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RESEARCH INTERESTS

Dynamical systems and their applications, conceptual climate models, nonsmooth systems, the carbon budget, bifurcations in nonautonomous systems, rate-dependent critical transitions

PROFESSIONAL EXPERIENCE

Cornell University

NSF Mathematical Sciences Postdoctoral Fellow, Department of Mathematics July 2019 – Present

EDUCATION

University of Minnesota—Twin Cities

PhD in Mathematics May 2019

Advisor: Richard McGehee

Title: Dynamical Systems for Planetary Climate

MS in Mathematics April 2016

Grinnell College

BA in Mathematics with Honors May 2013

PUBLICATIONS

A. Nadeau and E. Jaschke. Stable asymmetric ice belts in an energy balance model of Pluto. *Icarus* 331: 2019. pp. 15–25. DOI: [10.1016/j.icarus.2019.04.032](https://doi.org/10.1016/j.icarus.2019.04.032)

A. Nadeau and R. McGehee. A Simple Formula for a Planet's Mean Annual Insolation by Latitude. *Icarus*, 291: 2017. pp. 46–50. DOI: [10.1016/j.icarus.2017.01.040](https://doi.org/10.1016/j.icarus.2017.01.040).

*E. Dinan, A. Nadeau, I. Odegard. Folding Concave Polygons into Convex Polyhedra: The L-Shape, *Rose-Hulman Undergraduate Mathematics Journal*, 16(1) 2015.

*M. Chamberland, C. Johnson, A. Nadeau, B. Wu. Multiplicative Partitions, *Electronic Journal of Combinatorics*, 20(2), 2013.

Preprints

A. Nadeau and R. McGehee. Approximating Planetary Mean Annual Insolation. *In preparation*, Oct. 2018. On arXiv: <https://arxiv.org/abs/1810.10081>

A. Nadeau, C. Lehman, R. McGehee, and E. Gorham. Determining constraints on the carbon budget during deglaciation with a new method of carbon isotope data analysis. Under revision, *Qua Sci Rev*, Oct. 2018. Preprint at: <https://e.math.cornell.edu/people/nadeau/Nadeau-Carbon.pdf>

*A. Hoyer-Leitzel, A. Nadeau, A. Roberts, and A. Steyer. Detecting transient rate-tipping using Steklov averages and Lyapunov vectors, Feb. 2017. On arXiv: <https://arxiv.org/abs/1702.02955>

*B. Alpert, V. Morissette-Thomas, A. Nadeau, L. Proulx, Y. Wei, H. Zhu, J. Zhu. Mathematical Challenges in High Throughput Microcalorimeter Spectroscopy, Aug. 2014. *IMA Preprints*: <https://www.ima.umn.edu/preprints/Mathematical-Challenges-High-Throughput-Microcalorimeter-Spectroscopy>

*Alphabetical order indicated by *. Student coauthors are underlined.*

AWARDS, FELLOWSHIPS, AND GRANTS

For Individual Support:

University of Minnesota Interdisciplinary Doctoral Fellowship, 2016

Awarded annually to approximately 20 U of M PhD students to fund an interdisciplinary project.

Ford Foundation Predoctoral Fellowship, Honorable Mention, 2015

Awarded annually to 65 PhD students who will use diversity to enrich the education of all students.

Goldwater Scholarship, 2012

Awarded annually to approximately 300 US undergraduates interested in science and math.

Pamela Ferguson Endowed Prize in Mathematics, 2012

Awarded annually to up to two Grinnell juniors who show “the greatest achievement and promise.”

Various travel grants, 2012 - 2019

SIAM Student Travel Award: Sept. 2016, May 2017, Sept. 2018, May 2019

AMS Student Travel Award: Mar. 2019

MRC Travel Award: Jan. 2016

For Conference and Workshop Support:

AMS MRC Micro-Conference Grant (Co-PI), 2018

Grant to fund an intensive conference for Mathematics Research Community alumni.

For the Mathematics Project at Minnesota:

University of Minnesota Campus Climate Grant (Co-PI), 2017 and 2018

Awarded to projects to improve campus climate, foster understanding, and build community.

University of Nebraska “Watch Us” Grant (Co-PI), 2017

Grant to fund a workshop for new undergraduate women math majors at Minnesota.

PRESENTATIONS

Invited Presentations

- “Stable Asymmetric Ice Belts in An Energy Balance Model of Pluto.” May 2019
 Minisymposium on Feedback Mechanisms in Climate: The Maths and the Consequences
 SIAM Conference on Applications of Dynamical Systems
- “Mathematical considerations for adapting conceptual climate models to other planets.” November 2018
 Midwest Dynamical Systems Conference
- “Detecting Rate-Induced Tipping in an Ecological Resource–Consumer Model.” September 2018
 Minisymposium on Mathematical Methods for Conceptual Climate Modeling
 SIAM Conference on Mathematics of Planet Earth
- “Connections between Rate Induced Tipping and Nonautonomous Stability Theory.” May 2017
 Minisymposium on Applications and Numerical Methods in Nonauton. Systems
 SIAM Conference on Applications of Dynamical Systems
- “Peatlands, Agriculture, and the Carbon Budget.” September 2016
 Minisymposium on Mathematics and Conceptual Climate Modeling
 SIAM Conference on Mathematics of Planet Earth

