WILLIAM RILEY CASPER

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EDUCATION

University of Washington, Seattle   *June 2017*
Ph.D in Mathematics
Thesis: Bispectral Operator Algebras, Advisor: Max Lieblich
North Dakota State University   *December 2010*
M.S. in Mathematics, B.S. in Physics, B.S. in Mathematics

APPOINTMENTS

Aug. 2017-Present.	Postdoc	Louisiana State University, Baton Rouge LA
Aug. 2011- June 2017	Graduate RA (Summers)	Los Alamos National Lab, Los Alamos NM
Aug. 2011-June 2016	Graduate TA/RA	University of Washington, Seattle WA
Jan 2010-Aug. 2011	Postbac researcher	Los Alamos National Lab, Los Alamos NM
Aug. 2006-Dec. 2010	Undergraduate TA/RA	North Dakota State University, Fargo ND

RESEARCH INTERESTS

Noncommutative algebra, algebraic geometry, integrable systems, orthogonal polynomials, spectral theory, geophysical fluid dynamics, quantum computing

PUBLICATIONS

Casper, W. Riley, Horozov, E., Iliev, P., and Yakimov M. "A Sato Krichever Theory for Fractional Differential Operators." Submitted. arXiv preprint 2108.12010

Casper, W. Riley, Grünbaum, F. A., Yakimov, M. and Zurrián, I. "Reflective Prolate-Spheroidal Operators and the adelic Grassmannian." Commun. Pure Appl. Math 2021 arXiv preprint 2003.11616

Casper, W. Riley and Yakimov, M. "The matrix Bochner problem." American J. Math, 2020 arXiv preprint 1803.04405.

Casper, W. Riley, Grünbaum, F. A., Yakimov, M. and Zurrián, I. "Reflective prolate-spheroidal operators and the KP/KdV equations." Proc. Natl. Acad. Sci. USA, 2019.

Casper, W. Riley and Yakimov, M. "Integral operators, bispectrality and growth of Fourier algebras." J. Reine Angew. Math (Crelle's Journal), 2019 DOI: 10.1515/crelle-2019-0031.

Casper, W. Riley, Kolb, S., and Yakimov, M. "Bivariate continuous q-Hermite polynomials and deformed quantum Serre relations." J. Algebra Appl.

Casper, W. Riley "The symmetric 2×2 hypergeometric matrix differential operators." (submitted) arXiv preprint 1907.12703, 2019.

Casper, W. Riley "Elementary examples of solutions to Bochner's problem for matrix differential operators." Journal of Approximation Theory, 229:36-71, 2018.

Casper, W. Riley "An interaction between orthogonal polynomials and shear instabilities in the QG shallow water equations." arXiv preprint 1710.02756, 2017.

Coles, Patrick J. et al "Quantum algorithm implementation for beginners." arXiv preprint 1804.03719, 2018.

Casper, W. Riley and Nadiga, B. "A new spectral clustering algorithm." (submitted) arXiv preprint 1710.02756, 2017.

Nadiga, B., Casper, W. Riley, and Jones, P. "Ensemble-based global ocean data assimilation." Ocean Modelling 72 (2013): 210-230.

INVITED TALKS

AMS Sectional Meeting at Tufts University: *Quantum Probability, Orthogonal Polynomials, and Special Functions*, Medford, MA	2020
The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications: *Algebraic and Geometric Methods in Nonlinear Differential Equations* in Atlanta, Georgia	2020
Matrix-valued Special Functions and Integrability, Nijmegen, Netherlands	2019
Orthogonal Polynomials, Special Functions and Applications in Hagenberg, Austria	2019
Geometry and Physics XVI in Timisoara, Romania	2018
AMS-CMS Joint Conference in Shanghai, China	2018
ICM Satellite Conference in Cusco, Peru	2018

AWARDS

AMS-Simons Travel Grant	2018
Winner in Mathematics category, Los Alamos National Lab Student Symposium	2015
Academic Achievement Award, University of Washington	2013
Top Scholar Award, University of Washington	2011
Winner in Physics category, Los Alamos National Lab Student Symposium	2011
NDSU Math Department Teaching Award	2009
NDSU Goldwater Scholarship Nominee	2008

SERVICE

Community outreach:

- Volunteer math instructor for the Freedom Education Project Puget Sound (FEPPS) at the Washington Corrections Center for Women (2015-2016)
    - Taught multiple semester-long sections of college-level math classes inside a womens' prison to inmates working towards associates degrees
    - classes are accredited by Tacoma Community College
- Volunteer judge at UW Math Olympiad and LSU Math Contest 2015-present

Mentorship/Training:

