Jo Nelson

Honors &

PERSONAL Rice University jo.nelson [at] rice.edu

INFORMATION Department of Mathematics http://math.rice.edu/~jkn3

RESEARCH Symplectic and contact geometry and topology, singularity theory, and their interactions;

INTERESTS various flavors of Floer, symplectic, and contact homology; symplectic dynamics

EMPLOYMENT Rice University

Assistant Professor, 2018-Columbia University

Ritt Assistant Professor, 2017-2018 Barnard College, Columbia University

NSF Postdoctoral Fellow, 2013-2014, 2016-2017

VISITING Institute for Advanced Study

APPOINTMENTS Member, Spring 2023

Member, 2014-2016 Visitor, 2013-2014

Simons Center for Geometry and Physics, Stony Brook

Visiting Assistant Professor, Spring 2014

EDUCATION University of Wisconsin - Madison, USA

Ph.D. in Mathematics, August 2013
Advisor: Mohammed Abouzaid
M.A. in Mathematics, May 2009

Massachusetts Institute of Technology, USA

Visiting Graduate Student, Spring 2012

University of Illinois at Urbana-Champaign, USA

B.S. in Mathematics with High Distinction and Honors, Minor in German, August 2007

Technische Universität Berlin, Germany

Trans Atlantic Science Student Exchange Program, Academic Year 2006-2007

> NSF Standard Grant in Geometric Analysis and Topology, DMS-2104411 NSF Standard Grant in Geometric Analysis and Topology, DMS-1840723 NSF Mathematical Sciences Research Postdoctoral Fellowship, DMS-1303903

AWARDS Race and Anti-Racism Research Fund Grant,

2022 AWM Award for Scientific Excellence, Rice University AWM Student Chapter Race and Anti-Racism Research Fund Grant, with D. King (PI) and M. Hebl (co-PI), 2020

Brasil@Rice Collaborative Travel Grant, 2019

Mary Ellen Rudin Research Prize, University of Wisconsin - Madison, 2013

European Science Foundation - Short Travel Grant CAST, 2012

Honored Instructor Award, University of Wisconsin - Madison Housing, 2011 Celebrating Women in Mathematics Grant, University of Wisconsin (P.I. 2009-2010) Student Ambassador Fellowship from the Technische Universität Berlin, 2006-2007

University of Illinois International Scholar (Fellowship), 2006-2007 University of Illinois List of Teachers Rated Excellent, Fall 2005

Goethe-Institut Book Prize for Undergraduate Achievement in German, 2005

The Honors Teaching Assistantship for Undergraduates, University of Illinois, 2005

PUBLICATIONS & PREPRINTS

- 14. (with M. Hutchings) S^1 -equivariant contact homology for dynamically convex contact forms, in preparation, 60 pages.
- 13. (with M. Weiler) Knot filtered ECH for torus knot T(2,q) open book decompositions of the 3-sphere with applications to dynamics of area preserving maps of surfaces, in preparation, 60 pages.
- 12. E. Fattoracci, D. D. King, J. Nelson, & M. Hebl, Antiracism in Academic Advising: Enhancing Diversity, Equity, and Inclusion in High-Stress Contexts, in preparation.
- 11. (with L. DiGiosia) Cylindrical contact homology of links of simple singularities, in preparation, draft arXiv:2107.07102, 40 pages.
- 10. (with M. Weiler) Embedded contact homology of prequantization bundles, arXiv:2007.13883, 85 pages, revisions submitted to *J. of Symp. Geom.* on 11/1/2022.
- 9. (with L. Digiosia, H. Ning, M. Weiler, Y. Yang)* Symplectic embeddings of four-dimensional polydisks into ellipsoids, JFTPA 24, 69 (2022), 38 pages.
- 8. (with M. Hutchings) S^1 -equivariant cylindrical contact homology for hypertight contact forms, J. Topology 2022, (15) 1455–1539.
- 7. (with M. Hutchings) Axiomatic S^1 Morse-Bott theory, AG&T 20 (2020) 1641–1690.
- 6. Automatic transversality for contact homology II: filtrations and computations, *Proc. Lon. Math. Soc.* Vol. 120, 6 (2020), 853–917.
- 5. (with K. Christianson)* Symplectic embeddings of 4-dimensional polydisks into balls, *AG&T* 18 (2018) 2151–2178.
- 4. (with L. Abbrescia, I. Huq-Kuruvilla, & N. Sultani)* Reeb dynamics of the link of the *A_n* singularity, *Involve* Vol. 10 (2017), No. 3, 417–442.
- 3. (with M. Hutchings) Cylindrical contact homology for dynamically convex contact forms in three dimensions, *J. Symp. Geom.* 14 (2016), No. 4, 983–1012.
- 2. From Dynamics to Contact and Symplectic Topology and Back, *The Institute for Advanced Study Newsletter, Summer* 2016.
- 1. Automatic transversality for contact homology I: regularity, *Abh. Math. Semin. Univ. Hambg.* 85 (2015), no. 2, 125-179.

