

James Eldred Pascoe

Positions

Assistant Professor of Mathematics, Drexel University (Fall 2022-Present)

Assistant Professor of Mathematics, University of Florida (Fall 2018-Summer 2022)

National Science Foundation Mathematical Sciences Postdoctoral Research Fellow, Washington University in St. Louis (Fall 2016 - Summer 2018)

William Chauvenet Postdoctoral Lecturer, Washington University in St. Louis (Fall 2015 - Summer 2018)

Education

Ph.D. Mathematics, University of California, San Diego, 2015.

Advisor: Jim Agler.

Committee: Jim Agler, Adrian Ioana, Bill Helton, Bob Bitmead, William McEneaney.

M.A Applied Mathematics, University of California, San Diego, Fall 2011

B.S. Mathematics, minor in English, University of North Texas, Spring 2010.

Grants

"The 38th Southeastern Analysis Meeting (SEAM)" National Science Foundation Grant DMS-2154455 (2022-2023) (\$33,400 USD, co-PI Jury and McCullough)

"Matrix Analysis for the 21st Century" National Science Foundation Grant DMS-1953963 (2020-2023) (\$133,158 USD)

National Science Foundation Mathematical Sciences Postdoctoral Research Fellow (2016-2019) (\$150,000 USD)

Editorial work

Associate Editor, Complex Analysis and Operator Theory

Fields of Research Interest

Matrix inequalities, complex variables, stable polynomials, real algebraic geometry, noncommutative algebra, harmonic analysis, moment problems, multivariable operator theory, random matrix theory and free probability.

Research

Journal Articles

1. J. E. Pascoe, Ryan Tully-Doyle The royal road to automatic noncommutative real analyticity, monotonicity, and convexity. *Adv. Math.* to appear.
2. J. E. Pascoe Invariant structure preserving functions and an Oka-Weil Kaplansky density type theorem *Tohoku Math. Journal* to appear.

