Emily Sergel | Curriculum Vitae

Department of Mathematics, University of Pennsylvania
209 South 33rd Street, Philadelphia, PA 19104
✉ esergel@upenn.edu • math.upenn.edu/∼esergel

Mathematician specializing in algebraic combinatorics and symmetric function theory. Practitioner of experimental (computational) math and active learning techniques. Currently an NSF Postdoctoral Scholar.

Education and Work History

- **University of Pennsylvania** — **Philadelphia, PA**
  NSF Postdoctoral Scholar and Instructor — *Fall 2016–Spring 2019*

  I work closely with my Sponsoring Scientist, Jim Haglund, on research. I also teach Calculus I in a Structured, Active, In-class Learning format and previously taught a graduate course in Combinatorics. I am currently participating in Project NExT and received the AWM Dissertation Prize in 2017.

- **University of California, San Diego** — **La Jolla, CA**
  Graduate Student and Instructor — *Fall 2011–Spring 2016*

  I received my PhD in Mathematics under the direction of my advisor, Adriano Garsia. I worked as a TA, as an assistant for graduate courses, and as an instructor for a calculus course and a course in Game Theory.

  Awards and honors: NSF Graduate Research Fellowship, Graduate Student Teaching Scholarship, Microsoft Graduate Women Scholarship, GAANN Fellowship, James B. Ax Fellowship

- **Rutgers University** — **New Brunswick, NJ**
  Undergraduate Student and Recitation Leader — *Fall 2007–Spring 2011*

  I received a B.S. in Mathematics and Computer Science, as well as highest honors from the mathematics department. I was a member of the SAS honors program and the math department's honors track. I participated in summer REUs at Rutgers and at Rochester Institute of Technology. I also worked as a tutor, a grader, a peer instructor (TA's assistant), and a recitation leader (undergraduate TA).

  Awards and honors: Highest Honors in Mathematics, Hannah Hoyt Senior Prize, Weill Scholarship, James Dickson Carr Scholarship, Lawrence Corwin Prize in Mathematics, Tilla Weinstein Award

Research Activities

Publications

- James Haglund and Emily Sergel. *A compact formula for the Hilbert series in the Delta Conjecture.* In preparation.
- János Komlós, Emily Sergel, and Gábor Tusnády. *The asymptotic normality of $(s, s+1)$-cores with distinct parts.* Preprint arXiv:1809.00412.
- Emily Sergel. *A combinatorial model for ∇m_μ.* Preprint arXiv:1804.06037.
- Dun Qiu, Jeffrey B. Remmel, Emily Sergel, and Guoce Xin. *On the Schur positivity of $\Delta_{e_2} e_n[X]$.* Preprint arXiv:1710.03340. Accepted for publication in Electron. J. Combin.
- James Haglund and Emily Sergel. *A generalized major index statistic on tableaux.* Sém. Lothar. Combin. 78 (2017) B78b.
- Emily Sergel. *A proof of the Square Paths Conjecture.* J. Combin. Theory Ser. A 152C (2017), 363-379.
- Adriano Garsia, Emily Sergel Leven, Nolan Wallach, and Guoce Xin. *A new plethystic symmetric function operator and the rational compositional shuffle conjecture at $t{=}1/q$.* J. Combin. Theory Ser. A 145 (2017), 57-100.

- Emily Sergel. *The Combinatorics of nabla p_n and connections to the Rational Shuffle Conjecture.* PhD thesis, University of California, San Diego (2016).
- François Bergeron, Adriano Garsia, Emily Sergel Leven, and Guoce Xin. *Some remarkable new plethystic operators in the theory of Macdonald polynomials.* J. Comb. 7.4 (2016), 671-714.
- François Bergeron, Adriano Garsia, Emily Sergel Leven, and Guoce Xin. *A Compositional (km, kn)-Shuffle Conjecture.* Int. Math. Res. Not. IMRN (2015), rnr272.
- Tewodros Amdeberhan and Emily Sergel Leven. *Multi-cores, posets, and lattice paths.* Adv. Appl. Math. 71 (2015), 1-13.
- Angela Hicks and Emily Leven. *A simpler formula for the number of diagonal inversions of an (m, n)-Parking Function and a returning Fermionic formula.* Discrete Math. 338.3 (2015), 48-65.
- Emily Leven, Brendon Rhoades, and Andrew T. Wilson. *Bijections for the Shi and Ish Arrangments.* Euro. J. Comb. 39 (2014), 1-23.
- Angela Hicks and Emily Leven. *A refinement of the Shuffle Conjecture with cars of two sizes and $t = 1/q$.* J. Comb. 5.1 (2014), 31-50.
- Peter Richter, Emily Leven, Ahn Tran, Jobby Jacob, and Darren A. Narayan. *Rank numbers for bent ladders.* Discuss. Math. Graph Theory 34 (2014), 309-329.
- Emily Sergel. *Noncommutative Biorthogonal Polynomials.* Adv. Appl. Math. 48 (2012), 99-105.
- Emily Sergel, Peter Richter, Ahn Tran, Jobby Jacob, Patrick Curran, and Darren A. Narayan. *Rank numbers for some trees and unicyclic graphs.* Aequationes Math. 82.1-2 (2011), 65-79.