- Graduate student mentor for undergraduate research team in the Washington Experimental Mathematics Lab (WXML) studying machine learning (2016-2017)
    - worked with Sara Billey to guide a team of undergraduate researchers with diverse majors on a research project combining machine learning and graph theory
    - Provided guidance on fundamentals of computer programming in python
    - Familiarized students with various isomorphism invariants to distinguish nonisomorphic graphs
    - The project is ongoing and aims to use machine learning to identify graphs and create an online database of basic graphs akin to OEIS

- Co-mentor for computational physics summer school at Los Alamos National Lab 2017
  - Mentored with Balu Nadiga to guide a team of graduate student researchers on computational projects in geophysical fluid dynamics
  - Taught/lectured/debugged computational and postprocessing code in C, Fortran, and python
  - Lectured on fundamental concepts in geophysical fluid dynamics, including the shallow water and Boussinesq approximations, Taylor curtains, and Eckman pumping
- Co-host of student seminar on algebraic geometry at Los Alamos National Lab 2015
  - Orgainized a seminar in combination with Nick Howell (U. Oregon and Moscow HSE)
  - Introduced undergraduate/graduate students with engineering and physics backgroud to topics in algebraic geometry
  - Emphasized applications to non-math disciplines

Referee/Reviewer:

- Review writer for Zentralblatt MATH
- Referee for Journal of Approximation Theory
- Referee for Communications in Mathematical Physics
- Referee for SIAM Journal on Mathematical Analysis

Inclusivity:

- LSU SafeSpace certified since Fall 2018

ATTENDED CONFERENCES

AMS Sectional Meeting at Tufts University: *Quantum Probability, Orthogonal Polynomials, and Special Functions*, Medford, MA	2020
The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications: *Algebraic and Geometric Methods in Nonlinear Differential Equations*	2020
AMS Joint Mathematics Meeting	2020
Matrix-valued Special Functions and Integrability	2019
Orthogonal Polynomaials, Special Functions and Applications (OPSFA)	2019
AMS-CMS Joint Conference	2018
Geometry and Physics XVI	2018
ICM Satellite Conference	2018
Western Algebraic Geometry Symposium	2015-2017
AMS Joint Math Meetings	2016
Bootcamp for the Summer Research Institute on Algebraic Geometry	2015
Arizona Winter School on Arithmetic and Higher Dimensional Varieties	2015

TEACHING EXPERIENCE

Louisiana State University   Baton Rouge, LA

· Math 7290 *Group schemes* Spring 2020
· Math 2057 *Calculus III* Spring 2020
· Math 1551 *Honors Analytic Geometry and Calculus I* Fall 2019
· Math 7240 *Algebraic geometry* Fall 2018
· Math 1550 *Analytic Geometry and Calculus I* Fall 2017

University of Washington, Seattle Seattle, WA
· Math 530 *Real analysis graduate prelim prep* Summer 2017
· Math 530 *Complex graduate prelim prep* Summer 2017
· Math 309 *Linear analysis* Spring 2017
· Math 307 *Differential equations* Winter 2016
· Math 309 *Linear analysis* Fall 2015
· Math 309 *Linear analysis* Spring 2015
· Math 307 *Differential equations* Winter 2015
· Math 300 *Proof writing* Summer 2014
· Math 307 *Differential equations* Spring 2014
· Math 126 *Calculus III* Winter 2013
· Math 308 *Linear algebra* Fall 2013
· Math 326 *Advanced multivariate vector calculus* Summer 2013
· Math 307 *Differential equations* Spring 2013
· Math 125 *Calculus II* Winter 2012
· Math 126 *Calculus III* Fall 2012
· Math 126 *Calculus III* Spring 2012
· Math 125 *Calculus II* Fall 2011

North Dakota State University Fargo, ND
· TA for freshman physics labs and quiz sections for calculus 2006-2010

SHORT-TERM VISITS

University of Oregon, Eugene OR June 5-10, 2016

University of California, Berkeley CA April 1-5, 2019

Radboud University, Nijmegen, Netherlands July 6-14, 2019

Stockholm University, Stockholm, Sweden July 15-20, 2019

SOFTWARE DEVELOPMENT

Parallel Ocean Program (POP) and Data Assimilation Research Testbed (DART) data reanalysis

Highly configurable, parallelized high-performance pseudospectral DNS solver for Euler, shallow water, and boussinesq equations with multiple boundary conditions, capable of running with 1000's of cores

Quantum machine learning algorithm implementation on the D-Wave

Benchmarking and performance prediction software on HPC computer clusters

MISCELLANEOUS

Programming languages: C, C++, Fortran, Python, Ruby

Mathematical software: Sympy, Matlab/Octave, Mathematica