3. Kelly Bickel, J. E. Pascoe, Ryan Tully-Doyle Analytic continuation of concrete realizations and the McCarthy Champagne conjecture. *IMRN*. to appear.
4. Michael Jury, Igor Klep, Mark Mancuso, Scott McCullough, J. E. Pascoe Noncommutative partially convex rational functions. *Rev. Mat. Iberoamericana* to appear.
5. Kelly Bickel, J. E. Pascoe, Alan Sola. Singularities of rational inner functions in higher dimensions. *American Journal of Mathematics*. to appear.
6. J. E. Pascoe, Tapes Yadav Macroscale behavior of random lower triangular matrices. *Anal. Math. Phys.* 12 (2022), no. 1, Paper No. 12, 11 pp.
7. J. E. Pascoe, Ryan Tully-Doyle Monotonicity of the principal pivot transform. *Linear Algebra Appl.* 643 (2022), 161–165
8. J. E. Pascoe. The outer spectral radius and dynamics of completely positive maps. *Israel J. Math.* 244 (2021), no. 2, 945–969.
9. J. E. Pascoe, Meredith Sargent, Ryan Tully-Doyle. A controlled tangential Julia-Carathéodory theory via averaged Julia quotients. *Anal. PDE* 14 (2021), no. 6, 1773–1795.
10. Igor Klep, J. E. Pascoe, Jurij Volcic. Positive univariate trace polynomials. *J. Algebra* 579 (2021), 303–317.
11. Michael Jury, Igor Klep, Mark Mancuso, Scott McCullough, J. E. Pascoe Noncommutative partial convexity via Γ -convexity. *Journal of Geometric Analysis*. 31 (2021), no. 3, 3137–3160.
12. J. E. Pascoe, Ryan Tully-Doyle. Automatic real analyticity and a regal proof of a commutative multivariate Löwner theorem. *Proc. Amer. Math. Soc.*, 149 (2021), 2019–2024.
13. J. E. Pascoe. Trace minmax functions and the radical Laguerre Pólya class. *Res. Math. Sci.* 8 (2021), no. 1, 9.
14. Kelly Bickel, J. E. Pascoe, Alan Sola. Level curve portraits of rational inner functions. *Annali della Scuola Normale Superiore di Pisa, Classe di Scienze*, (2020) PP. 449-494 | Vol. XXI.
15. Meric Augat, Michael Jury, J. E. Pascoe. Effective noncommutative Nevanlinna-Pick interpolation on the row ball and applications. *J. Math. Anal. Appl.* 492 (2020), no. 2, 124457, 21 pp.
16. Igor Klep, J. E. Pascoe, Gregor Podlogar and Jurij Volcic Noncommutative rational functions invariant under the action of a finite solvable group. *J. Math. Anal. Appl.* 490 (2020), no. 2, 124341, 17 pp.
17. J. E. Pascoe An entire free holomorphic function which is unbounded on the row ball. *Journal of Operator Theory*, 84 (2020), no. 2, 365–367.
18. J. E. Pascoe Committee spaces and the random column-row property. *Complex Analysis and Operator Theory*. 14 Paper No. 13. (2020)
19. J. E. Pascoe, Benjamin Passer, Ryan Tully-Doyle. Representation of free Herglotz functions. *Indiana Univ. Math. J.* 68 No. 4 (2019), 1199–1215
20. J. E. Pascoe. The wedge-of-the-edge theorem: edge-of-the-wedge type phenomenon within the common real boundary. *Canad. Math. Bull.* 62 (2019), no. 2, 417–427.
21. J. E. Pascoe An elementary method to compute the algebra generated by some given matrices. *Linear Algebra Appl.* 571 (2019), 132–142.
22. J. E. Pascoe. Note on Löwner’s theorem on matrix monotone functions in several commuting variables of Agler, McCarthy and Young. *Monatsh. Math.* 189 no. 2 (2019), 377–381.
23. J. E. Pascoe, Ryan Tully-Doyle. Cauchy transforms arising from homomorphic conditional expectations parametrize free Pick functions *J. Math. Anal. Appl.* 472 (2) 2019. 1487–1498

24. J. E. Pascoe. An inductive Julia-Caratheodory theorem for Pick functions in two variables. *Proc. Edin. Math. Soc.*, (2) 61 (2018), no. 3. 647-660.
25. David Cushing, J. E. Pascoe, Ryan Tully-Doyle. Free functions with symmetry. *Math. Z.*, 289 (2018), no. 3-4, 837-857.
26. Kelly Bickel, J. E. Pascoe, Alan Sola. Derivatives of rational inner functions: geometry of singularities and integrability at the boundary. *Proc. Lond. Math. Soc.*, 116 (2) 281-329 (2018).
27. J. E. Pascoe. The noncommutative Löwner theorem for matrix monotone functions over operator systems. *Linear Algebra Appl.* 541 (2018) 54-59.
28. J. E. Pascoe. Positivstellensätze for noncommutative rational expressions. *Proc. Amer. Math. Soc.*, 146 (2018) 933-937.
29. John E. McCarthy, J. E. Pascoe. A non-commutative Julia Inequality. *Math. Ann.*, 370 (1-2) 423-446, 2018.
30. J. E. Pascoe. A wedge-of-the-edge theorem: analytic continuation of multivariable Pick functions in and around the boundary. *Bull. Lond. Math. Soc.*, 49 (5) 916-945, 2017
31. J. E. Pascoe, Ryan Tully-Doyle. Free Pick functions: representations, asymptotic behavior and matrix monotonicity in several noncommuting variables. *J. Funct. Anal.*, 273 (1) 283-328 (2017)
32. John McCarthy, J. E. Pascoe. The Julia-Caratheodory theorem on the bidisk revisited. *Acta Sci. Math. (Szeged)*, 83:1-2, 165-175, 2017
33. Igor Klep, J. E. Pascoe, Jurij Volcic. Regular and positive noncommutative rational functions. *J. Lond. Math. Soc.*, 95 (2) 613-632, 2017
34. J. William Helton, J. E. Pascoe, Ryan Tully-Doyle, Victor Vinnikov. Convex entire noncommutative functions are polynomials of degree two or less. *Integral Equations Operator Theory*, 86 (2), 151-163, 2016.
35. J. E. Pascoe. The inverse function theorem and the Jacobian conjecture for free analysis. *Math. Z.*, 278 (3-4) 987-994, 2014.

