

Katherine J. Meyer

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Academic Appointments

Assistant Professor of Mathematics Carleton College, Northfield, MN	2020–present
Postdoctoral Associate Cornell University Department of Mathematics, Ithaca, NY	2019–2020

Education

Doctor of Philosophy , Mathematics University of Minnesota, Minneapolis, MN	2019
Master of Science , Mathematics University of Minnesota, Minneapolis, MN	2016
Post-baccalaureate certificate , Mathematics Smith College, Northampton, MA	2012
Bachelor of Arts , Biology, <i>summa cum laude</i> Carleton College, Northfield, MN	2009

Publications

- Meyer K**, Broda J, Brettin A, Sánchez-Muñiz M, Gorman S, Isbell F, Hobbie S, Zeeman ML, and McGehee R (2023) Nitrogen-induced hysteresis in grassland biodiversity: a theoretical test of litter-mediated mechanisms. *The American Naturalist* 201(6): <https://doi.org/10.1086/724383>.
- Meyer K** and McGehee, R (2022) Intensity—A metric approach to quantifying attractor robustness in ODEs. *SIAM Journal on Applied Dynamical Systems* 21(2):960–981.
- Meyer K** (2019) Extinction debt repayment via timely habitat restoration. *Theoretical Ecology* 12(3):297–305. doi 10.1007/s12080-018-0395-y.
- Meyer K**, Hoyer-Leitzel A, Iams S, Klasky I, Lee V, Ligtenberg S, Bussmann E, and Zeeman ML (2018) Quantifying resilience to recurrent ecosystem disturbances using flow-kick dynamics. *Nature Sustainability* 1(11):671–678.
- Zeeman ML, **Meyer K**, Bussmann E, Hoyer-Leitzel A, Iams S, Klasky I, Lee V, and Ligtenberg S (2018) Resilience of socially valued properties of natural systems to repeated disturbance: a framework to support value-laden management decisions. *Natural Resource Modeling*, e12170, doi 10.1111/nrm.12170.
- Guswa AJ, Hamel P, and **Meyer K** (2018) Curve number approach to estimate monthly and annual runoff and baseflow. *Journal of Hydrologic Engineering* 23(2): doi 10.1061/(ASCE)HE.1943-5584.0001606.

Meyer K (2016) A mathematical review of resilience in ecology. *Natural Resource Modeling* 29(3): 339–352.

Saito TT, Lui DY, Kim HM, **Meyer K**, and Colaiácovo MP (2013) Interplay between structure-specific endonucleases for crossover control during *Caenorhabditis elegans* meiosis. *PLOS Genetics* 9(7): e1003586.

Saito TT, Mohideen F, **Meyer K**, Harper WJ, and Colaiácovo MP (2012) SLX-1 is required for maintaining genomic integrity and promoting meiotic noncrossovers in the *Caenorhabditis elegans* germline. *PLOS Genetics* 8(8): e1002888.

Teaching at Carleton

Math 111 – Introduction to Calculus

Fall 2022–Winter 2023: 27+35 students in two sections, most first-years with diverse interests. Maintained mastery quizzes and projects. Increased scaffolding for students to navigate group project logistics. Piloted formal instruction in mathematical writing with revision. Moved EDI reflection to start of term to set tone; referred back to it as course progressed.

Fall 2021: 24 students, most first-years with diverse interests. Maintained mastery quizzes and EDI reflection assignment; replaced 3 exams with 5 projects on topics such as exponential models of disease and accounting for externalities in agricultural optimization.

Fall 2020–Winter 2021: 3 online sections, 24–28 students each, many first-years with diverse interests. Piloted mastery quizzes to lower stakes and promote growth mindset. Assigned written reflections on personal and societal contexts of mathematics to highlight issues of EDI in our field. Frequent small group work fostered community, active practice.

Math 211 – Multivariable Calculus

Fall 2021: 29 students, most first-years. Used “paper clickers” (voting cards) to structure small-group discussion and to assess student understanding in real-time. Brought 3D concepts to life with spilled beans, play-doh, cardboard cut-outs, wooden dowels.

