

# MARIO MUSCEDERE

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## Professional Experience

- 2019–present Senior Lecturer, Department of Biology, Boston University.  
2019–present Director, Undergraduate Program in Neuroscience, CAS, Boston University.  
2019–2023 Director, Postdoctoral Associate Lecturer Program, Dept of Biology, Boston Univ  
2017–2019 Lecturer, Department of Biology, Boston University.  
2014–2017 Assistant Professor, Biology Dept. and Neurosci Program, Hendrix College, AR.  
2011–2014 HHMI Postdoctoral Faculty Fellow, Undergrad Prog in Neurosci, Boston Univ

## Education

- 2011 Ph.D., Boston University, Biology (Ecology, Behavior, and Evolution).  
2002 B.S., University of Maryland at College Park, Biological Sciences (Behavior, Ecology, Evolution, and Systematics), *magna cum laude*, with High Honors in Entomology.

## Teaching and Curriculum Development

- 2017–present Instructor at Boston University for:
- CAS BI 315 Systems Physiology (ongoing, 13 semesters)
  - Evolution module of CAS NE 101 Intro to Neuroscience (ongoing, 6 semesters)
  - CAS BI 225 Behavioral Biology (Fall '22, Spring '22, '23)
  - CAS BI/NE 542 Neuroethology (Spring '20, '21)
  - CAS BI 579 Progress in EBE/MB (Fall '20)
  - MET BI 105 Intro. Biol. for Health Sciences (Fall '17, '18, '19)
  - CAS NE 101 Introduction to Neuroscience (SUM 1 '19)
  - CAS BI 105 Intro. Biol. for Health Sciences (Fall '17, '18)
  - CAS BI/NE 545 Neurobiology of Motivated Behavior (Fall '17, '18)
  - CAS BI 594 Topics: Neurobiology of Social Behavior (Spring '18)
- Designed all lectures, assignments, and assessments for lectures and discussions.
- 2021-2022 Lead the Undergraduate Program in Neuroscience, in partnership with the CAS Writing Program's Writing in the Disciplines group, to develop the first Writing Action Plan for a CAS major. This major effort is restructuring writing instruction in the Program through curricular revisions and new course proposals.
- 2017–2020 Designed, proposed, and received final course and BU Hub approval for (1) KHC BI 104 Conflict and Cooperation and (2) a sequence of 10 research-for-credit courses for the Neuroscience major. Additionally, completed BU Hub revisions for the existing courses BI 105, BI 315, and BI/NE 542.
- 2014–2017 Assistant Professor at Hendrix College. Instructor for:
- BIOL 320 Animal Physiology (Fall '14, Spring '16 & '17, writing intensive)
  - BIOL 425 Systems Neuroscience (Spring '15, '16, '17)
  - BIOL 300 Comparative Animal Behavior (Fall '15 & '16, writing intensive)
- Designed all lectures, assignments, laboratory exercises, and assessments.

- 2014–2016 Member of the working group for the design and implementation of the Hendrix College Neuroscience major. Responsibilities included co-creating the learning goals and requirements of the new major as well as designing, proposing, receiving college approval for, and teaching the new course BIOL 425 Systems Neuroscience, an upper-level requirement of the major. The Hendrix faculty approved the major in 2016.
- 2011–2014 Postdoctoral Faculty Fellow and Lecturer in BU's Undergraduate Program in Neuroscience. Responsibilities of this HHMI-funded fellowship included redesigning BU's Neuroscience major by creating new core lecture and laboratory courses for the major (NE 101, 102, and 203); developing all laboratory exercises, assignments, and laboratory manuals for NE 102 and 203; co-instructing courses; coordinating lab courses; and designing and co-teaching the upper-level elective BI/NE 444 Neuroethology (Spring '13, '14, Fall '14, w/Tim Gardner)

### **Diversity, Equity, and Inclusion Efforts**

- 2020–present Teach a self-designed two lecture module on racism in physiology (including group work assignment), and a one lecture module on sexism in physiology, in my course CAS BI 315 Systems Physiology. This course is taken by 650 – 700 students per year; since Fall 2020, these modules have been delivered to almost 2,400 undergraduates.
- 2022–2023 Invited member of the inaugural Boston University Inclusive Pedagogy Institute, 06/07/22 – 06/09/22, and subsequent Learning Communities. My ongoing project aims to produce teaching materials for CAS BI 315 that provide accessible "on-ramps" for students to learn study skills and key foundational concepts.
- 2021 Participated in BU's Inclusive STEM Learning Community offered by the Provost's office and the CTL, 10/14/21 – 11/18/21.