ACADEMIC VISITS

COVID-19 CANCELLATION

RWTH Aachen University, Germany December 11 - December 17, 2022 **Simons Lauter Mathematical Sciences Institute (MSRI)** 4 weeks in Fall 2023 **Institute for Advanced Study**, Princeton November 8 - 18, 2021 **★Institut de Mathématiques de Jussieu-Paris Rive Gauche**, France September 2020 RWTH Aachen University, Germany April 27 - May 1, 2020 **Institute for Advanced Study**, Princeton March 26 - April 3, 2020 University of California at Berkeley March 3-6, 2020 University of California at Berkeley January 5-11, 2020 **Instituto de Matemática Pura e Aplicada**, Rio de Janeiro August 4-31, 2019 **Humboldt Universität Berlin**, Germany June 7-17, 2019 **Institute for Advanced Study**, Princeton March 10-24, 2019 University of California at Berkeley January 8-13, 2019 **Humboldt Universität Berlin**, Germany May 14-24, 2018 Universität Augsburg, Germany May 23-28, 2017

^{*} denotes a paper written with undergraduate research mentees.

Humboldt Universität Berlin, Germany May 16-22, 2017 February 28 - March 3, 2017 **Institute for Advanced Study**, Princeton Humboldt Universität Berlin, Germany January 18-24, 2017 Ruhr-Universität Bochum, Germany January 12-17, 2017 IRMA, Université de Strasbourg, France July 30 - August 3, 2016 November 9-13, 2015 University of California at Berkeley Institut des Hautes Études Scientifiques, France July 5-18, 2015 University of California at Berkeley May 6-13, 2015 University of California at Berkeley December 1-5, 2014 University of California at Berkeley October 6-10, 2014 Université Pierre et Marie Curie, France September 6-13, 2014 University of California at Berkeley December 2-6, 2013 **Institute for Advanced Study**, Princeton July 1 - August 31, 2013 **Institute for Advanced Study**, Princeton January 17-18, 2013 Ludwig-Maximilians-Universität München, Germany June 28 - July 6, 2012 **Institute for Advanced Study**, Princeton May 14 - June 7, 2012 Simons Center for Geometry and Physics, Stony Brook April 7-8, 2011 Korean National Institute for Mathematical Sciences, Seoul Fall 2009

INVITED LECTURES

LECTURES

♦ COVID-19 CANCELLATION

Lecture series

School on Symplectic Topology, IMPA, Brazil, August 2019 (2 lectures)

Northwestern University Geometry and Physics Seminar, Chicago, Fall 2017 (2 lectures)

ANR Contact Spectral Invariants Workshop, Houat, France, Summer 2017 (3 lectures)

Humboldt Universität Berlin, Oberseminar Geometrie, Summer 2016 (2 lectures)

University of Texas at Austin Geometry Seminar, Spring 2015 (3 lectures)

Simons Center Symplectic Seminar, Stony Brook, Spring 2014 (2 lectures)

Northeastern University, Boston, Fall 2013 (3 lectures)

Columbia University, New York, Fall 2013 (2 lectures)

Philadelphia Area Contact Topology Seminar (PACT), Bryn Mawr, Fall 2013 (4 lectures)

Conference talks

♦ Symplectic and Contact Topology Early Career Workshop mentor (August 2022)

South Central Topology Conference, Texas A&M (September 2021)

Advances in Symplectic Topology, Institut Henri Poincaré (May 2021)

Annual Conference on Geometric Analysis "at" Rutgers University (May 2021)

