Dr Brett A. Melbourne

29 November 2023

1. Position

Associate Professor of Mathematical Ecology and Data Science
Department of Ecology and Evolutionary Biology
University of Colorado at Boulder

2. Grants

Total $5.9 M as PI/co-PI since at University of Colorado, including 10 NSF grants.

Grants (last 5 years)

2022-2025	NEH. Humanities core competencies as data acumen: integrating humanities and data science (PI J Garrity, coPIs D Glimp, V Hulden, N Pieplow, E Vance, B Melbourne, R Deagman-Simonetta, R Burke).	$149,999
2019-2022	NSF DEB 1930222. Collaborative Research: Bridging ecology and evolution: understanding evolutionary rescue (PI with lead PI R Hufbauer).	$998,804
2020-2022	NSF DEB 2051752. RAPID: Synergistic effects of habitat fragmentation and climate-change driven megafire on biodiversity in a large-scale experiment (coPI with K Davies).	$279,550
2015-2021	NSF DEB 1457660. Collaborative Research: Species interactions in range dynamics and changing environments: stochastic models and experiments. (lead PI with collaborative PI A Hastings).	$1,020,000

3. Research

Impact (Google Scholar)

Total publications: 86. Impact: 13,550 citations, H-index 38 (Google Scholar).

Selected publications

This is a short list highlighting representative and notable research publications. For a more complete list see my Google Scholar profile. Senior authorship is first **or last position in bold**. Postdoc mentees: double underline. Graduate student mentees: single underline.

Nordstrom SW, Hufbauer RA, Olazcuaga L, Durkee LF, **Melbourne BA** (2023). How density dependence, genetic erosion, and the extinction vortex impact evolutionary rescue. **Proceedings of the Royal Society B** 290: 20231228.

Legault G, Bitters ME, Hastings A, **Melbourne BA**. (2020). lnterspecific competition slows range expansion and shapes range boundaries. **Proceedings of the National Academy of Sciences, USA** 117: 26854-26860.

Legault G, **Melbourne BA** (2019). Accounting for environmental change in continuous-time stochastic population models. **Theoretical Ecology** 12: 31-48.

Legault G, Fox JW, **Melbourne BA** (2019). Demographic stochasticity alters expected outcomes in experimental and simulated non-neutral communities. **Oikos** 128: 1704-1715.

Weiss-Lehman C, Tittes S, Kane NC, Hufbauer RA, **Melbourne BA** (2019). Stochastic processes drive rapid genomic divergence during experimental range expansions. **Proceedings of the Royal Society B** 286: 20190231.

White ER, Cox K, **Melbourne BA**, Hastings A (2019). Success and failure of ecological management is highly variable in an experimental test. **Proceedings of the National Academy of Sciences, USA** 116: 23169-23173.

Szűcs M, Vahsen ML, **Melbourne BA**, Hoover C, Weiss-Lehman C, Hufbauer RA (2017). Rapid adaptive evolution in novel environments acts as an architect of population range expansion. **Proceedings of the National Academy of Sciences, USA** 114: 13501-13506.

Weiss-Lehman C, Davies KF, Clements C, **Melbourne BA** (2017). Estimating extinction risk with minimal data. **Biological Conservation** 213: 194-202.

Weiss-Lehman C, Hufbauer RA, **Melbourne BA** (2017). Rapid trait evolution drives increased speed and variance in experimental range expansions. **Nature Communications** 8: 14303.

Grace JB *et al*. (2016). High-dimensional model reveals mechanisms linking productivity and plant species richness. **Nature** 529: 390-393.

Shoemaker LG, **Melbourne BA** (2016). Linking metacommunity paradigms to spatial coexistence mechanisms. **Ecology** 97: 2436-2446.

Tucker CM, Shoemaker LG, Davies KF, Nemergut DR, **Melbourne BA** (2016). Differentiating between niche and neutral assembly in metacommunities using null models of β-diversity. **Oikos** 125: 778-789.