### **Funding**

#### *—Funded NSF Grants—*

- 2020–present Traniello JFA, Harrison JF, **Muscedere ML (co-PI)**, Waters JS. Collaborative Research: Brain size, metabolism, and sociality in ants. NSF IOS 1354291. (\$715,877)

#### *—Other Funded Awards (grants with undergraduate mentees indicated by \*)—*

- \*2017 Hendrix Odyssey Undergraduate Research Grant (to E. Levy, \$3,434)
- \*2017 Hendrix Odyssey Undergraduate Research Grant (to J. Idec, \$3,434)
- 2017 Hendrix Faculty Project Grant (to M. Goadrich and Mario Muscedere, \$1,218)
- 2016 Hendrix Faculty Travel Grant (\$1,200)
- \*2016 Hendrix Odyssey Undergraduate Research Grant (to B. Nolan, \$3,334)
- \*2016 Hendrix Odyssey Undergraduate Research Grant (to K. Chakka, \$3,334)
- \*2015 AR Dept. Higher Ed. Student Undergr. Res. Fellowship (to A. Poole, \$4,937)
- 2015 Hendrix Faculty Travel Grant (\$1,200)
- \*2015 Hendrix Odyssey Undergraduate Research Grant (to B. Pluimer, \$3,831)
- \*2015 Hendrix Odyssey Undergraduate Research Grant (to Y. Bao, \$3,284)
- \*2014 AR Dept. Higher Ed. Student Undergr. Res. Fellowship (to S. Eddington, \$4,912)
- 2011–2014 Howard Hughes Medical Institute Postdoctoral Faculty Fellowship
- 2010 Boston University Graduate Student Organization travel award (\$500)
- 2003–2007 National Science Foundation Graduate Research Fellowship (\$119,000)