Conference Proceedings

- Emily Sergel. *A parking function interpretation for $\nabla m_{n,1^k}$.* Sém. Lothar. Combin. FPSAC Proceedings (2018), to appear.
- Emily Leven. *Two special cases of the rational Shuffle Conjecture.* DMTCS FPSAC Proceedings (2014), 789-800.

Selected Talks

- Iowa State University Math Department Colloquium — November 2, 2018
  Parking functions, schedules, and the Delta Conjecture
- AMS Fall Eastern Sectional Meeting — September 29, 2018
  On the distribution of (s,s+1)-core partitions with distinct parts.
- AMS Spring Southeastern Sectional Meeting — April 14, 2018
  On C-expansions for monomial symmetric functions.
- Lehigh University Math Department Colloquium — March 22, 2018
  A combinatorial Schur expansion for a special case of the Delta Conjecture
- Combinatorics, Algebra, & Topology Seminar at the US Naval Academy — December 1, 2017
  Schur positivity in a special case of the Delta Conjecture
- Rutgers Experimental Math Seminar — November 17, 2016
  Searching for tableaux statistics and Schur expansions
- AMS Spring Southeastern Sectional Meeting — March 6, 2016
  A proof of the Square Paths Conjecture
- Philadelphia Area Combinatorics and Algebraic Geometry Seminar — February 25, 2016
  A proof of the Square Paths Conjecture

- Joint Mathematics Meetings — January 9, 2016
  Parking Functions and the Square Paths Conjecture
- Combinatorics Seminar at UCLA — December 3, 2015
  Lattice Path Statistics and the Rational Shuffle Conjectures
- International Conference on Lattice Path Comb. and Applications — August 20, 2015
  A New Family of Lattice Paths Enumerating Cores
- International Conference on Orthogonal Polynomials and q-Series — May 12, 2015
  The Rational Shuffle Conjectures
- AMS Western Sectional Meeting — April 19, 2015
  Multi-cores, posets, and lattice paths
- Experimental Math and Lie Groups Joint Seminar at Rutgers University — October 3, 2014
  Combinatorial Aspects of the Rational Shuffle Conjecture
- International Conference on F.P.S.A.C. — June 30, 2014
  Two special cases of the rational Shuffle Conjecture
- Graduate Student Combinatorics Conference — April 20, 2013
  A Refinement of the Shuffle Conjecture for $t = 1/q$ and cars of two sizes
- L'Università degli Studi di Roma — November 2012
  Assistant instructor for the mini-course "Algebraic Combinatorics and the Shuffle Conjecture"
- Joint Mathematics Meetings — January 7, 2011
  Rank numbers for generalized ladders, some trees and unicyclic graphs
- Constructive Methods in Noncommutative Algebra Seminar at Rutgers University — October 29, 2009
  Noncommutative Biorthogonal Polynomials

Workshops Attended

- (upcoming) Banff International Research Station — January 20-25, 2019
  Representation Theory Connections to (q, t)-Combinatorics
- Centre de recherches mathematiques of Montreal — June 12-23, 2017
  Equivariant Combinatorics
- Research Institute for Symbolic Computation — July 26-31, 2015
  2nd Algorithmic and Enumerative Combinatorics Summer School
- Simons Institute for the Theory of Computing — November 17-20, 2014
  Symbolic and Numerical Methods for Tensors and Representation Theory
- Mathematical Research Community — June 16-20, 2014
  Algebraic and Geometric Methods in Applied Discrete Mathematics

Teaching Experience

- UPENN Math 104A: **Calculus I** — Fall 2017, Fall 2018, & Spring 2019
  Instructor. Textbook: Thomas's Calculus Chapters 6, 8-10. Technology: Canvas, MyMathLab. 20-60 students per semester. Introductory course for students previously exposed to calculus. These courses are taught in the Structured, Active, In-Class Learning format. The class is flipped, with textbook and instructional videos for at-home learning resources. Lecture time is used primarily for group work.
- UPENN Math 580: **Combinatorial Analysis and Graph Theory** — Fall 2017
  Instructor. Textbooks: Stanley's Enumerative Combinatorics, Vol. 1, and Wilf's Generatingfunctionology. Technology: Canvas. Graduate course, preparation for an oral qualifying exam in combinatorics. 10

students. In addition to traditional lectures and homework, this class included student presentations of supplementary material from the texts.