Brazil (Virtual) Mini-Workshop on Symplectic Geometry V (November 2020)

♦ Annual Conference on Geometric Analysis at Rutgers University (May 2020)

IPAM-UCLA Geometry and Topology Workshop (January 2020)

Conference on Symplectic Topology, IMPA, Brazil (August 2019)

Midwest Topology Seminar, Michigan State University (May 2019)

Texas Topology and Geometry Conference, TCU, Fort Worth, TX (February 2019)

Modern Math Workshop, Research Session & IAS/PCMI representative (October 2018)

AMS Southeastern Sectional Meeting, University of Arkansas (November 2018)

Geometric structures on 3 and 4 Manifolds in Dubrovnik (June 2018)

Symplectic Dynamics Workshop, Seoul National University (February 2018)

Oberwolfach Dynamische Systeme Workshop, Germany (July 2017)

MAA Mathfest, Symplectic Topology Invited Session (August 2017)

AMS Northeastern Sectional Meeting, Hunter College (Spring 2017)

Workshop on Topology: Identifying Order in Complex Systems, Rutgers (Spring 2017)

AMS Southeastern Sectional Meeting, North Carolina State (Fall 2016)

Symplectic Field Theory VIII, Humboldt Universität Berlin (August 2016)

Symplectic geometry and topology conference for Dusa McDuff, ICMS (July 2016) IHÉS Summer School on Moduli Problems in Symplectic Geometry (July 2015)

Georgia Topology Conference (May 2015)

Gökova Geometry and Topology Conference (May 2015)

Gökova Geometry and Topology Conference, evening expository talks (May 2015)

AWM Research Symposium, University of Maryland, College Park (Spring 2015)

AMS Eastern Sectional Meeting, Georgetown University (Spring 2015)

13th Graduate Topology & Geometry Conference, Young Faculty speaker (Spring 2015)

JMM, AMS Special Session on Geometries Defined by Differential Forms (January 2015)

American Institute for Mathematics Workshop on Contact Homology (December 2014)

JMM, AMS Special Session on Symplectic and Contact Manifolds (January 2014)

Simons Center, Graduate Workshop on Symplectic and Contact Topology (Fall 2012)

Polyfolds MIT-RTG workshop, Pajaro Dunes Resort, California (Summer 2012)

Université de Nantes, Symplectic and Contact Topology Summer School (Summer 2011) AMS Eastern Sectional Meeting, Cornell (Fall 2011)

Colloquia

University of Toledo, Ohio, Fall 2021

University of Louisiana - Lafayette, Fall 2019

University of Wisconsin - Madison, April 2019

IAS Mathematical Conversations, March 2019

University of Melbourne, February 2018

Northeastern University, January 2018

Rice University, January 2018

Notre Dame, January 2018

Duke, December 2016

International Seminars

Bochum-Aachen-Cologne-Heidelberg Symplectic Seminar, Germany (Fall 2022)

♦ Joint Analysis Seminar, RWTH Aachen University, Germany (Spring 2020)

Instituto Superior Técnico Lisboa, Geometria Seminar (Summer 2019)

Berlin-Hamburg Seminar zur symplektischen Geometrie (Summer 2019)

Humboldt Universität Berlin, Seminar zur symplektischen Geometrie (Spring 2018)

Universität Augsburg, Oberseminar symplektische geometrie (Spring 2017)

Berlin-Hamburg Seminar zur symplektischen Geometrie (Spring 2017)

Ruhr-Universität Bochum, Oberseminar Dynamical Systems (Spring 2017)

Paris Symplectix Seminar, Jussieu (Fall 2014)

Ludwig-Maximilians-Universität München, Geometry Seminar (Summer 2012)

Korean Institute for Advanced Study, Geometry Seminar (Fall 2009)

Domestic Seminars

Princeton University Algebraic Topology Seminar (Spring 2023)

Princeton University and IAS Symplectic Seminar (Fall 2021)

Contact and Symplectic Geometry Seminar, UC Berkeley (Fall 2021)

♦ Columbia University, Symplectic Geometry Seminar (Fall 2021)

IAS Math Conversations @ Home (March 2021)

Rice Undergraduate Colloquium (October 2020)

Western Hemisphere Virtual Symplectic Seminar, Columbia-SCGP-USC (May 2020)

