

## Contact Information

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## Employment

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1. J.L. Doob Research Assistant Professor *with Marius Junge* August 2021-Current  
Department of Mathematics, University of Illinois at Urbana-Champaign

## Education

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- Ph.D., Mathematics, Purdue University August 2015- April 2021  
Thesis: "On the abstract structure of operator systems and applications to quantum information theory"  
Advisor: Thomas J. Sinclair
- B.A., Mathematics, San José State University December 2014  
Advisor: Timothy Hsu

## Appointments

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5. Institute Affiliate August 2021-Current  
Illinois Quantum Information Science and Technology Center
4. J.L. Doob Research Assistant Professor August 2021-Current  
Department of Mathematics, University of Illinois at Urbana-Champaign
3. Andrews Fellow of Mathematics August 2015-December 2020  
Department of Mathematics, Purdue University
2. Purdue Research Foundation Fellow June 2019-June 2020  
Department of Mathematics, Purdue University
1. GAANN Fellow January 2016-January 2018  
Department of Mathematics, Purdue University

## Visiting Research Positions/Extended Stays

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3. Visiting Researcher June-July 2022  
Mathematisches Institut WWU Münster
2. Thematic Research Program: Operator Algebras, Groups and Applications to Quantum Information, Instituto de Ciencias Matematicas, Madrid, Spain May 2019
1. Long Program on Quantitative Linear Algebra, Institute for Pure and Applied Mathematics, University of California, Los Angeles, California, USA March-June 2018

## Short Research Visits

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7. Department of Computer Science, Columbia University, Host: Henry Yuen December 2022
6. Department of Mathematics, University of Virginia, Host: Ben Hayes April 2022
5. Army Cyber Institute, United States Military Academy, West Point Host: Travis Russell February 2020

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| 4. Department of Mathematics, University of Illinois at Urbana-Champaign<br>Host: Marius Junge | October 2019 |
| 3. Department of Mathematics, University of Virginia, Host: Ben Hayes                          | October 2019 |
| 2. Department of Mathematics, Sam Houston State University, Host: Damon Hay                    | March 2019   |
| 1. Department of Mathematics, Texas A&M, Host: Gilles Pisier                                   | March 2019   |

## Research Interests

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- Tensor theory of operator spaces
- Tensor theory of operator systems
- Local structure of operator spaces and operator systems
- Quantum information theory
- Operator algebras

## Publications and Preprints

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6. An index for inclusions of operator systems (with Colton Griffin and Thomas Sinclair) (2022). arXiv:2203.05710. Submitted
5. Approximating projections by quantum operations (with Colton Griffin, Aneesh Khilnani, and Thomas Sinclair) (2022) arXiv:2203.02627. Submitted
4. Matricial Archimedean order unit spaces and quantum correlations (with Travis Russell and Mark Tomforde). (2021) arXiv:2109.11671. To appear: Indiana University Mathematics Journal
3. A universal representation for quantum commuting correlations (with Travis Russell and Mark Tomforde). (2021) arXiv:2102.05827. Published: Annales Henri Poincaré (2022) DOI: 10.1007/s00023-022-01197-7
2. An abstract characterization for projections in operator systems (with Travis Russell). (2020) arXiv:2006.03094. To appear: Journal of Operator Theory
1.  $\mathcal{R}$  we living in the matrix? (with Rolando de Santiago). Notices of the American Mathematical Society. Volume 66, Number 8, (2019), Pgs. 1216-1224.

