Matthew J Michalska-Smith

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Current Positions

Postdoctoral Research Associate
University of Minnesota, Dept. of Ecology, Evolution and Behavior, Craft Lab — *Since 2018*

› Spatially-explicit modeling of rabies detection and prevalence
› The effects of network structure on global disease impact

Postdoctoral Research Associate
University of Minnesota, Dept. of Plant Pathology, Kinkel Lab — *Since 2018*

› Network structure of multi-layer microbial interaction networks
› Detecting and quantifying higher-order interactions in endophyte communities

Education

University of Chicago, Chicago, IL
M.S. / Ph.D., Ecology & Evolution — *2013-18*

Adviser: Stefano Allesina
Dissertation: "Structural Inferences: three cases of linking pattern and process in ecological networks"

University of Notre Dame, Notre Dame, IN
B.S., Biological Sciences and Theology — *2008-12*

Research

Grants

$199 136: The effect of contact network structure on the spread of COVID-19
National Science Foundation, Rapid Response Research (RAPID) Grant — *2020-22*

› Full Title: RAPID: The effect of contact network structure on the spread of COVID-19: balancing disease mitigation and socioeconomic well-being
› NSF DEB 2030509

$90 000: Multi-strain swine disease modelling
U. Minnesota, Coll. of Veterinary Medicine, Animal Health Capacity Grant — *2018-20*

› Full Title: Development of a multi-strain modeling framework for endemic swine pathogens
› Wrote grant, but PIs required to be U. Minnesota faculty

Papers in Progress

Drafts available upon request.

2. M Craft, AJ Davis, **M Michalska-Smith**, KM Pepin, G Miller, and AT Gilbert. "The effects of latitude and urbanness on raccoon rabies occurrence and prevalence". — In prep.

1. **M Michalska-Smith**, EA Enns, and ME Craft. "Using machine learning to quantify disease risk from contact network structure". — In prep.

* These authors have contributed equally to this publication.

Publications

21. C Brimacombe, K Bodner, **M Michalska-Smith**, T Poisot, and MJ Fortin. "Shortcomings of reusing species interaction networks created by different sets of researchers". *PLOS Biology* 21.4 (2023). doi: 10.1371/journal.pbio.3002068.

20. JP Dundore-Arias*, **MJ Michalska-Smith***, M Millican*, and LL Kinkel. "More than the Sum of its Parts: Unlocking the Power of Network Structure for Understanding Organization and Function in Microbiomes". *Annual Review of Phytopathology* 61 (2023). doi: 10.1146/annurev-phyto-021021-041457.

19. **M Michalska-Smith**, EA Enns, LA White, MLJ Gilbertson, and ME Craft. "The illusion of personal health decisions for infectious disease management: disease spread in social contact networks". *Royal Society Open Science* 10 (2023), p. 221122. doi: 10.1098/rsos.221122.

18. C Brimacombe, K Bodner, **M Michalska-Smith**, D Gravel, and MJ Fortin. "No strong evidence that modularity, specialization, or nestedness are linked to seasonal climatic variability in bipartite networks across large spatial extents". *Global Ecology and Biogeography* 31.12 (2022), pp. 2510–2523. doi: 10.1111/geb.13593.

17. D Makau, S Lycett, **M Michalska-Smith**, I Paploski, M Cheeran, M Craft, R Kao, D Schroeder, and A Doeschl-Wilson. "Ecological and evolutionary dynamics of multi-strain RNA viruses". *Nature Ecology & Evolution* 6.10 (2022), pp. 1414–1422. doi: 10.1038/s41559-022-01860-6.

16. **M Michalska-Smith**, Z Song, SA Spawn-Lee, ZA Hansen, M Johnson, G May, ET Borer, EW Seabloom, and LL Kinkel. "Network structure of resource use and niche overlap within the endophytic microbiome". *The ISME Journal* 16 (2022), pp. 435–446. doi: 10.1038/s41396-021-01080-z.

15. **M Michalska-Smith**, K VanderWaal, and ME Craft. "Asymmetric host movement reshapes local disease dynamics in metapopulations". *Scientific Reports* 12.9365 (2022). doi: 10.1038/s41598-022-12774-5.