Submitted Preprints

1. J. E. Pascoe, Ryan Tully-Doyle Induced Stinespring factorization and the Wittstock support theorem. *preprint.*
2. Scott McCullough, J. E. Pascoe Geometric Dilations and Operator Annuli. *preprint.*
3. Kelly Bickel, Greg Knese, J. E. Pascoe, Alan Sola Local theory of stable polynomials and bounded rational functions of several variables. *preprint.*
4. J. E. Pascoe, Ryan Tully-Doyle Averaged mixed Julia-Fatou type theory with applications to spectral foliation. *preprint.*
5. Kelly Bickel, J. E. Pascoe, Meredith Sargent Zero-free regions near a line. *preprint.*
6. J. E. Pascoe Free noncommutative principal divisors and commutativity of the tracial fundamental group. *preprint.*
7. J. E. Pascoe Noncommutative free universal monodromy, pluriharmonic conjugates and plurisubharmonicity. *preprint.*
8. J. E. Pascoe Noncommutative Schur-type products and their Schoenberg theorem. *in revision.*

Presentations

Colloquia and lecture series

1. "Geometric dilation and the quantum annulus." Colloquium, Drexel, January 2022
2. "The Jacobian conjecture in noncommuting variables and free universal monodromy." REU Colloquium, University of Tennessee, Chattanooga, Summer 2021
3. "The tracial fundamental group." Colloquium, University of Ljubljana, Fall 2020.
4. "Monodromy and logarithms of nonsingular matrix-valued functions." Distinguished Visiting Professor Lecture Series, Bucknell, March 2020
5. "Manipulating matrix inequalities." Colloquium, University of Florida, Fall 2018.
6. "The wedge-of-the-edge theorem." Distinguished Visiting Professor Lecture Series, Bucknell, October 2017.
7. "Real algebraic geometry and matrix inequalities." Distinguished Visiting Professor Lecture Series, Bucknell, October 2017.
8. "Free functions with Symmetry." Colloquium, University of Florida, Fall 2016.

Long invited talks

1. "The radical Laguerre Polya class" Oberwolfach March 2022.
2. "Abstract preservers" ICMS Workshop on Applied Positivity (2021)
3. "Free convexity, plurisubharmonicity, and universal monodromy" AIM workshop on Noncommutative Inequalities (2021)
4. "Trace minmax functions and the radical Laguerre-Polya class" Clemson Analysis Seminar (Feb 2021)
5. "The tracial fundamental group" 2TART Seminar series (2020)
6. "Trace minmax functions and the radical Laguerre-Polya class" 2TART: OTWIA (2020)
7. "Free convexity, plurisubharmonicity, and universal monodromy" Saarbrücken Analysis Seminar (2020)
8. "The royal road to the multivariate Loewner theorem" Stockholm University Analysis seminar (2019)
9. "The failure of the column-row property in the Fock space." Focus Program on Applications of Non-commutative Function Theory, Fields Institute, June 2019.
10. "Noncommutative Positivstellensätze." Wabash Miniconference, September 2017.
11. "Regular and positive noncommutative rational functions." Iowa 2016 Workshop on Noncommutative Analysis.
12. "Monotonicity in free analysis." JMM 2016, Special Session on Advances in Free Analysis: the Theory and Applications of Noncommutative Functions, Inequalities, and Domains.
13. "Representation formulas for Pick functions in two complex variables and free function theory." Free Stochastic Analysis Mini-Workshop, Saarbrücken.