Haddad NM *et al*. (2015). Habitat fragmentation and its lasting impact on Earth's ecosystems **Science Advances** 1: e1500052.

Hufbauer RA, Szűcs M, Kasyon E, Youngberg C, Koontz MJ, Richards C, Tuff T, **Melbourne BA** (2015). Three types of rescue can avert extinction in a changing environment. **Proceedings of the National Academy of Sciences, USA** 112: 10557–10562.

Borer ET, *et al*. (2014). Herbivores and nutrients control grassland plant diversity via light limitation. **Nature** 508: 517-520.

Hautier Y, *et al*. (2014). Eutrophication weakens stabilizing effects of diversity in natural grasslands. **Nature** 508: 521-525.

Szűcs M, **Melbourne BA**, Tuff T, Hufbauer RA (2014). The roles of demography and genetics in the early stages of colonization. **Proceedings of the Royal Society B** 281: 20141073.

Adler PB *et al*. (58 authors) (2011). Productivity is a poor predictor of plant species richness. **Science** 333: 1750-1753.

Melbourne BA & Hastings A (2009). Highly variable spread rates in replicated biological invasions: fundamental limits to predictability. **Science** 325: 1536-1539. Rated "Must read" by Faculty 1000.

Melbourne BA & Hastings A (2008). Extinction risk depends strongly on factors contributing to stochasticity. **Nature** 454: 100-103.

Melbourne BA, *et al.* (14 authors) (2007). Invasion in a heterogeneous world: resistance, coexistence or hostile takeover? **Ecology Letters** 10: 77-94. Rated "Top 20 most read" by Ecology Letters in 2007.

Melbourne BA & Chesson P (2006). The scale transition: scaling up population dynamics with field data. **Ecology** 87: 1478-1488.

4. Teaching and mentoring

Courses taught (last 5 years)

2022 EBIO 5460-002 Data Science for Biological Research
EBIO 5460-015 Machine Learning for Ecology
2021 EBIO 5460-002 Data Science for Biological Research.
EBIO 1220 General Biology
2020 EBIO 5460-002 Data Science for Biological Research
EBIO 6100 Ecological Forecasting
EBIO 1220 General Biology
2019 EBIO 1220 General Biology
2018 EBIO 5460-002 Data Science for Biological Research
EBIO 6300 Theory of Ecological Communities
EBIO 1220 General Biology

Course and curriculum development

EBIO 5460 Machine Learning for Ecology
AHUM 1825 Interdisciplinary Data Science for All
ASSETT Incubator: Inclusive Data Science program
EBIO 1220 General Biology online course
EBIO 6100 Ecological forecasting
Computational Biology Minor
EBIO 5460 Data Science for Biological Research
EBIO 6300 Theory of Ecological Communities
EBIO 1010 Introduction to Quantitative Thinking
EBIO 1220 General Biology active learning redesign
PHYS 7810 Foundations of Quantitative Biology
Interdisciplinary Quantitative Biology (IQ-Bio) cross college graduate certificate
EBIO 5100 Introduction to Quantitative Ecology and Evolution

Graduate student theses

Nordstrom SW (2023). Within-population environmental and genetic variation and its demographic and evolutionary consequences. University of Colorado (PhD).

Seabaugh J (2023). The socioecology of cheek pouch use in Cercopithecine monkeys. University of Colorado (Masters).

Spiers AI (2023). Enhancing ecological inference about forest species with remote sensing and statistical advances. University of Colorado (PhD).

Legault GB (2017). The impacts of demographic stochasticity on populations and communities. University of Colorado (PhD).

Shoemaker LG (2017). Stabilizing and equalizing mechanisms alter community coexistence and macroevolutionary diversity patterns. University of Colorado (PhD).

Weiss-Lehman C (2017). Spatial structure in extinction and range expansion: models and experiments. University of Colorado (PhD).

Tuff TA (2016). Relative motion as an ecological mechanism. University of Colorado (PhD).