14. AK Shaw, LA White, **M Michalska-Smith**, ET Borer, ME Craft, EW Seabloom, E Snell-Rood, and M Travisano. "Lessons from movement ecology for the return to work: modeling contacts and the spread of COVID-19". *PLOS ONE* 16.1 (2021), pp. 1–22. doi: 10.1371/journal.pone.0242955.

13. LL Sullivan, **MJ Michalska-Smith**, KP Sperry, DA Moeller, and AK Shaw. "Consequences of ignoring dispersal variation in network models for landscape connectivity". *Conservation Biology* 35.3 (2021), pp. 944–954. doi: 10.1111/cobi.13640.

12. MR Fulcher, ML Bolton, MD Millican, **MJ Michalska-Smith**, JP Dundore-Arias, J Handelsman, JL Klassen, KC Milligan-Myhre, A Shade, BE Wolfe, and LL Kinkel. "Broadening Participation in Scientific Conferences during the Era of Social Distancing". *Trends in Microbiology* 28.12 (2020), pp. 949–952. doi: 10.1016/j.tim.2020.08.004.

11. TH Bell, KL Hockett, RI Alcalá-Briseño, M Barbercheck, GA Beattie, MA Bruns, JE Carlson, T Chung, A Collins, B Emmett, P Esker, KA Garrett, L Glenna, BK Gugino, MdM Jiménez-Gasco, L Kinkel, J Kovac, KP Kowalski, G Kuldau, JHJ Leveau, **M Michalska-Smith**, J Myrick, K Peter, MFV Salazar, A Shade, N Stopnisek, X Tan, AT Welty, K Wickings, and E Yergeau. "Manipulating Wild and Tamed Phytobiomes: Challenges and Opportunities". *Phytobiomes Journal* 3.1 (2019), pp. 3–21. doi: 10.1094/pbiomes-01-19-0006-w.

10. **MJ Michalska-Smith** and S Allesina. "Telling ecological networks apart by their structure: A computational challenge". *PLOS Computational Biology* 15.6 (2019), e1007076. doi: 10.1371/journal.pcbi.1007076.
    › Selected as featured research for the PLOS Complexity Channel.
9. **MJ Michalska-Smith***, EL Sander*, M Pascual, and S Allesina. "Understanding the role of parasites in food webs using the group model". *Journal of Animal Ecology* 87.3 (2018), pp. 790–800. doi: 10.1111/1365-2656.12782.
8. G Barabás, **MJ Michalska-Smith**, and S Allesina. "Self-regulation and the stability of large ecological networks". *Nature Ecology & Evolution* 1.12 (2017), pp. 1870–1875. doi: 10.1038/s41559-017-0357-6.
7. J Grilli, G Barabás, **MJ Michalska-Smith**, and S Allesina. "Higher-order interactions stabilize dynamics in competitive network models". *Nature* 548.7666 (2017), pp. 210–213. doi: 10.1038/nature23273.
6. **MJ Michalska-Smith** and S Allesina. "And, not or: Quality, quantity in scientific publishing". *PLOS ONE* 12.6 (2017), pp. 1–12. doi: 10.1371/journal.pone.0178074.
5. G Barabás*, **MJ Michalska-Smith***, and S Allesina. "The Effect of Intra- and Interspecific Competition on Coexistence in Multispecies Communities". *The American Naturalist* 188.1 (2016), E1–E12. doi: 10.1086/686901.
4. **MJ Smith**, E Sander, G Barabás, and S Allesina. "Stability and feedback levels in food web models". *Ecology Letters* 18.6 (2015), pp. 593–595. doi: 10.1111/ele.12416.
3. **MJ Smith**, C Weinberger, EM Bruna, and S Allesina. "The Scientific Impact of Nations: Journal Placement and Citation Performance". *PLOS ONE* 9.10 (2014), e109195. doi: 10.1371/journal.pone.0109195.
2. PPA Staniczenko, **MJ Smith**, and S Allesina. "Selecting food web models using normalized maximum likelihood". *Methods in Ecology and Evolution* 5.6 (2014), pp. 551–562. doi: 10.1111/2041-210X.12192.
1. KG Turner, **MJ Smith**, and BJ Ridenhour. "Whirling disease dynamics: An analysis of intervention strategies". *Preventive Veterinary Medicine* 113.4 (2014), pp. 457–468. doi: 10.1016/j.prevetmed.2013.12.008.