## Honors and Awards

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| 6. AMS Travel Grant<br>American Mathematical Society                                  | March 2020    |
| 5. Purdue Research Foundation Grant<br>Department of Mathematics, Purdue University   | June 2019     |
| 4. GAANN Fellowship<br>Department of Mathematics, Purdue University                   | January 2016  |
| 3. Andrews Fellowship<br>Department of Mathematics, Purdue University                 | August 2015   |
| 2. Mervin L. Keedy Scholarship<br>Department of Mathematics, Purdue University        | August 2015   |
| 1. College of Science Dean's Scholar<br>College of Science, San Jose State University | December 2014 |

## Presentations

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### Invited

31. Lecture, Quantum Information and Computing Seminar, University of Delaware November 2022  
Title: TBD
30. Lecture, Operator Algebras Seminar, Purdue University October 2022  
Title: TBD
29. Research Scholars Seminar, Discovery Partners Institute, Chicago, IL September 2022  
Title: Quantum Information Theory: an intro from the theoretical viewpoint
28. Lecture Series, KnOttawa Summer School 2022, Kansas State University July 2022  
Lecture Series Topic: Quantum Information Theory
  - (a) Lecture 1: The Postulates of Quantum Mechanics Part I
  - (b) Lecture 2: The Postulates of Quantum Mechanics Part II
  - (c) Lecture 3: Quantum Operations and Quantum Noise Part I
  - (d) Lecture 4: Quantum Operations and Quantum Noise Part II
  - (e) Lecture 5: Quantum Error Correction
27. Kleines Seminar, WWU Münster, June 2022  
Title: The Postulates of Quantum Mechanics and Further Observations
26. Oberseminar  $C^*$ -algebren, WWU Münster, June 2022  
Title: A Universal Representation for Quantum Commuting Correlations
25. Operator Theory Seminar, University of Virginia April 2022  
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations
24. AMS Spring Southeastern Sectional Meeting on “Advances in Operator Algebras” March 2022  
University of Virginia  
Title: TBD (Meeting Canceled)
23. Plenary Lecture, Southeastern Analysis Meeting, University of Florida March 2022  
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations
22. Functional Analysis Seminar, University of California San Diego February 2022  
Title: Matricial Archimedean Order Unit Spaces and Quantum Correlations
21. Department of Mathematics & Statistics Colloquium, San José State University September 2021  
Title: From Correlation Sets to Tensor Products of  $C^*$ -algebras: The Connes-Kirchberg Problem
20. Expository Lecture Series, Groundwork for Operator Algebras Lecture Series (GOALS), July 2021  
Michigan State University, East Lansing, Michigan
  - (a) Lecture 1: Completely Positive Maps and Applications
  - (b) Lecture 2: Lance’s Weak Expectation Property and Kirchberg’s Conjecture
19. Special Session on Advances in Operator Algebras, Joint Mathematics Meeting January 2021  
Washington D.C.  
Title: An Abstract Characterization for Projections in Operator Systems
18. Special Session: “If You Build It They Will Come”: Presentations by Scholars in the January 2021  
National Alliance for Doctoral Studies in the Mathematical Sciences,  
Joint Mathematics Meeting, Washington D.C.  
Title: A Look into the Abstract Theory of Operator Systems and Some Applications to Quantum Information Theory