Math 232 – Linear Algebra

Spring 2023: 26+30 students in two sections; wide interests among undecided first-years and also sophomores through seniors majoring in statistics, chemistry, computer science, cognitive science, physics, economics. Developed applied projects including polynomial data interpolation.

Math 241 – Ordinary Differential Equations

Fall 2022: 20 students, a combination of undeclared sophomores and science / math majors. Maintained structures from Winter 2022 while providing more examples related to my research.

Winter 2022: 14+25 students in two sections, many undeclared sophomores considering majors in math, stat, CS. Piloted Mathematica lab day, weekly quizzes on core skills with re-tries, conversation exams, and a new final project option connected to flow-kick research.

Spring 2021: online with 29 students, many sophomores majoring in math, CS, and sciences. Synchronous, interactive lectures with breakout rooms. To accommodate varying circumstances and styles, students customized grading weights and participation options.

Math 291 – Independent Study on Math and Climate

Spring 2021, Winter 2022: one math major, interested in environmental applications of mathematics. Met weekly to discuss reading and exercises in Kaper and Engler's *Mathematics & Climate*.

Math 295 – Mathematics of Climate

Spring 2022: 25 students, many sophomores considering majors in math, CS, statistics, geology, chemistry, economics, English. Piloted a poster session for students to share out mathematical climate insights with the Carleton community.

Math 321 – Real Analysis I

Winter 2023: Converted online breakout room activities from Winter '21 to in-class worksheets. Piloted weekly journal reflections to improve metacognition and interrupt negative self-talk in this challenging course.

Winter 2021: Online with 24 students, an even mix of seniors / juniors / sophs. and of math / undecided / other majors. Flipped Mondays; Wednesdays and Fridays featured recorded, interactive lectures with chatblasts and breakout rooms. Piloted group projects for final assessment. Offered students choices in participation mode and final exam vs. project to fit circumstances.

Additional Teaching

Introduction to Analysis (*Cornell University, Ithaca, NY*) Spring 2020

MATH 3110, 45 students, a mix of prospective majors, non-majors, and economics masters students. Replaced in-person lectures with an online flipped classroom mid-semester due to pandemic; recorded videos about derivatives and sequences, series of functions.

Linear Algebra (*Cornell University, Ithaca, NY*) Fall 2019

MATH 2210, 58 students, many first years. Lectures added to scaffolded handout on projected tablet and students answered questions from the handout using paper clickers. Coordinated with two additional lecturers and three TAs to serve 234 students in total.

Finite Math (*University of St. Thomas, St. Paul, MN*) Fall 2018

MATH 101, 28 & 30 students, many first year business majors. Related theory of financial math, probability, and linear systems to student interests and societal issues via examples.

Applied Linear Algebra (*Univ. of Minn., Mpls, MN (UMN)*) $\frac{1}{4}$ term, Summer 2018

MATH 4242, 24 students, a mix of math/stats, computer science, and engineering majors. Developed note guides to reduce writing burden during matrix-heavy lectures.

Calculus I (*UMN*) Summer 2017

MATH 1271, 19 students, mixed years and majors. Retained student attention during two-hour session by interspersing group problem-solving time with short lectures.

Climate Change: Past, Present, and Future (*UMN*) Winter 2017

OLLI 20058, 53 students, retired adults. Developed and delivered this six-week course on climate change via a mathematical lens through the Osher Lifelong Learning Institute.

College Algebra & Probability (*UMN*) Summer 2015

MATH 1031, 3 students, fulfilling math requirement. Adapted to small class size and two hour period with in-class problem-solving sessions.