* These authors have contributed equally to this publication.

Non-peer-reviewed Publications

4. **M Michalska-Smith**, LA White, MLJ Gilbertson, and ME Craft, *Layered Interaction Network COVID-19 Simulator* 2021. URL: `https://z.umn.edu/LINCS`.
3. JP Dundore-Arias, MR Fulcher, ML Bolton, MD Millican, **MJ Michalska-Smith**, and LL Kinkel. "Hybrid Virtual Meeting Brings Together Global Community of Microbiome Researchers". *Phytopathology News* 54.6 (2020), p. 5.
2. MR Fulcher, ML Bolton, MD Millican, **MJ Michalska-Smith**, JP Dundore-Arias, and LL Kinkel. "Virtual Conference Idea Café Suggests APS is Positioned to Benefit From Increased Remote Participation Options". *Phytopathology News* 54.10 (2020), pp. 6–7.
1. S Allesina, E Sander, **MJ Smith**, and S Tang. "Superelliptical laws for complex networks" (2013). arXiv: `1309.7275`.

Talks

Developmental Biology Center Seminar Series **(Invited)**
Minneapolis, MN USA *9 February 2024*

Models of Infectious Disease Agent Study (MIDAS) Network Annual Meeting
Virtual *11 May 2021*

Clinical Trial Modeling Group **(Invited)**
St. Paul, MN USA *22 May 2018*

Ecological Society of America Annual Meeting
Louisville, KY USA *14 August 2019*

EpiQ (Quantitative Epidemiology) Seminar Series **(Invited)**
St. Paul, MN USA *17 December 2018*

Ecological Society of America Annual Meeting
New Orleans, LA USA *6 August 2018*

Public Dissertation Defense
Chicago, IL USA *2 May 2018*

NetSci International School and Conference on Network Science
Indianapolis, IN USA *20 June 2017*

Ecological Society of America Annual Meeting
Ft. Lauderdale, FL USA *9 August 2016*

Dissertation Proposal Hearing
Chicago, IL USA *27 August 2015*

Ecological Society of America Annual Meeting
Baltimore, MD USA *12 August 2015*

ICTP-SAIFR School on Pathogen Dynamics, Climate and Global Change
IFT-UNESP, São Paulo, Brazil *21 January 2015*

Poster Presentations

Models of Infectious Disease Agent Study (MIDAS) Network Annual Meeting
Bethesda, MD USA *8 September 2022*

Ecology and Evolution of Infectious Disease (EEID) Annual Meeting
Virtual *14 June 2021*

U. Minnesota College of Veterinary Medicine Points of Pride Research Day
Saint Paul, MN USA *2 October 2019*

Ecology and Evolution of Infectious Disease (EEID) Annual Meeting
Princeton, NJ USA *10-13 June 2019*

Undergraduate Scholars Conference, College of Science Joint Annual Meeting
Notre Dame, IN USA *4 May 2012*

Other Presentations

U. Minnesota College of Veterinary Medicine Points of Pride Research Day
Virtual *21 October 2020*

ACS International Center Webinar Series **(Invited)**
Online *25 February 2015*

Honors

Schmidt Science Fellowship Finalist *2018*
Dept. of Ed. Graduate Assistance in Areas of National Need (GAANN) Fellow *2015–2017*
NSF Graduate Research Fellowship Program Honorable Mention *2015*
Equity Certificate Hosted Online (ECHO) Foundations Certification *2023*

Other Funding Applications (Not Awarded)

Impacts of partial immunity on pathogen spread through animal and human populations
U. Minnesota, Signature Programs *2021*