17. Operator Theory Seminar, University of Iowa November 2020  
Title: Projections in Operator Systems and Applications to Quantum Information Theory
16. East Coast Operator Algebras Symposium, University of Virginia October 2020  
Title: Projections in Operator Systems and Applications to Quantum Information Theory
15. Mathematical Physics and Operator Algebras Seminar, Michigan State University September 2020  
(a) Lecture 1: Operator Spaces and Operator Systems: An Exposition.  
(b) Lecture 2: An Abstract Characterization for Projections in Operator Systems.
14. Rings and Wings Seminar, Algebras and Rings in Colorado Springs Center (ARCS) September 2020  
University of Colorado at Colorado Springs  
Title: An Abstract Characterization for Projections in Operator Systems
13. Oberseminar  $C^*$ -algebren, WWU Münster, June 2020  
Title: An Abstract Characterization for Projections in Operator Systems
12. 2TART Conference, University of Florida June 2020  
Title: An Abstract Characterization for Projections in Operator Systems
11. Operator Algebras Mini-Workshop, University of Virginia March 2020  
Title: On Operator Systems Containing Symmetries
10. Quantitative Linear Algebra Reunion Conference at Lake Arrowhead, Institute December 2019  
for Pure and Applied Mathematics, University of California, Los Angeles  
Title: Tensor Products and Categorical Properties of Matrix Convex Sets
9. Analysis Seminar, University of Illinois at Urbana-Champaign October 2019  
Title: Matrix Convex Sets, Tensor Products, and Noncommutative Choquet Boundaries
8. Operator Theory Seminar, University of Virginia October 2019  
Title: Matrix Convex Sets, Tensor Products, and Noncommutative Choquet Boundaries
7. Mathematics Colloquium, Sam Houston State University March 2019  
Title: On Operator Spaces and Submaximality
6. Linear Analysis Seminar, Texas A&M March 2019  
Title: On Operator Systems and Matrix Convexity
5. Graduate Research Day, Purdue University November 2018  
Title: Lance's WEP and Operator System Nuclearity
4. Quantitative Linear Algebra Culminating Workshop at Lake Arrowhead June 2018  
University of California, Los Angeles  
Title: Lance's Weak Expectation Property and The Tensor Theory of Operator Systems
3. Quantitative Linear Algebra General Seminar Series, Institute for Pure and April 2018  
Applied Mathematics, University of California, Los Angeles  
Title: Characterizations of Operator Systems Via Tensor Product Nuclearity Part II
2. Quantitative Linear Algebra General Seminar Series, Institute for Pure and April 2018  
Applied Mathematics, University of California, Los Angeles  
Title: Characterizations of Operator Systems Via Tensor Product Nuclearity Part I
1. Department of Mathematics and Statistics Colloquium, San José State University April 2015  
Title:  $C^*$ -Algebras and Real Operator Systems

## Contributed

4. Early Career Workshop in Operator Theory & Operator Algebras, Indiana University and Purdue University  
Title: A Universal Representation for Quantum Commuting Correlations February 2021
3. Wabash Annual Mini-Conference, IUPUI, Indianapolis, IN  
Title: Matrix Convex Sets, Tensor Products, and Noncommutative Choquet Boundaries September 2019
2. Northern California Undergraduate Mathematics Conference, Saint Mary's College  
Title: Real Operator Systems in  $M_n$  March 2015
1. American Mathematical Society Joint Mathematics Meetings, AMS Session on Functional Analysis  
Title: Real Operator Systems in  $M_n$  January 2015

## Conferences/Workshops Attended

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28. QLA Meets QIT II, Illini Center, University of Illinois at Urbana-Champaign  
Illinois Quantum Information Science and Technology Center  
Chicago Quantum Exchange November 2022
27. Operator Algebras, Dynamics, and Groups. ICM Satellite Conference  
University of Copenhagen July 2022
26. Advancing Quantum Mechanics with Mathematics and Statistics, IPAM  
University of California Los Angeles March-June 2022
  - (a) Workshop IV: Monte Carlo and Machine Learning Approaches in Quantum Mechanics May 2022
  - (b) Workshop III: Large-scale Certified Numerical Methods in Quantum Mechanics May 2022
  - (c) Workshop II: Model Reduction in Quantum Mechanics April 2022
  - (d) Workshop I: Multiscale Approaches in Quantum Mechanics March-April 2022
25. AMS Spring Central Sectional Meeting on "Recent Developments in Operator Algebras", Purdue University March 2022
24. AMS Spring Southeastern Sectional Meeting on "Advances in Operator Algebras"  
University of Virginia (Meeting Canceled) March 2022
23. Southeastern Analysis Meeting, University of Florida March 2022
22. Groundwork for Operator Algebras Lecture Series, Michigan State University July 2021
21. Early Career Workshop in Operator Theory & Operator Algebras  
Indiana University and Purdue University February 2021
20. Entropy Inequalities, Quantum Information and Quantum Physics  
Institute for Pure and Applied Mathematics, University of California, Los Angeles February 2021
19. Joint Mathematics Meeting, Washington D.C. January 2021
18. East Coast Operator Algebras Symposium, University of Virginia October 2020
17. Groundwork for Operator Algebras Lecture Series (GOALS)  
Michigan State University June-July 2020