Further invited talks

1. "Abstract Presevers" IWOTA 2020 (in 2021)
2. "Realizations for special classes of noncommutative functions" IWOTA 2021

3. "Algebraic geometry and topology arising from tracial and determinantal free noncommutative functions" JMM 2021 special session on AMS Special Session on Advances in Multivariable Operator and Function Theory in Both Commutative and Non-commutative Settings
4. "Advances in realization theory for special classes of noncommutative functions" JMM 2020 special session on Advances in Multivariable Operator Theory: Connections with Algebraic Geometry, Free Analysis, and Free Probability
5. "The column-row property fails for the multipliers of the Fock space" IWOTA 2019
6. "Noncommutative positivity preserving products and their Schoenberg type theory" ILAS 2019, July 12, 2019
7. "Computing matrix algebra dimension and other exotic applications of the Pick matrix" ILAS 2019, July 8, 2019
8. "Calculating algebra dimension and other exotic applications of the Pick matrix." SEAM 2019, Alabama.
9. "Geometric aspects of the Julia quotient on sets with controlled tangential approach." Special session on Special Session on Operator and Function Theory, Delaware, AMS Sectional 2018
10. "Monotone maps for manipulating matrix inequalities." International Workshop on Operator Theory and Applications (IWOTA) 2018 in Free Analysis and Free Real Algebraic Geometry Special Session. Shanghai, China.
11. "Monotone maps for manipulating matrix inequalities." Matrix Theory and Network Systems (MTNS) 2018 in Problems in Positivity, Factorizations, and State Space Realizations for Scalar and Matrix Variables Special Session. Hong Kong.
12. "Invariant theory for non-commutative functions and applications." JMM 2018, San Diego, Special Session on Free Convexity and Free Analysis.
13. "Applications of model- realization theory to inverse problems in free probability." Mathematical Congress of the Americas, 2017, Special Session on Free Probability and its applications.
14. "Applications of model- realization theory to inverse problems in free probability." JMM 2017, Special Session on Operator Theory, Function Theory and Models.
15. "Matrix monotonicity in several variables." Semi-plenary, Southeastern Analysis Meeting (SEAM) 2016.
16. "Matrix monotonicity in several variables." International Workshop on Operator Theory and Applications (IWOTA) 2016 in Noncommutative Inequalities Special Session.
17. "Matrix monotonicity in several variables." Matrix Theory and Network Systems (MTNS) 2016 in Problems in Matrix and Operator Variables Special Session.
18. "Free functions with Symmetry." San Antonio, JMM 2015, Special Session on Noncommutative function theory.
19. "Using operator theory to measure the asymptotic behavior of Pick functions in two variables at infinity." San Antonio, JMM 2015, Special Session on Multivariable Operator Theory.
20. "A wedge of the edge of the wedge." ICMS Workshop 2014: Function theory in several complex variables in relation to modelling uncertainty.
21. "Matrix monotonicity in several noncommuting variables." JMM 2014, Special Session on Multivariable Operator Theory.
22. "Matrix monotonicity in several noncommuting variables." St. Louis AMS Sectional Meeting, Fall 2013, Special Session on Multivariable Operator Theory.

Invited seminar talks

1. "Geometric aspects of rational inner function membership in function spaces." Linear Analysis seminar TAMU Spring 2017.
2. "The Julia-Caratheodory theorem on the bidisk and the bi-upper half plane." Seminar at University of Auckland, February 2017.
3. "The Julia-Caratheodory theorem on the bidisk." Seminar, University of Florida, Fall 2016.
4. "Matrix monotone functions in one and several variables." TAMU Linear Analysis Seminar, October 24, 2014.