### **Publications (undergraduate researchers underlined)**

- Goolsby B, Smith EJ, Muratore IB, Coto ZN, **Muscedere ML**, Traniello JFA. Behavioral and neural resilience to isolation in a eusocial insect. *Brain Behav. Evol.*, in revision.
17. Azorsa F, **Muscedere ML**, Traniello JFA (2022) Socioecology and evolutionary neurobiology of predatory ants. *Front Ecol Evol* 9, 804200. doi: 10.3389/fevo.2021.804200.
  16. Giraldo Y, **Muscedere ML**, Traniello JFA (2021) Eusociality and senescence: neuroprotection and physiological resilience to aging in insect and mammalian systems. *Front Cell Dev Biol* 9, 1556. doi: 10.3389/fcell.2021.673172.
  15. LaVallee J, Grant T, D'Angelo-Early S, Kletsov S, Berry NA, Abt KM, Bloch CP, **Muscedere ML**, Adams KW (2019) Refining the nuclear localization signal within the Egr transcriptional coregulator NAB2. *FEBS Letters* 593: 107-118.
  14. Waxman H, **Muscedere ML**, Traniello JFA (2017) Behavioral performance and neural systems are robust to sensory injury in workers of the ant *Pheidole dentata*. *Brain Behav Evol* 89: 195-208.
  13. **Muscedere ML** (2017) *Pheidole* ants: sociobiology of a highly diverse genus. In: *Reference Module in Life Sciences*, Elsevier. ISBN: 978-0-12-809633-8, doi: 10.1016/B978-0-12-809633-8.01208-5.
  12. **Muscedere ML**, Helms Cahan S, Helms K, Traniello JFA (2016) Geographic and life-history variation in ant queen colony founding correlates with brain amine levels. *Behav Ecol* 27: 271-278.
  11. Iliş I, **Muscedere ML**, Traniello JFA (2015) Neuroanatomical and morphological trait clusters in the ant genus *Pheidole*: evidence for modularity and integration in brain structure. *Brain Behav Evol* 85: 63-76.
  10. **Muscedere ML**, Gronenberg W, Moreau CS, Traniello JFA (2014) Investment in higher-order central processing regions is not constrained by brain size in social insects. *Proc R Soc B* 281: 20140217.
  9. Smith AR, **Muscedere ML**, Seid M, Traniello JFA, Hughes, WOH (2013) Biogenic amines are associated with worker task but not patriline in the leaf-cutting ant *Acromyrmex echinator*. *J Comp Physiol A* 199: 1117-1127.
  8. **Muscedere ML**, Djermoun A, Traniello JFA (2013) Brood-care experience, nursing performance, and neural development in the ant *Pheidole dentata*. *Behav Ecol Sociobiol* 67: 775-784.
  7. **Muscedere ML**, Johnson N, Gillis B, Kamhi JF, Traniello JFA (2012) Serotonin modulates worker responsiveness to trail pheromones in the ant *Pheidole dentata*. *J Comp Physiol A* 198: 219-227.
  6. **Muscedere ML**, Traniello JFA (2012) Division of labor in the hyperdiverse ant genus *Pheidole* is associated with distinct subcaste- and age-related patterns of worker brain organization. *PLoS ONE* 7: e31618. doi:10.1371/journal.pone.0031618.
  5. **Muscedere ML**, Traniello JFA, Gronenberg W (2011) Coming of age in an ant colony: cephalic muscle development correlates with behavioral maturation in *Pheidole dentata*. *Naturwissenschaften* 98: 783-793.
  4. **Muscedere ML**, Berglund JL, Traniello JFA (2011) Polymorphism and division of labor during foraging cycles in the leaf-cutting ant *Acromyrmex octospinosus* (Formicidae; Attini). *J Insect Behav* 24: 94-105.
  3. **Muscedere ML**, Willey TA, Traniello JFA (2009) Age and task efficiency in the ant *Pheidole dentata*: young minor workers are not specialist nurses. *Anim Behav* 77: 911-918.

2. Wilkinson GS, Johns PM, Kelleher ES, **Muscedere ML**, Lorsong A (2006) Fitness effects of X chromosome drive in the stalk-eyed fly, *Cyrtodiopsis dalmanni*. *J Evol Biol* 19: 1851-1860.
1. Thorne BL, Breisch NL, **Muscedere ML** (2003) Evolution of eusociality and the soldier caste in termites: influence of intraspecific competition and accelerated inheritance. *Proc Natl Acad Sci USA* 100: 12808-12813.

