

## **J. Frances (Franne) Kamhi**

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### ***Scientific Career***

Denison University

Assistant Professor in Neuroscience, Psychology (beginning August 2022)

Oberlin College

Visiting Assistant Professor in Neuroscience (2019 – present)

Macquarie University

Postdoctoral Fellow (2016 – 2019)

Smithsonian Tropical Research Institute

Research assistant (Summer 2009)

National Institute of Mental Health (USA)

Post-baccalaureate research assistant (2008 – 2009)

### ***Educational Background***

Boston University

Ph.D (2016), Graduate Program for Neuroscience

*Advisor:* James Traniello

Dissertation title: “Neuroecology of social organization in the Australasian weaver ant *Oecophylla smaragdina*”

Oberlin College

BA with high honors (2008), Neuroscience; Psychology minor

### ***Fellowships and Awards***

- Fellow of the Higher Education Academy (2019)
- Macquarie University Early Career Researcher Open Access publishing award (2017)
- International Union for the Study of Social Insects Travel Award (2014)
- George R. Bernard Jr. Travel Award (2012, 2014)
- Boston U. Graduate Program for Neuroscience Research Fellowship (Spring 2013)
- NSF East Asia and Pacific Summer Institute Fellowship, Australia (2012)
- NIH Training Grant, Boston University (2009-2010)
- John Frederick Oberlin Scholar (2004-2008)

### Grants

- Oberlin College Grant-in-Aid (**primary investigator Franne Kamhi**), 1/2022 – 6/2022, “Dopamine cell expression and collective foraging behavior” \$3,300
- Oberlin College Grant-in-Aid (**primary investigator Franne Kamhi**), 9/2020 – 12/2021, “Dopaminergic regulation of adaptive foraging” \$1,695
- Powers International Travel Grant (**primary investigator Franne Kamhi**), 6/2020 – 6/2021, “Neuromodulation of nestmate recognition in the Solomon Island weaver ant” \$3,950
- Oberlin College Grant-in-Aid (**primary investigator Franne Kamhi**), 6/2019 – 12/2019, “Mapping the world: does neural reorganization foster navigational learning?” \$2,255
- Macquarie University Research Development Grant (**lead investigator Franne Kamhi**, co-CI Ajay Narendra, Associate Investigator Andrew Barron), 1/2017 – 12/2018, “Understanding the function of neural circuit changes in visual navigation.” \$49,972
- Macquarie University Strategic Infrastructure Scheme (co-CIs Ajay Narendra, Phil Taylor, Sue Lindsay, Andrew Barron, Mariella Herberstein, **Franne Kamhi**, Nathan Hart, Jane Williamson, Simon Griffith, Martin Whiting, Glenn Brock, Dorrit Jacob), 1/2017, “Automated stereo fluorescence microscope.” \$142,453.92

### Peer-Reviewed Journal Publications

*h*-index: 11; *i*-10 index: 13; Names of students that I mentored are underlined.

1. Islam, M., Deeti, S., **Kamhi, J.F.** and K. Cheng (2021). Minding the gap: detour learning and visual scanning behaviour in nocturnal bull ants. *Journal of Experimental Biology*. doi: 10.1242/jeb.242245. Impact factor: 3.312
2. Islam, M., Deeti, S., Mahmudah, Z., **Kamhi, J.F.** and K. Cheng (2021). Detour learning ability and the effect of novel sensory cues on learning in Australian bull ants *Myrmecia midas*. *bioRxiv*. doi: 10.1101/2021.01.25.428158.
3. **Kamhi, J.F.**, Barron, A.B., and A. Narendra (2020). Vertical lobes of the mushroom bodies are essential for view-based navigation in Australian *Myrmecia* ants. *Current Biology*. doi: 10.1016/j.cub.2020.06.030. Citations: 35, Impact factor: 5.720
4. **Kamhi, J.F.**, Ilies, I., and J.F.A. Traniello (2019). Social complexity and brain evolution: comparative analysis of modularity and integration in formicine ant brain organization.

