

Matthew J Michalska-Smith

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Current Positions

Postdoctoral Research Associate

U. Minnesota, Ecology, Evolution and Behavior, Craft Lab

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

Since 2018

Postdoctoral Research Associate

U. Minnesota, Dept. of Plant Pathology, Kinkel Lab

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

Since 2018

Education

University of Chicago, Chicago, IL

M.S. / Ph.D., Ecology & Evolution

Adviser: Stefano Allesina

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

2013-18

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

2020–2022

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

https://www.nsf.gov/awardsearch/showAward?AWD_ID=2030509NSF DEB 2030509

\$90 000: Development of a multi-strain modeling framework for endemic swine pathogens

Internal, Univ. Minnesota, Dept. Veterinary Population Medicine Animal Health Capacity Grant

2018–2020

> wrote grant, but PIs required to be Univ. Minnesota faculty

Papers in Progress

Drafts available upon request.

1. Brimacombe, C., Bodner, K., **Michalska-Smith, M.**, Gravel, D. & Fortin, M.-J. *No strong evidence that modularity, specialization, or nestedness are linked to seasonal climatic variability in bipartite networks across large spatial extents* — In Review at *Global Ecology and Biogeography*.
2. Brimacombe, C., Bodner, K., **Michalska-Smith, M.**, Poisot, T. & Fortin, M.-J. *Shortcomings of reusing species interaction networks created by different sets of researchers* — In Review at *PLOS Biology*.
3. Craft, M., Davis, A. J., **Michalska-Smith, M.**, Pepin, K. M., Miller, G. & Gilbert, A. T. *The effects of latitude and urbanness on raccoon rabies occurrence and prevalence* — In Prep.

4. Dundore-Arias*, J. P., **Michalska-Smith***, **M. J.**, Millican*, M. & Kinkel, L. L. *More than the Sum of its Parts: Unlocking the Power of Network Structure for Understanding Organization and Function in Microbiomes* — In Review at *Annual Reviews of Phytopathology*.
5. Makau, D., Lycett, S., **Michalska-Smith, M.**, Paploski, I., Cheeran, M., Craft, M., Kao, R., Schroeder, D. & Doeschl-Wilson, A. *Ecological and evolutionary dynamics of multi-strain RNA viruses* — Accepted at *Nature Ecology & Evolution*.
6. **Michalska-Smith, M.**, Enns, E. A. & Craft, M. E. *Using machine learning to quantify disease risk from contact network structure* — In Prep.
7. **Michalska-Smith, M.**, Enns, E. A., White, L. A., Gilbertson, M. L. J. & Craft, M. E. *The illusion of personal health decisions for infectious disease management: disease spread in social contact networks* — Submitted.

Publications

1. **Michalska-Smith, M. J.**, Song, Z., Spawn, S., Hansen, Z., Johnson, M., May, G., Borer, E., Seabloom, E. & Kinkel, L. L. Network structure of resource use and niche overlap within the endophytic microbiome. *The ISME Journal* **16**, 435–446. doi: 10.1038/s41396-021-01080-z (2022).
2. **Michalska-Smith, M.**, VanderWaal, K. & Craft, M. E. Asymmetric host movement reshapes local disease dynamics in metapopulations. *Scientific Reports* **12**. doi: 10.1038/s41598-022-12774-5 (2022).
3. Shaw, A. K., White, L. A., **Michalska-Smith, M.**, Borer, E. T., Craft, M. E., Seabloom, E. W., Snell-Rood, E. & Travisano, M. Lessons from movement ecology for the return to work: modeling contacts and the spread of COVID-19. *PLOS ONE* **16**, 1–22. doi: 10.1371/journal.pone.0242955 (2021).
4. Sullivan, L. L., **Michalska-Smith, M. J.**, Sperry, K. P., Moeller, D. A. & Shaw, A. K. Consequences of ignoring dispersal variation in network models for landscape connectivity. *Conservation Biology* **35**, 944–954. doi: 10.1111/cobi.13640 (2021).
5. Fulcher, M. R., Bolton, M. L., Millican, M. D., **Michalska-Smith, M. J.**, Dundore-Arias, J. P., Handelsman, J., Klassen, J. L., Milligan-Myhre, K. C., Shade, A., Wolfe, B. E. & Kinkel, L. L. Broadening Participation in Scientific Conferences during the Era of Social Distancing. *Trends in Microbiology* **28**, 949–952. doi: 10.1016/j.tim.2020.08.004 (2020).
6. Bell, T. H., Hockett, K. L., Alcalá-Briseño, R. I., Barbercheck, M., Beattie, G. A., Bruns, M. A., Carlson, J. E., Chung, T., Collins, A., Emmett, B., Esker, P., Garrett, K. A., Glenna, L., Gugino, B. K., del Mar Jiménez-Gasco, M., Kinkel, L., Kovac, J., Kowalski, K. P., Kuldau, G., Leveau, J. H. J., **Michalska-Smith, M.**, Myrick, J., Peter, K., Salazar, M. F. V., Shade, A., Stopnisek, N., Tan, X., Welty, A. T., Wickings, K. & Yergeau, E. Manipulating Wild and Tamed Phytobiomes: Challenges and Opportunities. *Phytobiomes Journal* **3**, 3–21. doi: 10.1094/pbiomes-01-19-0006-w (2019).
7. **Michalska-Smith, M. J.** & Allesina, S. Telling ecological networks apart by their structure: A computational challenge. *PLOS Computational Biology* **15**, e1007076. doi: 10.1371/journal.pcbi.1007076 (2019).
8. **Michalska-Smith***, **M. J.**, Sander*, E. L., Pascual, M. & Allesina, S. Understanding the role of parasites in food webs using the group model. *Journal of Animal Ecology* **87**, 790–800. doi: 10.1111/1365-2656.12782 (2018).
9. Barabás, G., **Michalska-Smith, M. J.** & Allesina, S. Self-regulation and the stability of large ecological networks. *Nature Ecology & Evolution* **1**, 1870–1875. doi: 10.1038/s41559-017-0357-6 (2017).
10. Grilli, J., Barabás, G., **Michalska-Smith, M. J.** & Allesina, S. Higher-order interactions stabilize dynamics in competitive network models. *Nature* **548**, 210–213. doi: 10.1038/nature23273 (2017).