Contributed Presentations

- “The Carbon Budget.” March 2019
 AMS Midwest and West Joint Sectional Meeting; Honolulu, HI
- “Mathematics Project at Minnesota.” August 2018
 MathFest Session on Advancing Women in Mathematics: On the Ground Initiatives
- “Predominant sources and sinks of carbon from Mauna Loa data.” June 2017
 World Conference on Natural Resource Modeling; Barcelona, Spain

Invited Colloquia

“Good Things Come in Small Packages: Modeling Pluto’s Climate” University of Minnesota–Duluth Mathematics Colloquium	September 2019
“Hot Tip: Use Math to Study Our Changing Climate.” Carleton College Mathematics Student Seminar	February 2019
“Dynamics of Pluto’s Icy Heart.” Wheaton College (Mass.) Mathematics Student Seminar	January 2019
“Mapping and Tracking Pluto’s Nitrogen Glaciers.” Univeristy of St. Thomas Center for Applied Mathematics Colloquium	October 2018
“Mathematical challenges in modeling Pluto’s climate.” St. Olaf College Mathematics, Statistics and Computer Science Research Seminar	September 2018
“Partitioning the Carbon Budget: 20kyr to Present (I and II).” Mathematics and Climate Research Network Paleoclimate Seminar Series	March 2018
“Mathematical Tipping Points and Climate Change.” College of the Holy Cross Mathematics and Computer Science Colloquium	February 2018
“Rate induced tipping and nonautonomous bifurcation.” NOAA Geophysical Fluid Dynamics Lab Tipping Points Seminar Series	July 2016
“How we can use box models to study climate.” Grinnell College Mathematics and Statistics Seminar Series	September 2014

SERVICE**Conference Organizer**

AMS Micro-conference on Differential Equations, Probability, and Sea Ice Joint with Kaitlin Hill	September 2018
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SIAM Minisymposium Organizer

Planetary Motion and its Effects on Climate SIAM Conference on Applications of Dynamical Systems Joint with Harini Chandramouli	May 2019
Applications of Numerical Methods for Nonautonomous Systems SIAM Conference on Applications of Dynamical Systems Joint with Alanna Hoyer-Leitzel	May 2017

University of Minnesota

Co-Founder and Co-Director, Mathematics Project at Minnesota <i>Coordinate workshop for underrepresented undergraduates interested in pursuing math careers.</i>	2017 – Present
President and other officer positions, SIAM Student Chapter <i>Organize annual activities including undergraduate modeling competition and 5-Minute Thesis event.</i>	AY 2014 – AY 2017

Grinnell College

Alumni Committee Member, Louis Stokes Alliance for Minority Participation–IINSPIRE <i>Establish network of post-baccalaureate IINSPIRE students to facilitate mentor-mentee relationships.</i>	2017 – Present
Student Assistant and Intern, Grinnell Science Project <i>Coordinate orientation week for 30 incoming freshman who are underrepresented in the sciences.</i>	AY 2010 – AY 2013

UNDERGRADUATE RESEARCH SUPERVISOR**Undergraduate Research Opportunity Program, University of Minnesota**

Emma Jaschke, “Adapting the Budyko Energy Balance Model to Pluto.”
Elise Reed, “Proposed Effects of Early Agriculture on Current Climate.”
Julie Sherman, “Constraints on the Oceanic Carbon Sink using Atmospheric Oxygen Data.”

Directed Study (MATH 4993), University of Minnesota
Khanh Kieu, “Dependence of Tipping Points to Initial Conditions.”

Senior Project (MATH 4995), University of Minnesota
Emma Jaschke, “High School Math Applications to Climate.”

TEACHING EXPERIENCE

Course Developer, University of Minnesota
ODL MATH 2243 (*online*): Linear Algebra and Differential Equations

Instructor, University of Minnesota
MATH 2243: Linear Algebra and Differential Equations [Su 2017, Fa 2017]
ODL MATH 2243 (*online*): Linear Algebra and Differential Equations [AY 2017, AY 2018]

Graduate Teaching Assistant, University of Minnesota
MATH 3283W: Sequences, Series, and Foundations: Writing Intensive [Sp 2018, Sp 2019]
MATH 2374: College of Science and Engineering Multivariable Calculus [Sp 2015]
MATH 1572H: Honors Calculus II [Fa 2015]
MATH 1372: College of Science and Engineering Calculus II [Fa 2014]
MATH 1272: Calculus II [Sp 2014]
MATH 1271: Calculus I [Fa 2013]

INDUSTRIAL EXPERIENCE

Princeton Cooperative Institute for Climate Science Intern Summer 2016
Princeton University and NOAA Geophysical Fluid Dynamics Lab
Assessing Biogeochemical Stocks and Fluxes in GFDL’s ESMs

John Deere Early Talent Intern Summers 2009 and 2010
Tractor Cab Assembly Operations, Waterloo, IA
Logistics/Product Planning and Quality Assurance in the 9000 Line Tractors

PROFESSIONAL MEMBERSHIPS

Member, Society for Industrial and Applied Math
Member, American Mathematics Society
Member, Mathematics and Climate Research Network

TECHNICAL SKILLS

Programming Languages: Python, MATLAB, Mathematica, Maple, C/C++, HTML
Foreign Languages: Arabic (Modern Standard, Jordanian and Egyptian Colloquial)