- Brain, Behavior and Evolution* 93:4-18. doi: 10.1159/000497267. Citations: 11, Impact factor: 2.103
5. Sheehan, Z., **Kamhi, J.F.**, Seid, M.A., and A. Narendra (2019). Differential investment in brain regions for a diurnal and nocturnal lifestyle in Australian *Myrmecia* ants. *Journal of Comparative Neurology* 527(7): 1261-1277. Citations: 21, Impact factor: 3.33
  6. **Kamhi, J.F.**, Arganda, S., Moreau, C.S. and J.F.A. Traniello (2017). Origins of aminergic regulation of behavior in complex insect social systems. *Frontiers in Systems Neuroscience* 11 (74): doi: 10.3389/fnsys.2017.00074. Citations: 50, Impact factor: 3.79
  7. Narendra, A., **Kamhi, J.F.**, Y. Ogawa (2017). Moving in dim light: behavioural and visual adaptations in nocturnal ants. *Integrative and Comparative Biology* 57(5): 1104-1116. Citations: 22, Impact factor: 2.149
  8. **Kamhi, J.F.**, Sandridge-Gresko, A., Walker, C., Robson, S.K.A., and J.F.A. Traniello (2017). Worker brain development and colony organization in ants: does division of labor influence neuroplasticity? *Developmental neurobiology* 77 (9): 1072-1085. Citations: 11, Impact factor: 2.529
  9. **Kamhi, J.F.**, Gronenberg, W., Robson, S.K.A., and J.F.A. Traniello (2016). Social complexity influences brain production and operation costs in ants. *Proceedings of the Royal Society: B.* 283 (1841): 20161949. Citations: 40, Impact factor: 5.051
  10. Giraldo, Y.M., **Kamhi, J.F.**, Fourcassié, V., Moreau, M., Robson, S.K.A., Rusakov, A., Wimberly, L., Diloreto, A., Kordek, A., and J.F.A. Traniello (2016). Lifespan behavioral and neural resilience in a social insect. *Proceedings of the Royal Society: B.* 283 (1822): 20152603. Citations: 29, Impact factor: 5.051
  11. **Kamhi, J.F.**, Nunn, K., Robson, S.K.A., and J.F.A. Traniello (2015). Polymorphism and division of labor in a socially complex ant: neuromodulation of aggression in the Australian Weaver Ant, *Oecophylla smaragdina*. *Proceedings of the Royal Society: B.* 282(1811): 20150704. Citations: 50, Impact factor: 5.051; recommended in F1000 Prime as being of special significance in its field
  12. **Kamhi, J.F.** and J.F.A. Traniello (2013). Biogenic amines and collective organization in a superorganism: neuromodulation of social behavior in ants. *Brain, Behavior and Evolution*, 82(4): 220-236. Citations: 64, Impact factor: 2.103
  13. Muscedere, M.L., Johnson, N., Gillis, B. C., **Kamhi, J. F.**, and J.F.A. Traniello (2012). Serotonin modulates worker responsiveness to trail pheromone in the ant *Pheidole dentata*. *Journal of Comparative Physiology*, 198(3): 219-227. Citations: 47, Impact factor: 1.988

14. Snyder, J.S., Choe, J.S., Clifford, M.A., Jeurling, S.I., Hurley, P., Brown, A., **Kamhi, J.F.**, and H.A. Cameron (2009). Adult-born neurons are more numerous, faster maturing and more involved in behavior in rats than in mice. *Journal of Neuroscience*, 29(46): 14484-14495. Citations: 447, Impact factor: 6.344
15. Snyder, J.S., Glover, L.R., Sanzone, K.M., **Kamhi, J.F.**, and H.A. Cameron (2009). The effects of exercise and stress on the survival and maturation of adult-generated granule cells. *Hippocampus*, 19(10): 898-906. Citations: 218, Impact factor: 5.492

### ***Invited Presentations***

1. **Kamhi, J.F.** (October 2021). Landmark navigation in Australian bull ants. University of California, Riverside; Neuroscience Program virtual seminar.
2. **Kamhi, J.F.** (September 2021). Tiny brains make big decisions: the neuroecology of ant foraging behavior. Cleveland State University; Ecology, Evolution, and Environmental Science seminar.
3. **Kamhi, J.F.** (November 2020). The neuroecology of ant behavior. East Carolina University; Biology Department virtual seminar.
4. **Kamhi, J.F.** and A. Narendra (August 2018). Knowing where you're going: how the ant brain processes spatial information. International Union for the Society of Social Insects Congress; Symposium: Neuroethology of the hive mind. Guarajá, Brazil.
5. **Kamhi, J.F.** (April 2018). The neuroecology of ant social behaviour and visual navigation. Evolution/Behaviour lab group meeting at University of Melbourne, VIC, Australia.
6. **Kamhi, J.F.** and A. Narendra (February 2018). Neural mechanisms underlying visual landmark orientation in ants. Deutsche Forschungsgemeinschaft (DFG; German Research Council) workshop; Symposium: Decision making and communication in social and ecological contexts. Katoomba, NSW, Australia.
7. **Kamhi, J.F.**, Sheehan, Z., and A. Narendra (December 2017). Neural adaptations for ants navigating in low light environments. Australasian Neuroscience Society; Symposium: Knowing where you're going: comparative perspectives on a core problem. Sydney, NSW, Australia
8. **Kamhi, J.F.** (May 2017). Leading session on integrating and resolving conflicting cues. Perspectives on how insects integrate multiple behaviours workshop. Sydney, NSW, Australia
9. **Kamhi, J.F.**, Robson, S.K.A., Gronenberg, W., and J.F.A. Traniello (July 2014). The neuroecology of social organization in the Australian weaver ant, *Oecophylla*

*smaragdina*. International Union for the Society of Social Insects Congress; Symposium: Integrative analyses of division of labor. Cairns, Queensland, Australia.