Understanding complex ecological systems through integration with the tools of smart-cities research
Schmidt Futures, Schmidt Science Fellows *2020*

Friend or Foe? Determining ecological interaction type from network structure
National Science Foundation, Graduate Research Fellowship Program *2015*
› Intellectual Merit rated "Excellent" by all three reviewers
› Broader Impact rated "Excellent", "Good", and "Very Good"

The Dynamics of Partially-Specified Biological Systems
National Science Foundation, Graduate Research Fellowship Program *2014*
› Submission rated "Excellent" and "Good" by reviewers

Travel Awards

U. Minnesota BioTechnology Institute *2019*
U. Chicago, Biological Sciences Division *2017*
U. Chicago, UChicagoGRAD *2016*
U. Chicago, Biological Sciences Division Recruitment *2015*

Teaching

Guest Lecturer *Spring 2024*
U. Minnesota, College of Food, Agricultural and Natural Resource Sciences
› Ecology, Epidemiology, and Evolutionary Biology of Plant Microbe Interactions

Guest Lecturer *Fall 2020*
U. Minnesota, College of Veterinary Medicine
› Ecology of Infectious Disease
› Health and Biodiversity

Instructor *2015-2017*
U. Chicago, BSD-QBio
(Biological Sciences Division Quantitative Biology Boot-camp for incoming graduate students)
› Beginner/Advanced programming in the biological sciences
› Statistics for large datasets

Teaching Assistant *2014-2017*
U. Chicago, Biological Sciences Division
› Theoretical Ecology (Winter 2017)
› Biodiversity (with laboratory component; Spring 2016)
› Introduction to Scientific Computing (Winter 2014, 2016)
› Ecology & Evolution (with laboratory component; Winter 2015)

Press

U. Minnesota CVM Profiles: Connecting the dots on COVID *2021*
U. Minnesota CVM Profiles: Perspectives: Connected to COVID-19 *2020*
NPR Morning Edition: Why Some Scientific Collaborations Are More Beneficial Than Others *2014*

Professional Community Engagement

MIDAS Network:

- Member since 2021
- Reviewer of abstracts for 2020, 2021 annual meetings

Ecological Society of America:

- Member since 2015 (Theoretical and Disease Ecology Sections)
  - Judge for Lotka and Volterra awards for best theoretical ecology student Presentation/Poster (2018 2019)
- Reviewer of 21 posters for the 2020 annual meeting
- Represented U. Chicago at Strategies for Ecology Education, Diversity and Sustainability (SEEDS) Diversity Career Fair at the 2015 ESA Annual Meeting

American Phytopathological Society:

- Co-organized session ("Idea Café: Virtual Scientific Conferences: Making them work for you!") for 2020 annual meeting

Peer-Reviewing

- BioScience
- DESIDOC J. of Library & Information Technology
- Ecography
- Ecological Complexity
- Ecological Research
- Ecology
- Ecology Letters
- Ecological Research
- Ecosphere
- Environmental Modelling & Software
- FEMS Microbiology Ecology
- Frontiers in Ecology and Evolution
- Frontiers in Genetics
- Functional Ecology
- Int'l J. of Infectious Disease
- iScience
- J. of Animal Ecology
- J. of Forestry Research
- J. of The Royal Society Interface
- J. of Theoretical Biology
- Mathematical Biosciences & Engineering
- Oikos
- Phytobiomes
- PLOS Computational Biology
- PLOS ONE
- Proc. of the Royal Society of London B
- Scientific Reports
- Scientometrics
- The American Naturalist

Schools & Workshops

ICTP-SAIFR School on Pathogen Dynamics, Climate and Global Change
IFT-UNESP, São Paulo, Brazil *12-23 January 2015*

Non-adaptive selection: explaining macroscopic laws in ecology and evolution
EPFL CIB, Lausanne, Switzerland *7-11 July 2014*

Skills & Experience

Programming: R (including the `tidyverse` suite of packages); python; julia; `C`

Data Visualization: `ggplot2`; `Shiny` interactive, online applications

Other: LaTeX; git; Linux; Microsoft Excel