David McMorris

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RESEARCH INTERESTS

Mathematical biology and scientific computing, applications of control theory to plant life history and ecology.

EDUCATION

University of Nebraska-Lincoln

Ph.D. in Mathematics   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

APPOINTMENTS

Adjunct, Christopher Newport University   August 2021 - present

Graduate Teaching Assistant, UNL   2014 - 2020

TEACHING EXPERIENCE

Instructor of Record

Christopher Newport University

Math 130: Precalculus	Spring 2022, Spring 2023
Math 125: Elementary Statistics	Fall 2023
Math 135: Calculus for Business and Social Sciences	Fall 2021, Spring 2022

University of Nebraska-Lincoln

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

Teaching Assistant

University of Nebraska-Lincoln

Math 107: Calculus II Recitation	Spring 2015
Math 106: Calculus I Recitation	Fall 2014, Summer 2015

Qualifying Exam Workshops

University of Nebraska-Lincoln

Organized workshops for first-year graduate students preparing for qualifying exams

PDE and Applied Math Workshop	May 2018
ODE and Applied Math Workshop	May 2017

Grader

University of Nebraska-Lincoln

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

PUBLICATIONS
AND PREPRINTS

1. D. McMorris and G. Ledder, *Resource Allocation in Annual Plants.* (submitted) bioRxiv 2021.04.19.440512.

2. 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

Optimal Allocation of Two Resources in Annual Plants
(50 min)
UNL, Dissertation Defense   July 2020

† *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

RESEARCH EXPERIENCE

University of Nebraska-Lincoln   2016 - 2020
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.

– 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.

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

MCM/ICM, Consortium for Mathematics and Its Applications   Since 2021

The Mathematical Contest in Modeling and Interdisciplinary Contest in Modeling are international modeling contests each spring which challenge students to engage with open-ended problems and write detailed reports of their work. I helped with the first round of judging each year, and will work with a team to complete the final round of judging in 2023.

Referee, Letters in Biomathematics   Since 2021

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   November 2014 - 2019

Proctored/coordinated throughout a day of high school mathematics competitions for approximately 1400 students across Nebraska.