### **Conference Presentations**

1. Coto, Z.N., Fandozzi, E., Azorsa, F., Mashimo, B., Riley, J., Muratore, I.B., Waters, J.S., Harrison, J.F., Perl, C.D., **Kamhi, J.F.**, Muscedere, M., Traniello, J.F.A. (January 2022). Brain size, metabolic scaling, and social complexity in ants. Oral presentation, Causal Mechanisms of Metabolic Scaling Symposium. Society for Interactive and Comparative Biology Annual Meeting, Tempe, AZ.
2. **Kamhi, J.F.**, Barron, A.B., and A. Narendra (August 2020). View based navigation in ants requires the mushroom body vertical lobes. Animal Behaviour Live, virtual conference.
3. **Kamhi, J.F.** and A. Narendra (July 2018). Visual navigation in ants: what is the role of the mushroom body in processing landmark information. International Congress of Neuroethology, Brisbane, QLD, Australia.
4. Jaroslow, D., **Kamhi, J.F.**, and A. Narendra (July 2018). Sex-based differences in ant neuroplasticity. International Congress of Neuroethology, Brisbane, QLD, Australia.
5. Sheehan, Z., **Kamhi, J.F.**, and A. Narendra (July 2018). Size or light: what drives neural investment in bull ants? International Congress of Neuroethology, Brisbane, QLD, Australia.
6. Narendra, A., **Kamhi, J.F.**, and Y. Ogawa (July 2018). Action in dim light: vision and visual navigation of nocturnal ants. International Congress of Neuroethology, Brisbane, QLD, Australia.
7. **Kamhi, J.F.**, Ogawa, Y., Szwaja, P., Barron, A.B., and A. Narendra (July 2017). Pharmacologically determining mushroom body function in visual navigation. Australasian Society for the Study of Animal Behavior, Mooroolbark, VIC, Australia.
8. Arganda, S., Arganda-Carrera, I., Gordon, D.G., Beaudoin, M. Hoadley, A.P., **Kamhi, J.F.**, and J.F.A. Traniello (August 2016). Statistical brain atlases illuminate the evolution of brain structure. European International Union for the Society of Social Insects Congress, Helsinki, Finland, by S.A.
9. **Kamhi, J.F.**, Gronenberg, W., Robson, S.K.A., and J.F.A. Traniello (July 2016). Social organization in ants affects brain production and operation costs. Australasian Society for the Study of Animal Behavior, Katoomba, NSW, Australia.
10. **Kamhi, J.F.** and J.F.A. Traniello (June 2015). Brain metabolic investment and social complexity in the Australian weaver ant *Oecophylla smaragdina* and sister species

*Formica subsericea*. Social Insects in the Northeast Regions Meeting. Boston University, Boston, MA.

11. **Kamhi, J.F.** and J.F.A. Traniello (November 2014). Neuromodulation and social organization in the Australian weaver ant *Oecophylla smaragdina*. Social Insects in the Northeast Regions Meeting. Cornell University, Ithaca, New York.
12. **Kamhi, J.F.**, Gordon, D.G., Ronk, K.C., Gronenberg, W., and J.F.A. Traniello (August 2013). Social role, age, experience, and synaptic remodeling in the Australian weaver ant, *Oecophylla smaragdina*. Poster presented at the Neuroethology: Behavior, Evolution, and Neurobiology Gordon Research Conference, Mt. Snow Resort in West Dover, Vermont.
13. **Kamhi, J.F.**, Robson, S.K.A., and J.F.A. Traniello (June 2013). The neuroethology of division of labor in the Australian weaver ant, *Oecophylla smaragdina*. James Cook University School of Marine and Tropical Biology Postgraduate Student Conference. Townsville, Queensland, Australia
14. **Kamhi, J.F.**, Giraldo, Y.M., Nunn, K., Patel, E., Walker, C.L., Gronenberg, W., and J.F.A. Traniello (October 2012). Brain structure and division of labor in ants: the neuroecology of social complexity. Poster presented at the Society for Neuroscience conference, New Orleans, LA.
15. Douglass, J.K., **Kamhi, J.F.**, Coronado-Rivero, J., and W.T. Wcislo (August 2010). Brain scaling in insects: Does being small intensify "brain vs. brawn" trade-offs? Poster presented at the 9th International Congress of Neuroethology, Salamanca, Spain, by J.K.D.