**Oral and Poster Presentations (undergraduate coauthors underlined)**

29. Azorsa F, **Muscedere ML**, Traniello JFA. (2022) Diet, social complexity, and brain evolution in predatory ants. Oral presentation, Int'l Union for the Study of Social Insects congress, San Diego CA.
28. Coto Z, Muratore I, Fandozzi E, Azorsa F, Waters J, Harrison J, Perl C, Kamhi JF, **Muscedere ML**, Traniello JFA (2022) Body size, social complexity, and brain metabolic scaling in ants. Oral presentation, Society for Integrative & Comparative Biology meeting, Phoenix AZ.
27. Coto Z, Fandozzi E, Hunter E, Azorsa F, Muratore I, Arganda S, Arganda-Carreras I, Kamhi JF, Waters J, Harrison J, **Muscedere ML**, Traniello JFA (2021) Social complexity and brain metabolism in ants. Oral presentation, Animal Behavior Society meeting virtual.
26. Azorsa F, **Muscedere ML**, Traniello JFA (2021) Diet, social complexity, and brain evolution of predatory ants. Oral presentation, Animal Behavior Society meeting, virtual.
25. Goolsby B, Muratore I, **Muscedere ML**, Traniello JFA. (2018) Neurobiological consequences of worker isolation in a eusocial insect. Poster, BU UROP Symposium, Boston, MA.
24. **Muscedere ML** (2018) Plasticity and resilience in ant social behavior: fitness consequences and neural mechanisms. Invited. Bridgewater State University Department of Biological Sciences weekly seminar, Bridgewater, MA.
23. Chakka K, Bao Y, **Muscedere ML** (2017) Behavioral acceleration after injuries in the ant *Pheidole dentata* is accompanied by changes in brain amine levels. Poster, Society for Integrative & Comparative Biology meeting, New Orleans, LA.
22. Eubank J, Eddington SA, **Muscedere ML** (2017) Body size, task specialization, and olfactory learning in carpenter ants (*Camponotus americanus*). Poster, Society for Integrative & Comparative Biology meeting, New Orleans, LA.
21. Nolan B, **Muscedere ML** (2017) How do *Pheidole dentata* ant workers compensate for antennal injuries when following pheromone trails: critical periods and odor sampling strategies. Poster, Society for Integrative & Comparative Biology meeting, New Orleans, LA.
20. \*Poole AM, **Muscedere ML** (2017) Social resilience and behavioral flexibility in major workers of the ant *Pheidole dentata*. Poster, Society for Integrative & Comparative Biology meeting, New Orleans, LA. *\*Division of Animal Behavior (DAB) Best Poster Honorable Mention*
19. Adams KW, **Muscedere ML**, Lipton PA (2016) Providing an authentic research experience in neurobiology coursework using neuronal differentiation of PC12 cells as a model system. Poster, Society for Neuroscience meeting, San Diego, CA.
18. **Muscedere ML**, Waxman H, Bao Y, Pluimer B, Traniello JFA (2016) Resilience in a miniature nervous system: olfactory impairment minimally affects task performance in ant workers. Oral presentation, Society for Integrative & Comparative Biology meeting, Portland, OR.

17. Eddington SA, **Muscedere ML** (2016) Effects of body size and brain neuromodulators on olfactory learning in carpenter ants (*Camponotus americanus*). Poster, Society for Integrative & Comparative Biology meeting, Portland, OR.
16. Pluimer BR, **Muscedere ML** (2016) Behavioral resilience with a tiny brain: can workers of the ant *Pheidole dentata* compensate for reductions in sensory ability? Poster, Society for Integrative & Comparative Biology meeting, Portland, OR.
15. Bao Y, **Muscedere ML** (2015) Injury-induced behavioral acceleration and brain biogenic amine levels in workers of the ant *Pheidole dentata*. Poster, Central AR Undergraduate Summer Research Symposium, Little Rock, AR. \*Best poster winner
14. **Muscedere ML** (2015) Impacts of physiological and neurobiological variation on behavioral variability in insect societies. Invited. Social Insect Behavior Workshop 2015, Champalimaud Foundation, Lisbon, PT.
13. **Muscedere ML**, Giraldo Y, Gordon DG, Waxman H, Traniello JFA (2014) The development of task performance across the worker lifespan. Invited. Int'l Union for the Study of Social Insects congress, Cairns, AU
12. **Muscedere ML**, Waxman H, Traniello JFA (2012) Is afferent sensory information required for development of central input and processing regions of the insect olfactory system in the ant *Pheidole dentata*? Poster, Society for Neuroscience meeting, New Orleans, LA.
11. **Muscedere ML**, Gronenberg W, Traniello JFA (2011) The ant genus *Pheidole* as a model system in socioecology. Poster, Gordon Research Conference (Neuroethology), Easton, MA.
10. **Muscedere ML** (2010) Brains, muscles, nursing, and foraging: polyethism, behavioral development, and their physiological correlates in *Pheidole*. Oral presentation, Pierce lab group, Harvard University, Cambridge MA.
9. **Muscedere ML**, Traniello JFA (2010) Intra- and interspecific neuroanatomical variation among behaviorally differentiated workers in the ant genus *Pheidole*. Oral presentation, Int'l Union for the Study of Social Insects congress, Copenhagen, DK.
8. \*Mertl A, \***Muscedere ML**, \*Traniello JFA (2009) Age, size, brain and subcaste evolution in the ant genus *Pheidole*. Oral presentation, Entomological Society of America meeting, Indianapolis, IN. \*Talk co-presented by all authors
7. Djermoun A, **Muscedere ML**, Traniello JFA (2009) Behavioral development in a complex social invertebrate: does experience influence nursing competence in the ant *Pheidole dentata*? Poster, Boston Undergraduate Research Symposium, Cambridge, MA.
6. **Muscedere ML**, Seid MA, Johnson N, Willey TA, Gillis B, Traniello JFA (2009) Brains, neurotransmitters, nursing, and foraging in the ant *Pheidole dentata*. Oral presentation, Society for Integrative & Comparative Biology meeting, Boston, MA
5. **Muscedere ML**, Willey TA, Traniello JFA (2007) Behavioral and neural development in the ant *Pheidole dentata*: are callows really specialist nurses? Oral presentation, Animal Behavior Society meeting, Burlington, VT.
4. Willey T, **Muscedere ML**, Traniello JFA (2006) Age and brood care in the ant *Pheidole dentata*: are callows really specialists? Poster, Int'l Union for the Study of Social Insects congress, Washington, DC.
3. Berglund JL, **Muscedere ML**, Genuardi M, Traniello JFA (2006) Polymorphism and division of labor in the leaf-cutter ant *Acromyrmex octospinosus* (Formicidae: Attini) during cycles of foraging and gardening. Poster, Int'l Union for the Study of Social Insects congress, Washington, DC.