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| (a) Groundwork for Operator Algebras Lecture Series (GOALS)<br>Culminating Workshop   | July 2020       |
| 16. Noncommutative Geometry and Operator Algebras Spring Institute<br>Vanderbilt University   | May 2020        |
| 15. Operator Algebras Mini-Workshop, University of Virginia   | March 2020      |
| 14. Quantitative Linear Algebra Reunion Conference at Lake Arrowhead, Institute<br>for Pure and Applied Mathematics, University of California, Los Angeles, USA               | December 2019   |
| 13. QLA Meets QIT, Purdue University  | November 2019   |
| 12. Classification Problems in von Neumann Algebras, Banff International Research<br>Station for Mathematical Innovation and Discovery (BIRS)                                 | September 2019  |
| 11. Wabash Mini-Conference, IUPUI   | September 2019  |
| 10. Thematic Research Program: Operator Algebras, Groups and Applications<br>to Quantum Information, Visiting Researcher, Instituto de<br>Ciencias Matematicas, Madrid, Spain | May 2019        |
| (a) Workshop II: Mathematical Aspects of Quantum Information Theory   | May 2019        |
| (b) School II: Applications to Quantum Information Theory   | May 2019        |
| 9. Brazos Analysis Seminar, University of Houston   | March 2019      |
| 8. Wabash Mini-Conference, IUPUI  | September 2018  |
| 7. Quantitative Linear Algebra, Visiting Scholar/Researcher, Institute for Pure<br>and Applied Mathematics, University of California, Los Angeles                             | March-June 2018 |
| (a) Workshop IV: Quantitative Linear Algebra Culminating Workshop   | June 2018       |
| (b) Workshop III: Random Matrices and Free Probability  | May 2018        |
| (c) Workshop II: Approximation Properties in Operator Algebras and Ergodic Theory   | May 2018        |
| (d) Workshop I: Expected Characteristic Polynomial Techniques and Applications  | April 2018      |
| 6. Classification of Group von Neumann Algebras, American Institute<br>of Mathematics, San Jose, California, USA  | January 2018    |
| 5. Wabash Mini-Conference, IUPUI  | September 2017  |
| 4. East Coast Operator Algebras Seminar, Loyola University  | October 2016    |
| 3. Workshop on Non-Commutative Analysis, University of Iowa   | June 2016       |
| 2. Great Plains Operator Theory Symposium, University of Illinois at Urban-Champaign  | May 2016        |
| 1. East Coast Operator Algebras Seminar, University of Iowa   | October 2015    |

### Other Conferences Attended/Outreach

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| 9. Panelist, Finding and Getting Jobs: A Panel Discussion<br>Purdue University   | April 2021    |
| 8. Q&A Moderator, Fields of Success, Stories from Math Alliance Alumni<br>Math Alliance Field of Dreams Conference, Institute for Mathematics<br>and its Applications, University of Minnesota (virtual) | November 2020 |

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| 7. Panelist, Grad School Life, Career Paths in the Mathematical Sciences: An IMA/Math Alliance Workshop, Institute for Mathematics and its Applications, University of Minnesota, USA  | July 2020     |
| 6. Panelist, Finding Your Focus in Graduate School: The Many Focuses of a Math Sciences PhD., Career Paths in the Mathematical Sciences: An IMA/Math Alliance Workshop, Institute for Mathematics and its Applications, University of Minnesota, USA | June 2019     |
| 5. Panelist, Maximizing Opportunities, Math Alliance Field of Dreams, St. Louis, USA   | November 2018 |
| 4. Math Alliance Field of Dreams Conference, St. Louis, USA  | November 2018 |
| 3. Latinos in the Mathematical Sciences, Institute for Pure and Applied Mathematics, University of California, Los Angeles   | March 2018    |
| 2. Math Alliance Field of Dreams Conference, St. Louis, USA  | November 2017 |
| 1. Math Alliance Field of Dreams Conference, St. Louis, USA  | November 2016 |