Symplectic Zoominar, Montreal-Princeton/IAS-Tel Aviv-Paris (May 2020)

★IAS Symplectic Dynamics and Geometry Seminar (Spring 2020)

© Columbia University, Symplectic Geometry Seminar (Spring 2020)

Northern California Symplectic Geometry Seminar, Stanford University (Spring 2020)

Rice University, Undergraduate Colloquium (January 2020)

IAS Symplectic Dynamics and Geometry Seminar (Spring 2019)

UC Davis, Topology Seminar (Spring 2019)

University of Virginia, Topology Seminar (Fall 2018)

Rutgers, Geometry and Topology Seminar (Spring 2018)

Northern California Symplectic Geometry Seminar, Stanford University (Fall 2017)

Joint Georgia Tech and UGA Geometry and Topology Seminar (Spring 2017)

University of Pennsylvania, Deformation Theory Seminar (Spring 2017)

MIT, Topology and Geometry Seminar (Fall 2016)

Rutgers, Geometry and Topology Seminar (Fall 2016)

Triangle Topology Seminar, joint between Duke, UNC, and NC State (Fall 2016)

Duke, Graduate/Faculty Seminar (Fall 2016)

Harvard, Gauge Theory and Symplectic Topology Seminar (Spring 2016)

UC Davis, Geometry Seminar (Fall 2015)

UC Davis, Student-Run Geometry/Topology Seminar (Fall 2015)

University of Virginia, Topology Seminar (Fall 2015)

IAS, Postdoc Talks (Fall 2015)

Columbia University, Reading group on contact and symplectic topology (Fall 2015)

Barnard College, Columbia University, Perspectives in Mathematics (Fall 2015)

Notre Dame, Geometry and Topology Seminar (Spring 2015)

Bronx Community College, Research Seminar (Spring 2015)

UIUC Symplectic Geometry Seminar (Spring 2015)

Northern California Symplectic Geometry Seminar, UC Berkeley (Fall 2014)

MIT, Topology and Geometry Seminar (Fall 2014)

Columbia Undergraduate Math Seminar (Fall 2014)

Harvard, Gauge Theory and Symplectic Topology seminar (Fall 2014)

IAS, Postdoc Talks (Fall 2014)

University of Rochester, New York, Geometry Seminar (Spring 2014)

Princeton University and IAS Symplectic Seminar (Spring 2014)

IAS, Postdoc Talks (Fall 2013)

MIT, Symplectic Geometry Seminar (Spring 2013)

University of Wisconsin - Madison, Geometry and Topology Seminar (Fall 2012)

University of Texas at Austin, Geometry Seminar (Fall 2012)

Columbia University, Symplectic Geometry Seminar (Spring 2012)

MIT, Topology and Geometry Seminar (Spring 2011)

University of Wisconsin Richland Center (Spring 2011)

TEACHING Rice University

Math 699: Graduate Seminar (The Seiberg-Witten Equations)	Spring 2022
Math 699: Graduate Seminar (Towards the Seiberg-Witten Equ	ations) Fall 2021
Math 451/551: Differentiable Manifolds	Fall 2022
Math 541: Topics in Topology	Spring 2022
Math 444/539: Geometric Topology	Fall 2018 & Fall 2019
Math 402/500: Differential Geometry	Spring 2021
Math 401: Curves and Surfaces	Spring 2022 & Fall 2019
Math 222: Honors Calculus IV	Spring 2021
Math 212: Multivariable Calculus	Fall 2018

Columbia University

Math 4081: Introduction to Differentiable Manifolds

Spring 2018

Math 1201: Calculus III

Fall 2016 & 2017

ACADEMIC Supervision of PhD Theses
ADVISING Leo DiGiosia Rice University (August 2022)

Subsequent position US Bank, Quantitative Modeling

Supervision of Postdoctoral ResearchersSubsequent position

Dr. Morgan Weiler Rice University (2019-21) NSF MSPRF (Cornell)

Supervision of Distinction in Research and Creative WorksSubsequent PhD candidacyHaoming NingRice University (2020)University of WashingtonYirong YangRice University (2020)University of Washington

