summer Research Fellowship**

\$5000 Stipend, \$1000 Research Funds

Science, Engineering, Technology Gateway Ohio (SETGO), National Science Foundation

2009–2013

**Award of Scholars**

Merit-based 75% Tuition Scholarship

Bowling Green State University, College of Arts and Sciences

## Outreach

2017

**Konstanzer Lange Nacht Der Wissenschaft**

“Long Night of Science” Public Outreach Event

Volunteer

Konstanz, Germany

2016

**Das Schwarmverhalten der Fische**

Public Seminar by Prof. Jens Krause

Volunteer Co-organizer

Konstanz, Germany

2013–2014

**Kid’s Tech University, Bowling Green State University**

Public Outreach Event for Schoolchildren Grades K–8

Volunteer

Bowling Green, Ohio, USA

2008–2010

**The Toledo Zoo Aquarium**

Volunteer and Intern

Toledo, Ohio, USA

## Advisees

Graduate

Ingabritta Hormann, M.S. Biology, University of Konstanz

Simon Gommel, M.S. Biology, University of Konstanz

Taylor Carter, M.S. Biology, University of Konstanz

Undergraduate

Chiara Hirschhorn, B.S. Biology, University of Konstanz

Connie Santangelo, B.S. Biology, Bowling Green State University

Lindsey Cunningham, B.S. Biology, Bowling Green State University

Tracy Togba, B.S. Biology, Bowling Green State University

## Peer Review

*Journals:*

eLife, Science Advances, PNAS

*Grants:*

IMPRS Project Grant, IMPRS Travel Grant

## Skills

### Computational

*Languages:*

Python (Expert), R (Intermediate), MATLAB (Intermediate)

*Applications:* Bayesian inference, statistical analysis, and data visualization  
machine learning, deep learning, computer vision, and image processing

*Libraries:* Stan, tensorflow, keras, pytorch, scikit-learn, OpenCV

## **Biological**

*Physiology:* electrophysiology, histology, ophthalmoscopy, fish lateral line disruption and visualization

*Microscopy:* scanning and transmission electron microscopy, confocal, fluorescence, and general light microscopy

## References

Iain D. Couzin  
Director, Max Planck Institute for Ornithology  
Professor, University of Konstanz  
Department of Collective Behaviour  
icouzin@orn.mpg.de  
+49 7531 88-4928

Daniel D. Wiegmann  
Associate Professor  
Bowling Green State University  
Department of Biological Sciences  
ddwiegm@bgsu.edu  
+1 (419) 372 2691

Verner P. Bingman  
Distinguished Research Professor  
Bowling Green State University  
Department of Psychology  
vbingma@bgsu.edu  
+1 (419) 372 6984

Sheryl L. Coombs  
Professor Emeritus  
Bowling Green State University  
Department of Biological Sciences  
scoombs@bgsu.edu  
+1 (419) 372 1206