## Teaching

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### *University of Illinois at Urbana-Champaign*

- Math 492: Quantum Channels and Error Correction (8 students) Illinois Geometry Lab, University of Illinois at Urbana-Champaign Fall 2022
- Math 415: Applied Linear Algebra (280 students) Fall 2022
- Math 492 Select Topics in Quantum Information Theory (16 students) Illinois Geometry Lab, University of Illinois at Urbana-Champaign Spring 2022
- Math 415 Applied Linear Algebra (280 students) Spring 2022
- Math 125 Elementary Linear Algebra (80 students) Fall 2021

### *Purdue University*

- Math 16200 Plane Analytic Geometry And Calculus II (Recitation) Summer 2021
- Math 16010 Applied Calculus 1 (Instructor) Spring 2021
- Math 26100 Multivariate Calculus (Recitation) Fall 2017
- Math 16600 Analytic Geometry and Calculus II (Recitation) Spring 2017

## Advising

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### *University of Illinois at Urbana-Champaign*

- Chieh Hsu (Undergraduate), Physics May 2022-Current

## Service

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- Seminar Committee Member, Illinois Quantum Information Science and Technology Center (IQUIST), University of Illinois at Urbana-Champaign August 2022-Current
- Scholarship Board Member, Sloan University Center of Exemplar Mentoring at Illinois University of Illinois at Urbana-Champaign September 2021-Current
- Mentor, Sloan University Center of Exemplar Mentoring at Illinois University of Illinois at Urbana-Champaign September 2021-Current
- TA, Groundwork for Operator Algebras Lecture Series (GOALS) Michigan State University June-July 2020

### Conferences/Seminars Organized:

8. Co-Organizer (with Marius Junge, Felix Leditzky and Thomas Sinclair) November 2022  
QLA Meets QIT II  
University of Illinois at Urbana-Champaign, Illinois Quantum Information Science and Technology Center, Chicago Quantum Exchange
7. Co-Organizer (with Marius Junge) August 2021-Current  
Operator Algebras Seminar  
University of Illinois at Urbana-Champaign
6. Co-Organizer (with Rolando de Santiago, Thomas Sinclair and Andrew Toms) March 2022  
AMS Spring Central Sectional Meeting on "Recent Developments in Operator Algebras"  
Purdue University
5. Co-Organizer (with Marius Dadarlat and Thomas Sinclair) August 2019-May 2021  
Operator Algebras Seminar  
Purdue University
4. Organizer, Junior Operator Algebras Seminar August 2018-May 2021  
Purdue University
3. Co-Organizer (with Thomas Sinclair), QLA (Quantitative Linear Algebra) Meets QIT (Quantum Information Theory) Conference November 2019  
Purdue University
2. Organizer, Quantitative Linear Algebra General Seminar Series March 2018-June 2018  
Institute for Pure and Applied Mathematics  
University of California, Los Angeles
1. Organizer, Quantitative Linear Algebra Open Problem Session March 2018-June 2018  
Institute for Pure and Applied Mathematics  
University of California, Los Angeles

### Other:

- Graduate Student Representative August 2017-May 2018  
Department of Mathematics, Purdue University
- Chapter President, Purdue University AMS Student Chapter August 2017-May 2018  
Purdue University



## References

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- Marius Dadarlat, Professor of Mathematics, Purdue University,  
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- Marius Junge, Professor of Mathematics, University of Illinois at Urbana-Champaign,  
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- Vern Paulsen, Professor of Mathematics, University of Waterloo  
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- Gilles Pisier, Distinguished Professor of Mathematics, Texas A&M, Professor Emeritus of Mathematics, Sorbonne Université,  
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- Thomas J. Sinclair, Associate Professor of Mathematics, Purdue University,  
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