Supervision of Undergraduate Senior Honors ThesesSubsequent PhD candidacy

Theodore Coyne Columbia University (2018) UC Berkeley

Sara Edelman-Muñoz Barnard College (2018) Rice, NSF GRF Honorable Mention

Ph.D. Thesis Committee Member

Saraswathi Venkatesh (advisor: M. Abouzaid), Columbia University March 2018

Remote Integrated Research Experience at Rice University

Virtual BeECH (Beyond ECH Capacities), 2020 Subsequent PhD candidacy

Leo DiGiosia Grad student

Haoming Ning Undergraduate University of Washington Yirong Yang Undergraduate University of Washington

Summer Research Experience for Undergraduates at Columbia University

Arithmetic Invariants of Knots, 2018 Subsequent PhD candidacy

Teresa Brown Columbia University

Quang Dao Columbia University University of Michigan

Mariya Delyakova Columbia University

Lucas Furtado Columbia University

Myeonhu Kim Columbia University Princeton University

Evan Wickenden Columbia University UC Boulder Physics (theory)

Symplectic Packings and Embeddings, 2017 Subsequent PhD candidacy

Theodore Coyne Columbia University UC Berkeley

Sara Edelman-Muñoz Barnard College Rice, NSF GRF Honorable Mention

Greyson Potter Columbia University Boston University

Chunying Hungdai Barnard College

Obstructions of Symplectic Embeddings, 2016

Kat Christianson

Columbia University

Irit Huq-Kuruvilla

Columbia University

Greyson Potter

Subsequent PhD candidacy

NSF GRF UC Berkeley

NSF GRF UC Berkeley

Boston University

Rox Sayde Barnard College Northwestern University

Elizabeth Yoo Columbia University Princeton, NSF GRF Honorable Mention

Obstructions of Symplectic Embeddings, 2015

Kat Christianson

Columbia University

Irit Huq-Kuruvilla

Nawaz Sultani

Columbia University

Columbia University

University of Michigan

Reeb dynamics on the link of the A_n -singularities, 2014 Subsequent PhD candidacy

Leonardo Abbrescia Columbia University NSF GRF Michigan State Irit Huq-Kuruvilla Columbia University NSF GRF UC Berkeley University of Michigan

OUTREACH & MENTORING

Rice Math Club, Rice University Student Club

Faculty sponsor.

Association for Women in Mathematics Chapter at Rice University

2018-

2021-

Faculty advisor. In 2020-21, I organized a joint Colloquium given by Amanda Glazer, who presented her undergraduate thesis study, the National Mathematics Survey, discussing the difficulties and barriers that women in math face. Following such discussion, I secured funding for and helped start weekly "Math Nights," where students meet and study together in a supportive community, beginning in Fall 2021. I also helped the chapter organize many professional development events, including panels on REUs and proof-writing techniques.

Mathematical Perspectives for Prospective Majors, Rice University

2018-2021

Organized events to advertise the mathematics major and minor.

Freshman Math Mentorship Program, with the AWM Chapter at Rice University 2020-21 Faculty advisor. https://math.rice.edu/freshman-mentorship-program

Horizons in Mathematics, Rice University

2018-20

Founded a colloquium series with Dr. Allison Miller to bring outstanding mathematicians from traditionally under-represented backgrounds to Rice University.

https://sites.google.com/view/anmiller/horizons

Math Alliance Mentor, Facilitated Graduate Applications Process (F-GAP) 2016-2018

AWM Chapter at Barnard College and Columbia University

2016-2018

Faculty advisor and mentoring program coordinator

Institute for Advanced Study, Women and Mathematics Program

Spring 2016

Organized a panel discussion highlighting various careers in mathematics.

Institute for Advanced Study, Women and Mathematics Program

Spring 2015

Organized the career panel discussion and research seminar talks.

Math Night, Robert E. Willett Elementary School, Volunteer

Spring 2015

Julia Robinson Math Festival, Princeton University, Co-Organizer

Spring 2015

Sonya Kovalevsky Day, Barnard College

November 21, 2014

Organized and led the one-hour workshop, "Baller geometry: when the shortest path isn't a straight line" for thirty 10th grade female students from the Urban Assembly Schools.

Upper Freehold Regional School District, New Jersey

October 28, 2014

Keynote speaker for Allentown High Math and Science Honor Society Induction.