Other talks

1. "Positivstellensätze for noncommutative rational functions." Sums of Squares: Real Algebraic Geometry and its Applications, Innsbruck, August 2017.
2. "Geometric aspects of rational inner function membership in function spaces." WashU Analysis Seminar Spring 2017.
3. "Positive noncommutative rational functions." Analysis Seminar WashU Spring 2016.
4. "Hankel Vector Moment Sequences." Analysis Seminar WashU Fall 2015.
5. "Hankel vector moment sequences." GPOTS 2014.
6. "Injective free polynomials." Hilbert Function Spaces 2013.
7. "Boundary approximation and interpolation of Pick functions." Advancement to Candidacy 2013.
8. "The Pick problem." Food for Thought (Graduate student seminar) 2013.
9. "The Hamburger moment problem." Food for Thought (Graduate student seminar) 2012.

Other Awards

Mathematisches Forschungsinstitut Oberwolfach Leibniz Graduate Student, Workshop: Structured Function Systems and Applications, 2013

Graduate Assistant in Areas of National Need Fellow 2010-2012

Other work experience

University of California, San Diego.

Graduate Research Assistant for Jim Agler, Summers 2012, 2013, 2014, Fall-Spring 2015.

Graduate Research Assistant for Bill Helton, Summer 2011.

Teaching assistant for various classes including: Calculus, Complex analysis, Real analysis, Introduction to Proof.

University of North Texas, Denton. Grader and Mathlab tutor. Fall 2008- Spring 2010.

Apprentice Landman / Land Title Researcher, Ardmore, OK, Summer 2007.

Professional Activities and Service

Conferences

Organizer SEAM 2022

Consultant on online meeting organization for IWOTA 2020 Lancaster (in 2021)

Organized the Southeastern Analysis Meeting (SEAM) 2021 with Bolotnikov, Jury and McCullough under the 2TART brand

Organized 2TART: OTWIA Conference Summer 2020 with Klep, Bickel and Hartz.

Organized 2TART Conference Spring 2020

Founder and Organizer for *The Online Operator Theory And Related Topics (2TART) Conference and Seminar Series*.

Organized Special Session at UF AMS Sectional Meeting 2019

Organized Free Analysis Seminars at UCSD 2012 - 2015.

Organized Upper Triangularizability and Brown Measure Seminar at WashU Fall 2017

Diversity, Outreach, Equity and Inclusion

Organized 2TART: OTWIA Conference Summer 2020 "Widening the pipeline" discussion, which directly led to OTTER (junior operator theorist group), operatortheory.org, and other resources with an eye towards diversity, equity and inclusion.

Co-founder operatortheory.org, an operator theory resource website (joint with Kelly Bickel and Ryan Tully-Doyle)

Consultant for OTTER, a junior operator theorist group

Co-taught a one hour "Uncommon Reads" on Bridge

St. Louis Math Circle November 2017

Mentorship and Advising

Graduate student mentorship: Jurij Volcic, Benjamin Passer, Mark Mancuso,

Postdoc student mentorship: Meredith Sargent, Cody Stockdale,

Undergraduate mentorship: Ana Colovic, Andrew West, Katerina Satteone

Advisor: Tapesh Yadav, Austin Jacobs, Michael Coopman

Co-Chair: Meric Augat

Departmental service

Steering Committee Member for University of Florida Mathematics Department

Graduate committee member

Qualifying exam committee in Analysis, Functional Analysis

Longer Visits

University of Ljubljana, Slovenia, August 2018 (2 weeks)

Stockholm University, Sweden, August 2017 (2 weeks)

University of Ljubljana, Slovenia, August 2017 (2 weeks)

Texas A&M University, April 2017 (1 month)

University of Auckland, January-February 2017 (6 weeks)

University of Florida, October-November 2016 (1 month)

University of Auckland, December 2015. (1 month)

Miscellaneous

Programming Languages: Working knowledge of Java, C, C++, JavaScript, Mathematica, HTML.