11. **Michalska-Smith, M. J.** & Allesina, S. And, not or: Quality, quantity in scientific publishing. *PLOS ONE* **12**, 1–12. doi: 10.1371/journal.pone.0178074 (2017).
12. Barabás*, G., **Michalska-Smith***, M. J. & Allesina, S. The Effect of Intra- and Interspecific Competition on Coexistence in Multispecies Communities. *The American Naturalist* **188**, E1–E12. doi: 10.1086/686901 (2016).
13. **Smith, M. J.**, Sander, E., Barabás, G. & Allesina, S. Stability and feedback levels in food web models. *Ecology Letters* **18**, 593–595. doi: 10.1111/ele.12416 (2015).
14. **Smith, M. J.**, Weinberger, C., Bruna, E. M. & Allesina, S. The Scientific Impact of Nations: Journal Placement and Citation Performance. *PLOS ONE* **9**, e109195. doi: 10.1371/journal.pone.0109195 (2014).
15. Staniczenko, P. P. A., **Smith, M. J.** & Allesina, S. Selecting food web models using normalized maximum likelihood. *Methods in Ecology and Evolution* **5**, 551–562. doi: 10.1111/2041-210X.12192 (2014).
16. Turner, K. G., **Smith, M. J.** & Ridenhour, B. J. Whirling disease dynamics: An analysis of intervention strategies. *Preventive Veterinary Medicine* **113**, 457–468. doi: 10.1016/j.prevetmed.2013.12.008 (2014).

* These authors have contributed equally to this publication.

Non-peer-reviewed Publications

1. **Michalska-Smith, M.**, White, L. A., Gilbertson, M. L. J. & Craft, M. E. *Layered Interaction Network COVID-19 Simulator* 2021. <https://z.umn.edu/LINCS>.
2. Dundore-Arias, J. P., Fulcher, M. R., Bolton, M. L., Millican, M. D., **Michalska-Smith, M. J.** & Kinkel, L. L. Hybrid Virtual Meeting Brings Together Global Community of Microbiome Researchers. *Phytopathology News* **54**, 5 (2020).
3. Fulcher, M. R., Bolton, M. L., Millican, M. D., **Michalska-Smith, M. J.**, Dundore-Arias, J. P. & Kinkel, L. L. Virtual Conference Idea Café Suggests APS is Positioned to Benefit From Increased Remote Participation Options. *Phytopathology News* **54**, 6–7 (2020).
4. Allesina, S., Sander, E., **Smith, M. J.** & Tang, S. Superelliptical laws for complex networks. arXiv: 1309.7275 (2013).