Julia Robinson Math Festival, Princeton University, Co-Organizer

Spring 2014

The Urban Assembly School for Wildlife Conservation, the Bronx

Fall 2013

Discussed careers in mathematics with small groups of 8-12th graders, developed class-room activities with the 9-12th grade math teachers, and volunteered as a teacher's aide.

Upper Freehold Regional School District, New Jersey

November 21, 2013

Keynote speaker for Allentown High School World Language Honor Society Induction ceremony: "How language enriches your life and career."

Institute for Advanced Study, Women and Mathematics Program

Spring 2012

Teaching assistant for the mini-course, From Linear Algebra to the Non-Squeezing Theorem of Symplectic Geometry as part of the program, 21st Century Geometry.

Camp Euclid Summer 2012

Mentored an online 8-week mathematics research program for middle and high schoolers.

Girl Scout Math Whiz Badge Session

May 2010

Organized and designed a day long activity for local 3rd and 4th grade Girl Scouts.

Professional Activities

Virtual International Learning Seminar

Obstruction Bundle Zooming, with J. Rooney (Simons Center)

Fall 2020

★ COVID-19 CANCELLATION

Conferences, Workshops, and Summer Schools Organized

https://www.jacobrooney.com/obg-seminar-2020/

Banff Women in Geometry 3, September 24-29, 2023

Banff International Research Station, Symplectic Team Co-Lead with L. Starkston

Workshop on Symplectic Field Theory X,

August 26-September 1, 2023

Humboldt Universität Berlin, with M. Hutchings, K. Mohnke, and C. Wendl

Dubrovnik 2020: *Holomorphic curves and low dimensional topology,* June 22-26, 2020 Inter-University Center, Croatia with T. Mark, G. Matic, A. Wand, and C. Wendl

New advances in symplectic and contact topology, with M. Weiler AWM Research Symposium Special Session, Rice University April 8-9, 2019

Facets of Symplectic Topology, with T. Holm and J. Weitsman

April 21-22, 2018

AMS Eastern Meeting Special Session, Northeastern University

Augmentations and Legendrians at the IAS

February 11-12, 2016

Moduli Problems in Symplectic Geometry, IHÉS Summer School July 6-17, 2015 Chair of organizational committee, with D. Cristofaro-Gardiner and J.W. Fish.

Transversality in Contact Homology

December 8-12, 2014

AIM Research Workshop, with J.W. Fish, M. Hutchings, and K. Wehrheim

Seventh Annual Graduate Student Topology and Geometry Conference April 18-19, 2009 University of Wisconsin - Madison, with N. Addington, T.-S. Lien, M. Childers

Past seminar organization

Symplectic Geometry and Gauge Theory Seminar, Columbia University	2017-18
Joint Columbia and IAS symplectic seminar	2014-2016
Joint Princeton and IAS symplectic seminar	2014-2016
Working seminar in contact and symplectic topology, Simons Center	Spring 2014
Foundations of contact homology working seminar, Columbia University	Fall 2013
Symplectic Geometry and Gauge Theory Seminar, Columbia University	Fall 2013
Women in Mathematics at Wisconsin, UW Madison	2009-2013

Information of Potential Interest

Member: American Mathematical Society, Association for Women in Mathematics, National Association of Mathematicians

Languages: English (native), deutsch (nicht schlecht), français (un peu)

SERVICE

International Service to the Mathematics Community

Trustee: Association of Members of the Institute for Advanced Study (AMIAS) 2019-2022

Grant Evaluator: German-Israeli Foundation for Scientific Research and Development

Referee: Algebraic Geometry & Topology, Annals of Mathematics, Advances in Mathemat-

ics, Inventiones Mathematicae, IMRN, Journal of Differential Geometry, Journal of Fixed Point Theory and Applications, Journal of Topology, MathSciNet, AMS Graduate Studies in Mathematics

National Service to the Mathematics Community

Panelist: National Science Foundation

Service to the Rice University Mathematics Department

Fall 2022	Career Seminar
2021-2022	Support to the Diversity Committee
2021-2022	Department Artwork
2018-2022	Graduate Student Admissions Committee
1/19-12/20	Chair, Diversity and Support Committee
2018-2020	Topology Qualifying Exam
2018-	Advisory Committee to Appointments Committee
2018-2019	Chair, Colloquium Committee
2018-2019	Evans Instructor Hiring
2018-2019	Topology Seminar