Advising Student Research—Recent Projects

- Individual Research Project: Modeling Grasslands** Spring - Summer 2022
Mentored Carleton junior on exploration of spatially implicit grassland community models. She built skills in coding MATLAB simulations and applying concepts from ODEs in a novel context.
- Individual Research Project: Bounding Seed Loss** Spring - Summer 2022
Senior from 2021-22 Integrative Exercise extended the group's results to construct an upper bound on seed loss using geometric properties of habitat and dispersal. Manuscript in prep.
- Integrative Exercise: Modeling Habitat Fragmentation** Fall 2021-Winter 2022
Four seniors developed a novel approach to capturing dispersal geometry in a spatially implicit ODE model, yielding nuanced predictions of grassland plant dynamics under habitat fragmentation. They published their results in the Rose Hulman Undergraduate Journal of Mathematics at <https://scholar.rose-hulman.edu/rhumj/vol23/iss2/1>.
- Carleton Summer Student Research Partners** Summer 2021
Two students supported from the Towsley and the New World Endowed Funds researched the connections between continuous and discrete disturbance models and won a student presentation award at MAA MathFest. Manuscript in prep.
- Integrative Exercise: Grassland RESCUE Model** Winter-Spring 2021
Four seniors dove into the applied mathematics process: developing models to address questions of interest to ecologist collaborators in a new grassland experiment at Cedar Creek Ecosystem Science Reserve, analyzing the models, and interpreting the results biologically.
- Math Climate Summer Research Workshop** 2018
Developed research topics that undergraduate and beginning graduate students explored during summer workshop at AIM. Produced three pre-workshop training videos; advised projects during weeklong in-person workshop and online thereafter.

Invited Talks

- Mathematics of change, disturbance, and resilience*
Carleton Summer STEMinar Series Jul. 2022
- Habitat-driven extinctions: insights from spatially implicit ODE models*
Carleton Biology Seminar Jan. 2023
Claremont Colleges Mathematics Colloquia, Claremont, CA Oct. 2019
- Dynamics of flow-kick disturbance models*
Grinnell Mathematics and Statistics Seminar Nov. 2022
AIM Little School Dynamics Colloquium Feb. 2022
Wake Forest University Analysis Seminar Apr. 2021
- Perspectives on resilience theory* Apr. 2021
EPSCoR Workshop: Resilience Theory meets AI, machine learning, edge computing and other SMART approaches

<i>Bridging between continuous and discrete disturbance models</i> JMM AMS Special Session on Recent Advances in Ecol. Modeling	Jan. 2021
<i>Metric bounds on attractor continuation</i> CRM Program on Topological and Rigorous Computational Methods for High Dimensional Dynamics, Montréal, Canada	Apr. 2019
<i>Measuring attractor intensity using nonautonomous control</i> Midwest Dynamical Systems Conference, Minneapolis, MN	Nov. 2018
<i>Mentoring undergraduate math research on the reversibility of sea ice loss</i> SIAM Conference on Applied Mathematics Education, Portland, OR	Jul. 2018

Selected Presentations

<i>From simple maps to chaos</i> Carleton Tour of Math Lecture Series	Jan. 2022
<i>Why does biodiversity exist, and how can we protect it? Insights from mathematical modeling.</i> Carleton Tour of Math Lecture Series	Jan. 2021
<i>Computing the intensity of an attractor</i> Cornell Scientific Computation and Numerics Seminar	Mar. 2020
<i>Quantifying intensity of dynamic attractors using bounded, nonaut. control.</i> Joint Math Meetings, Baltimore, MD	Jan. 2019
<i>Why does biodiversity fail to recover in formerly polluted grasslands?</i> CRITICS Winter Workshop, Wöltingerode, Germany	Mar. 2018

Professional Development

LTC Lunch: Strategies for Oral Assessment (organizer) Brought together four panelists to lead discussions on the importance of developing communication skills, strategies for preparing (potentially anxious) students for oral exams, logistics of organizing them, and in-class debates as another form of assessment.	Spring 2023
LTC iGen Book Discussion Group In response to Jean Twenge's <i>iGen</i> , considered the roles and responsibilities of faculty and staff in supporting Carleton's student body and advancing the mission of the college.	Winter 2022
Well Being in Learning Environments Initiative Member a cohort of eight Carleton faculty who implemented a strategy to promote student well-being in a course during Spring 2021 then reflected and reported on its impact.	2021
Project NExT Brown '20 Cohort Learned about teaching techniques such as mastery-based grading, oral exams, tactivities. Organizing an MathFest session on teaching math for social justice, Aug. 2021.	2020–2021
Cornell Math Communications Seminar (presenter, participant) Led writing workshop and presented advice on giving good talks. Critiqued YouTube math videos, learned about tools for webpage development and web-based presentations.	2019-2020