- UCSD Math 152: **Applied Math and Computing** Spring 2016
  Instructor. Textbook: Ferguson's Game Theory. Technology: Blackboard, WebWork. Over 100 students. Topics course for upperclassmen with an emphasis on algorithms and computation.

- UCSD Math 10C: **Calculus III** Summer 2014
  Instructor. Textbook: Hughes-Hallett's Calculus. Technology: Blackboard, WebAssign, iClickers. Over 100 students. Required math course for non-STEM majors. Lectures included active learning via iClickers and Think-Pair-Share group work.

- UCSD Math 202 & Math 264: **Applied Algebra & Combinatorics** Winter 2011-Spring 2014
  Assistant Instuctor. These graduate courses were taught by Prof. Adriano Garsia from his own notes. I assisted him during lectures, during MAPLE workshops in the computer lab, and in preparing class notes.

- UCSD Math 20B & 20C: **Calculus II & III** Fall 2011 - Winter 2011 & Fall 2015
  Teaching Assistant. Textbook: Rogawski's Calculus: Early Transcendentals. Approximately 30 students per section. Required math courses for STEM majors.

- Rutgers Math 112 & 115: **Precalculus** Fall 2009 - Spring 2011
  Recitation Leader (Undergraduate Teaching Assistant). Textbook: Stewart's Precalculus. Approximately 30 students per semester. Remedial course.

Pedagogical Training

- **Workshop for the Project NExT Peach Cohort** at MathFest July 2018
  Sessions and small group workshops on interactive learning, workplace culture, diversity in the classroom, intentional course design, advising students, standards-based grading, and teaching math online.

- **UCSD Center for Teaching Development Workshop** Spring 2014
  Follow-up to "The College Classroom" for Summer Graduate Teaching Scholars.
  Additional training in course design and active learning techniques.

- **UCSD Educational Technology Services** Spring 2014
  Technical training in iClickers & Blackboard.

- **UCSD Center for Teaching Development: The College Classroom** Winter 2014
  Training in research-based practices and theories of learning.

Service & Outreach

- **Co-organizer for "Future Directions in Algebraic Combinatorics,"** *a conference to be held in June 2019 in celebration of Adriano Garsia's 90th birthday. Co-PI for pending NSF and NSA conference grants. Contributor to the conference website:* sites.google.com/view/garsiafest/

- **Co-organizer for the CAGE (Combinatorics, Algebra and Geometry) seminar** *run jointly by several universities in the Philadelphia area.*

- **Association for Women in Mathematics (AWM):** *Chair of the national Student Chapter Committee (Fall 2018-present). Member of the national committees on Student Chapters and Student Chapter Awards (Fall 2016-present). Co-founder of the national student Poster Contest (beginning Spring 2019). Judge for the student Essay Contest (2017).*

- **UCSD Chapter of AWM:** *President / Secretary (Fall 2012-Spring 2015). Recurring panelist for graduate and undergraduate events. Organizer for the annual conference "Undergraduate Math Day" (2012-2014). Founder and Program Coordinator for the Graduate-Undergraduate Learning Program. Graduate-Undergraduate Learning Mentor (2012-2015) for reading courses on Combinatorics of Permutations, Topics in Concrete Math, and an Introduction to Groups and Representation Theory.*

Additional Outreach/Expository Talks & Panels

- Joint Millersville University - Franklin & Marshall College Math Colloquium — October 18, 2018
  Career advice: how to get into graduate school and beyond
- University of Pennsylvania Math Department — August 24, 2018
  Panelist for new instructor training
- Rutgers Math Freshman-Sophomore Seminar — January 30, 2018
  Fields and field extensions
- Rutgers Math Freshman-Sophomore Seminar — February 7, 2017
  Finite projective planes
- Nebraska Conference for Undergraduate Women in Mathematics — January 30, 2016
  Panelist for "Choosing a Mathematics Graduate Program"
- UCSD Undergraduate Math Day — May 3, 2014
  What's the Deal with Combinatorics?

Miscellanea

- Other names used: Emily Leven, Emily Sergel Leven
- U.S. Citizen
- Member of the American Mathematical Society, the Mathematical Association of America, and the Association for Women in Mathematics.
- Proficient in MAPLE, Java, and LaTeX. Familiar with C/C++, Mathematica, and MATLAB. Basic ability with Python and Sage.
- Intermediate fluency in Spanish and Hungarian.