2. **Muscedere ML**, Traniello JFA (2006) Comparative neuromorphology and division of labor in North American *Pheidole*. Poster, Int'l Union for the Study of Social Insects congress, Washington, DC.
1. **Muscedere ML** (2001) Behavior of reproductive soldiers of dampwood termites in intraspecific interactions. Oral presentation, Entomological Society of America meeting, San Diego, CA.

### **Laboratory Manuals**

3. Adams KW, **Muscedere ML** (2015) BIOL 441: Cell Signaling. Bridgewater: Department of Biological Sciences, Bridgewater State University.
2. Adams KW, **Muscedere ML**, Lipton PA (2013) NE 102: Principles of Cell and Molecular Neurobiology. Boston: Undergraduate Program in Neuroscience, Boston University.
1. **Muscedere ML**, Adams KW, Blakeley H, Lipton PA (2011) NE 203: Principles of Neuroscience. Boston: Undergraduate Program in Neuroscience, Boston University.

### **Departmental/College/University Service**

- 2019–present Director, Undergraduate Program in Neuroscience, CAS.
- 2017–present Academic advisor to BU Neuroscience majors (38 current advisees).
- 2019–2023 Director, Postdoctoral Associate Lecturer Program, CAS Biology.
- 2020–2022 Postdoctoral Associate Lecturer search committee chair, CAS Biology (8 times).
- 2019–2023 Staff hiring manager, CAS Neuroscience (8 times).
- 2019–2022 Faculty search committee member, CAS Biology (2 Lecturers), CAS Neuroscience (3 Lecturers).
- 2020 Member of the Appointments, Promotion, and Tenure Committee, CAS Biology.
- 2019–2020 Member of the BU Advising Network.
- 2018–2019 Member of the Boston University Premedical and Pre dental Advisory Board.

### **Student mentorship**

- 2019–present PhD committee member (all students BU Biology): Zach Coto, Frank Azorsa, Brandon Guell ('23), and Majo Salazar Nicholls.
- 2011–2022 Undergraduate honors committee member: Matt Cobb (Neuroscience '11), Adina Rusakov (Biology '12), Kelley Nunn (Biology '12), Eva Fandozzi (Neuroscience '19), Troy Gallerani (Neuroscience '20), Eli Panetta (Psychology, '22).
- 2003–2019 Research mentor for 26 undergraduates at BU and Hendrix College who:
- Graduated with departmental honors (8 students).
  - Received competitive intramural (15 students) and extramural (2 students) research grants.
  - Co-authored at least one scientific poster or presentation (15 students).
  - Attended and presented posters describing their work at regional, national, and international scientific meetings (11 students).
  - Co-authored peer-reviewed research publications (6 students).
  - Were accepted to medical school (6 students), veterinary school (1 student), or graduate programs in STEM (7 students) or science journalism (1 student).