Student Seminar on Undergraduate Math Education (co-organizer)	2017–2018
Facilitated workshops on effective group work, gathering feedback, course design, and more. Arranged peer observations and managed repository of shared teaching materials.	
Difficult Dialogues Workshop: How to Be a Better Ally (participant)	Jul. 2018
Explored foundations of personal identity, privilege, and allyship at interactive session during the SIAM Annual Meeting.	
Preparing Future Faculty Program (participant)	2016–2018
Studied pedagogy and faculty roles in higher education in two-semester sequence.	

Service

Equity, Diversity, and Inclusion Initiatives

Math Skills Center Department Liason	2020–present
Added to new-tutor training reflection on how identity and implicit bias influence tutor-tutee interactions. Surveyed 182 student experiences in the Math Skills Center and followed up on results with a tutor training session focused on strategies for creating a welcoming environment.	
Co-Organizer, Math for Social Justice Project NExT session at MathFest	Aug 2021
Coordinated contributions from four mathematicians and educators who shared experience, expertise, and ideas for incorporating social justice into the mathematics classroom and curriculum.	
Tour of Math Session on Racism and Anti-Racism in Math and Statistics	2021
About 55 students took this one-credit tour of big ideas in mathematics. Together with a student and another faculty member, led discussion of predictive policing and math's role in society, as well as racial microaggressions in a math/stats learning context	
Student-Faculty Reading Group	summer 2020
Partnered with two department faculty and our three Student Departmental Advisors to select reading/listening/watching material on the intersection of math and statistics with race and to host weekly sessions for faculty and students to discuss them.	
Cornell AWM Intro to Research Seminar	Mar. 2020
Started talks by women mathematicians at Cornell geared for an early undergraduate audience, with the aim to demystify math research and provide female role-models.	
Girls Solve It! MathBio Camp Conservation Day	Aug. 2016, 2017
Led group of 30-32 high school girls in MATLAB exploration of sea turtle conservation strategies using Lefkowitz stage matrices.	

Peer Review

European Journal of Applied Mathematics	Articles reviewed, year
SIAM Journal on Applied Mathematics	1, 2022
Nature Ecology and Evolution	1, 2020
	2, 2019

Additional Service

Committee Member, Carleton Sustainability Working Group	2023–present
Leading on planning relating to career planning and alumni. Contributing to education sub-group.	
Faculty Editor, <i>Goodsell Gazette</i>	2022–2023
Soliciting news and editing content for biweekly departmental newsletter.	
Committee Member, Carleton Environmental Advisory Committee	2021–2022
Helped planned for the second phase of Carleton’s Climate Action Plan and the role of offsets to counterbalance Scope 3 emissions.	
Doctoral Committee Member	2022–present
Offering perspectives and resources on modeling from the dynamic viewpoint for a graduate student in the University of Minnesota Ecology, Evolution, and Behavior PhD program who is researching how animal migration shapes responses to climate change.	
Co-Organizer, MAST Department Colloquium	2021–2022
Invited and coordinated the talks of guest speakers in Carleton’s Mathematics and Statistics semi-weekly colloquium series	

Honors and Awards

Interdisciplinary Doctoral Fellowship, UMN Institute on the Environment	2017–2018
SIAM Student Travel Award to attend Snowbird Conference, UT	May 2017
NSF Graduate Research Fellowship	2014–2017
College of Science and Engineering Fellowship, UMN	2013-2014
Jefferson Natural Sciences Teaching Award, Carleton College	2009
Phi Beta Kappa, Carleton College	2008