David McMorris

Contact Information

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Research Interests

Mathematical biology, focused on applications of control theory to plant life history and ecology. Additional interests in scientific computing and computational fluid dynamics.

Education

University of Nebraska-Lincoln

Ph.D. Candidate, Mathematics — expected August 2020
Advisor: Glenn Ledder
Dissertation: *Optimal Allocation of Two Resources in Annual Plants*

M.S. in Mathematics — May 2016

Hope College

B.S. in Mathematics — May 2014
Magna Cum Laude
Advisor: Brian Yurk

Honors and Awards

Parents' Recognition Award, UNL — 2017
Nominated by parents for making a difference in the lives of their students.

Outstanding Qualifying Exam, UNL — 2015

Othmer Fellowship, UNL — 2014
Merit-based three-year fellowship awarded to incoming graduate students.

Albert E. Lampen Mathematics Prize, Hope College — 2014
Awarded annually to two graduating seniors in mathematics.

Member of Phi Beta Kappa — inducted 2014

Member Pi Mu Epsilon, Michigan Delta chapter — inducted 2014

John H. Kleinheksel Mathematics Award, Hope College — 2012
Awarded annually to select sophomore-level mathematics majors.

Presidential Scholarship, Hope College — 2010
Merit-based scholarship at Hope College

Publications

1. D. McMorris, P. Pearson, and B. Yurk, *A modified wavelet method for identifying transient features in time signals with applications to bean beetle maturation.* Involve, a Journal of Mathematics, **10(1)** (2016), 21-42.

Presentations

† denotes invited talk

† *Plant Life History and Optimal Control*
(20 min)
Nebraska Wesleyan University Math Club — November 2019

† *Investigating Plant Growth Through Mathematical Biology*
(50 min)
Nebraska Wesleyan University STEM Seminar — March 2019

† *Using Optimal Control Theory to Model Resource Allocation in Annual Plants*
(50 min)
Creighton University Department of Mathematics Colloquium November 2018

An Optimal Control Approach to Resource Allocation in Annual Plants
(50 min)
UNL MathBio Seminar October 2018

An Application of Optimal Control to Resource Allocation in Annual Plants
(20 min)
Midwest Mathematical Biology Conference, UW - La Crosse May 2018

† *Optimal Control Theory and Math Biology*
(10 min)
Nebraska Wesleyan University Math Club October 2017

† *Modified Wavelet Methods for Identifying Transitions in Bean Beetle Maturation*
(Poster)
Hope College Celebration of Undergraduate Research April 2014
† Michigan Mathematics Prize Competition Awards Day March 2014

† *Identifying Transitions in Bean Beetle Maturation Using Modified Wavelet Methods*
(15 min)
† Hope College Mathematics Department Colloquium October 2013
Midstates Consortium for Math and Science Undergraduate Research Symposium, University of Chicago October 2013

Teaching Experience

Instructor of Record

Math 302: Math Modeling Spring 2017, 2019, 2020
A course for pre-service elementary teachers.

Math 104: Applied Calculus ($\sim$ 110 students) Fall 2019

Math 106: Calculus I Fall 2018
Part of the WHT Scholars Learning Community for first-generation Nebraska college students

Math 203: Contemporary Mathematics Spring 2018

Math 301: Geometry Matters Summer 2017
A course for pre-service elementary teachers.

Math 103: College Algebra & Trigonometry Fall 2016, 2017
Part of the WHT Scholars Learning Community for first-generation Nebraska college students

Math 101: College Algebra Fall 2015, Spring 2016, Summer 2016

Teaching Assistant

Math 107: Calculus II Recitation Spring 2015

Math 106: Calculus I Recitation Fall 2014, Summer 2015

Qualifying Exam Workshops

Organized workshops for first-year graduate students to prepare for qualifying exams

PDE and Applied Math Workshop May 2018

ODE and Applied Math Workshop May 2017

Grader

Math 489/889: Stochastic Processes	Fall 2018
Math 831: Partial Differential Equations	Fall 2017
Math 842: Methods in Applied Mathematics	Fall 2016
Math 104: Applied Calculus	Spring 2015

Research Experience

University of Nebraska – Lincoln 2016 - Present
Dissertation Research; Advisor: Glenn Ledder
Optimal control theoretical approach to resource allocation in annual plants

- Developed a two-resource model for resource allocation in annual plants.
- Used optimal control theory to determine the growth trajectory that maximizes fruit production over the course of a growing season. (in progress)
- Implemented numerical methods to simulate the model in MATLAB.

University of Nebraska – Lincoln Summer 2018
Graduate Research Assistant; Advisor: Adam Larios
Regularity of solutions to fractional Benjamin-Bona-Mahony equation

- Used numerical techniques to investigate the effects of incorporating a fractional differential operator on the smoothness of solutions to the BBM equation.

Hope College 2013-2014
Undergraduate Research Assistant; Advisor: Brian Yurk
Studied effects of climate change on growth of embryonic *Callosobruchus maculatus*

- Developed and implemented laboratory protocol for exposing embryos to varying environmental conditions and collecting data via digital microscopy.
- Employed a modified wavelet image processing algorithm with R and Java to examine effects of climate variation on the timing of key transition points in embryonic development.

Service

New Student Enrollment, UNL Summer 2019, 2020
Worked with academic advisors and incoming freshmen to determine their math placement based on their backgrounds and major requirements.

Nebraska Conference for Undergraduate Women in Mathematics,
Department of Mathematics, UNL January 2019, 2020
NCUWM is an annual conference open to undergraduate women mathematicians. I volunteered to assemble informational packets and register conference attendees.

Dean Search, College of Arts and Sciences, UNL January 2019
Served on a panel of 10 students who met with and evaluated each candidate.

Math Day, Department of Mathematics, UNL Annually Since November 2014
Proctored/coordinated throughout a day of high school mathematics competitions for approximately 1400 students across Nebraska.