### ***Teaching and Mentoring Experience***

#### *Courses taught*

- Neuroethology, lecture and lab (Oberlin College, Spring 2020; Fall 2020, 2021)
- Senior seminar: Brain evolution and behavior (Oberlin College, Spring 2021)
- The brain: an introduction to neuroscience (Oberlin College, Fall 2019; Spring 2021)
- Introductory neuroscience lab (Oberlin College, Fall 2019; Spring 2021)
- Quantitative Toolkit: Patterns and Predictions (team taught; Oberlin College, Summer 2020)
- Invertebrate neurobiology (Oberlin College, Fall 2019)

#### *Guest Lectures*

- Ants in society (Oberlin College, Ethnobiology first-year seminar; Nov. 2021)
- Insect Hormones (Macquarie University, Science of Sex course; 2018)

- Invertebrate Neurobiology (Macquarie University, Invertebrate Biology course; 2017, 2018)
- Animal Hormones (Macquarie University, Comparative Physiology course; 2017, 2018, 2019)

#### *Teaching Fellowships*

- Neurophysiology, lab (Macquarie University, Semester 1, 2019)
- Graduate Systems and Behavioral Neuroscience, lab and discussion (Boston University [BU], Spring 2012 and 2014)
- Graduate Cellular and Systems Neuroscience, discussion (BU, Fall 2011 and 2013)
- Principles of Neuroscience, lab and discussion (BU, Fall 2012)
- Experimental Psychology: Physiological, lab (BU, Spring 2011)
- Introduction to Cellular and Systems Neuroscience, discussion (BU, Fall 2010)

#### *Graduate and Undergraduate Mentoring*

PhD: Muzahid Islam (2017 – 2020, successfully completed)  
Masters: Duncan Jaroslow, Macquarie U. (2017 – 2018, successfully completed)  
Zachary Sheehan, Macquarie U. (2016 – 2017, successfully completed)  
Honors: Kelley Nunn, Boston U. (2011 – 2012, successfully completed)  
Undergraduate: 2 current students, 19 students total, Oberlin College, Macquarie U., Boston U., James Cook U. (2011 – present)

#### ***Membership and Professional Services***

- Program Committee for the International Union for the Study of Social Insects (July 2021 – present)
- Diversity, Equity, and Inclusion board for the International Union for the Study of Social Insects (December 2020 – present)
- Co-editor of special issue on “Neuroethology of the colonial mind” in *Frontiers in Ecology and Evolution* (August 2020-present)
- Grant reviewer for The Paul G. Allen Frontiers Group (2021)
- Counsel of the Australasian Society for the Study of Animal Behavior (2017 – 2018)
- Co-organized the 5<sup>th</sup> annual Social Insects in the Northeast Regions Meeting (2015)
- Traniello Lab Safety Coordinator (2013 – 2015)
- Member of the International Union for the Study of Social Insects
- Member of the International Congress of Neuroethology

- Expert peer-reviewer for general biology and specialty journals such as *Proceedings of the Royal Society B*, *Scientific Reports*, *Developmental Neurobiology*, *Behavioral Ecology*, *PLoS One*, *Journal of Comparative Physiology A*, *Journal of Comparative Neurology*, *Journal of Experimental Biology*, *Behavioral Ecology and Sociobiology*, and *Journal of Insect Physiology*

### ***Community Scientific Outreach***

- Teaching and Research in Natural Sciences for Development (TReND) in Africa, Neuroscience School volunteer teacher (2016 – present)
- Improv Theatre Sydney collaborative science and improvisational theatre event presenter (May 2018)
- Volunteer for Australia’s National Indigenous Science Education Program (2018)
- Volunteer organizer for Minibeast outreach program with elementary schools (April 2018)
- Speaker at Sydney’s Society for Insect Studies Inc. event (community group hosted by the Australian Museum; August 2017)
- Graduate Women in Science and Engineering Mentoring Program, Boston U. (2014-2015)
- Contributor to the American Computer Museum Exhibit on Brains and Thinking Machines; Bozeman, Montana, USA (2014)
- Volunteer teacher for Biology Inquiry and Outreach with Boston University Graduate Students, with under-represented high school students (2010-2015)
- Volunteer judge for Massachusetts State Science and Engineering Fair (2010-2015)

### ***Media Coverage***

- **The Brink:** “From ant brains, seeking new lessons about human behavior and society” by Kat McAlpine (2020)
- **Insectes Sociaux:** Interview <https://insectessociaux.com/2016/05/21/interview-with-a-social-insect-scientist-franne-kamhi/> (2016)
- **Smithsonian:** “These unusual American ants never get old” by Marcus Woo (2016)
- **Australian Broadcasting Corporation (ABC):** “Brain chemical turns tree ants into aggressive soldiers” by Clare Pain (2015)
- **Behavioral Ecology and Sociobiology:** Cover photograph, Australian weaver ants (2015)
- **Boston University Research:** “Five thousand heads are better than one” by Barbara Moran (2014)