Talks

MIDAS Network Annual Meeting

Virtual 11 May 2021

> Understanding the LINCS in realistic human contact networks

Clinical Trial Modeling Group

(Invited)

St. Paul, MN USA

22 May 2018

> The role of roles in COVID-19 transmission: partitioning interactions to inform social distance relaxation in Minnesota

Ecological Society of America Annual Meeting

Louisville, KY USA

14 August 2019

Session: Species Interactions II

> Characterizing resource competition network structure within the endophytic microbiome

EpiQ (Quantitative Epidemiology) Seminar Series

(Invited)

St. Paul, MN USA

17 December 2018

> Pattern and process in ecological networks of parasites

Ecological Society of America Annual Meeting

New Orleans, LA USA

6 August 2018

Session: Communities: Spatial Patterns And Environmental Gradients I

> A naïve approach to a longstanding question: Using ordination to identify gradients in ecological data

Public Dissertation Defense	
<i>Chicago, IL USA</i>	2 May 2018
> Structural Inferences: three cases of linking pattern and process in ecological networks	
NetSci International School and Conference on Network Science	
<i>Indianapolis, IN USA</i>	20 June 2017
> Higher-order interactions stabilize dynamics in competitive network models	
Ecological Society of America Annual Meeting	
<i>Ft. Lauderdale, FL USA</i>	9 August 2016
Session: Species Interactions	
> Identifying unique species roles by characterizing differences in ecological network structure	
Dissertation Proposal Hearing	
<i>Chicago, IL USA</i>	27 August 2015
> Structure and Stability	
Ecological Society of America Annual Meeting	
<i>Baltimore, MD USA</i>	12 August 2015
Session: Theoretical Ecology	
> Looking locally to see globally	
ICTP-SAIR School on Pathogen Dynamics, Climate and Global Change	
<i>IFT-UNESP, São Paulo, Brazil</i>	21 January 2015
> The Scientific Impact of Nations: Journal Placement and Citation Performance	
Poster Presentations.....	
MIDAS Network Annual Meeting	
<i>Bethesda, MD USA</i>	8 September 2022
> Quantifying effects of various interpersonal interactions and risk-tolerances on disease spread in multi-layer contact networks	
Ecology and Evolution of Infectious Disease Annual Meeting	
<i>Virtual</i>	14 June 2021
> A systematic exploration of the role of contact network structure on infectious disease spread	
Univ. Minnesota College of Veterinary Medicine Points of Pride Research Day	
<i>Saint Paul, MN USA</i>	2 October 2019
> The effects of metapopulation structure on multi-strain disease dynamics	
Ecology and Evolution of Infectious Disease Annual Meeting	
<i>Princeton, NJ USA</i>	10-13 June 2019
> The effects of metapopulation structure on multi-strain disease dynamics	
Undergraduate Scholars Conference, College of Science Joint Annual Meeting	
<i>Notre Dame, IN USA</i>	4 May 2012
> Modeling Seasonal Influenza in Indiana with an Age-Stratified SEIR Model	
Other Presentations.....	
Univ. Minnesota College of Veterinary Medicine Points of Pride Research Day	
<i>Saint Paul, MN USA</i>	21 October 2020
> Video Abstract: The Role of Roles in COVID-19 Transmission	
ACS International Center Webinar Series	
https://global.acs.org/international-center-events/...	25 February 2015
> Webinar: Global Scientific Collaboration: Key to Scientific Success	

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
Other Funding Applications (Not Awarded).....	
Impacts of partial immunity on pathogen spread through animal and human populations	
<i>Univ. Minnesota, Signature Programs</i>	2021
Friend or Foe? Determining ecological interaction type from network structure	
<i>National Science Foundation, Graduate Research Fellowship Program</i>	2015
> Intellectual Merit rated “Excellent” by all three reviewers	
> Broader Impact rated “Excellent”, “Good”, and “Very Good”	
The Dynamics of Partially-Specified Biological Systems	
<i>National Science Foundation, Graduate Research Fellowship Program</i>	2014
> Submission rated “Excellent” and “Good” by reviewers	
Travel Awards.....	
Univ. Minnesota BioTechnology Institute	2019
Univ. Chicago, Biological Sciences Division	2017
Univ. Chicago, UChicagoGRAD	2016
Univ. Chicago, Biological Sciences Division Recruitment	2015

Teaching

Guest Lecturer

U. Minnesota, College of Veterinary Medicine

- > Ecology of Infectious Disease
- > Health and Biodiversity

Fall 2020



Instructor

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

2015-2017



Teaching Assistant

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)

2014-2017



Press

Univ. Minnesota CVM Profiles

Connecting the dots on COVID

2021

Univ. 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 (Models of Infectious Disease Agent Study) Network:

- > Member since 2021

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 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.....

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

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

Data Visualization: ggplot2; Shiny interactive, online applications

Other:  L^AT_EX;  git