## **Pedagogical Training and Conferences**

- 2018–2019 One of eight BU faculty selected for the year-long Scholarship of Teaching and Learning Faculty Learning Community at the BU CTL. Participants received an introduction to how to conduct publication-quality educational research.
- 2019 Educational Innovation Conference, Center for Teaching and Learning, Boston University, 05/03/19.
- 2018 Assessment on Tour: Boston Workshop, ExamSoft, Boston University. 09/25/18.
- 2018 Off to a Good Start: Excellence in Teaching Introductory STEM courses, Massachusetts AAC&U PKAL Regional Network Summer Meeting, Salem State University. 06/15/18.
- 2018 Fostering Academic Success in STEM, Center for Excellence and Innovation in Teaching and Learning, University of New Hampshire. 04/27/18.

## **Other Professional Activities**

### *—Research/Scholarship—*

- 2011–present Subject Editor, *Journal of Insect Science*, Oxford University Press.
- 2004–present Journal reviewer for: *Animal Behaviour*, *American Naturalist*, *Behavioural Processes*, *Biological Conservation*, *Biology Letters*, *Current Biology*, *Insectes Sociaux*, *Journal of Insect Behavior*, *Journal of Theoretical Biology*, *Journal of Zoology*, *Myrmecological News*, *Naturwissenschaften*, *PLoS ONE*, *Proceedings of the Royal Society B*.
- 2015 Invited *ad hoc* grant reviewer, M.J. Murdock Charitable Trust Murdock College Science Research Program.

### *—Teaching—*

- 2018 Subject Matter Expert reviewer for Six Red Marbles (Medford, MA). Project involved reviewing content questions for biological accuracy and relevancy to aid in the development of a novel online study aid for higher education students.
- 2018 External chapter reviewer for Booker et, al., *Principles of Biology*, 3<sup>rd</sup> ed. McGraw-Hill.
- 2018 External chapter reviewer for Hillis et, al., *Principles of Life*, 3<sup>rd</sup> ed. Sinauer.

## **Community/Student Outreach**

### *—Presentations, discussions, and interviews—*

- 2020 “Brains, individuals, and colonies: behavioral physiology of ants”, BU Bug Club, 10/29/20.
- 2020 Panelist for “The Postdoc Landscape: the Range of ‘Non-Traditional’ Post-Docs for Roles in Education,” Program in Graduate Education at Harvard Medical School, 04/14/2020.
- 2015 “Plasticity and resilience in ant social behavior: fitness consequences and neural mechanisms”, Hendrix Biology senior seminar, 09/25/15.
- 2015 “Swarm intelligence and complex group behavior in insects”, Arkansas River Valley Audubon Society, 07/27/15.
- 2015 “Honey bee behavior: swarm intelligence and intelligent swarms”, Hendrix Beekeeping Society, 04/02/15.

- 2014 “Brains, individuals, and colonies: behavioral physiology of ants”, Hendrix Biological Society, 11/03/14.
- 2014 Faculty moderator of the Hendrix TEDx Salon “On the Fringe of Science Fiction”, 09/23/14.
- 2007 One of the six featured myrmecologists in Cambridge Community Television’s documentary "Ants."
- 2004 “The social regulation of foraging in leaf-cutting ants (Formicidae: Attini)”, Nerd Nite Boston, 06/23/04.

———*Hands-on experiences*———

- 2015 Designed and administered an inquiry-based lab exercise on the scientific method and termite behavior for KIPP Delta Charter High School students, Hendrix College, 09/18/15.
- 2010–2014 Through Upward Bound, hosted two high school students from groups underrepresented in STEM each July for three days of laboratory experience in the Traniello lab.
- 2006–2009 Instructor for BIO-BUGS outreach labs, designed by the BU Biology Graduate Student Association to expose area HS students to the life sciences. Also served on a committee of graduate students to develop curricula for a new lab, “Whodunit?”, in April 2008.
- 2009 Designed and administered a hands-on demonstration of termite behavior and chemoreception for elementary school children at Brookline ScienceFest, 03/28/09.