

# T. Kyle Petersen

## Curriculum Vitae

Department of Mathematical Sciences  
DePaul University  
☎ (773) 325-1353  
✉ [tpeter21@depaul.edu](mailto:tpeter21@depaul.edu)  
<http://math.depaul.edu/tpeter21>

### Education

- 2006 **Ph.D.**, *Brandeis University*, Mathematics.
- 2001 **A.B.**, *Washington University*, Mathematics (cum laude).

### Academic appointments

- 2021–current **DePaul University**, *Department of Mathematical Sciences*, Chair.
- 2018–current **DePaul University**, *Department of Mathematical Sciences*, Professor.
  - 2013–2018 **DePaul University**, *Department of Mathematical Sciences*, Associate Professor.
  - 2009–2013 **DePaul University**, *Department of Mathematical Sciences*, Assistant Professor.
  - 2006–2009 **University of Michigan**, *Department of Mathematics*, Assistant Professor (non-tenure track).
- 2005 **Institut Mittag-Leffler**, Visitor.

### Research Interests

Algebraic, Enumerative, and Topological Combinatorics

### Publications

#### Books

- T. K. Petersen, “Inquiry-Based Enumerative Combinatorics: One, two, skip a few... ninety-nine, one hundred” *Undergraduate Texts in Mathematics*, Springer (2019), 238 pp.
- T. K. Petersen, “Eulerian Numbers,” *Birkhäuser Advanced Texts Basler Lehrbücher*, Springer, New York (2015), 456 +xviii pp.

#### Research papers

- 39. R. Acton, T. K. Petersen, B. Shirman, and D. Toal, *A more malicious maitre d'*, *American Mathematical Monthly*, **130** (2023), 728–745.
- 38. K. Liechty and T. K. Petersen, *Monotone subsets in lattices and the Schensted shape of a Sós permutation*, *Combinatorial Theory*, **2** (2022), paper no. 9, 41 pp.
- 37. J. Fulman, G. B. Kim, S. Lee, and T. K. Petersen, *On the joint distribution of descents and signs of permutations*, *Electronic Journal of Combinatorics*, **28** (2021), paper no. 3.37, 30 pp.
- 36. J. Fulman and T. K. Petersen, *Card shuffling and P-partitions*, *Discrete Mathematics*, **344** (2021), paper no. 112448, 18 pp.
- 35. S. Bockting-Conrad, Y. Kashina, T. K. Petersen, and B. E. Tenner, *Sós permutations*, *American Mathematical Monthly*, **128** (2021), 407–422.

34. S. C. Gutekunst, K. Mészáros, T. K. Petersen, *Root cones and the resonance arrangement*, *Electronic Journal of Combinatorics*, **28** (2021), #P.12, 39 pp.
33. T. K. Petersen and B. E. Tenner, *Broken bricks and the pick-up sticks problem*, *Mathematics Magazine*, **93** (2020), 175–185.
32. J. B. Lewis, J. McCammond, T. K. Petersen, and P. Schwer, *Reflection length for affine Coxeter groups*, *Transactions of the American Mathematical Society*, **371** (2019), 4097–4127.
31. R. Davis, S. Nelson, T. K. Petersen, and B. E. Tenner, *The pinnacle set of a permutation*, *Discrete Mathematics*, **341** (2018), 3249–3270.
30. T. K. Petersen, *A two-sided analogue of the Coxeter complex*, *Electronic Journal of Combinatorics*, **25** (2018) #P4.64, 28 pp.
29. S. C. Billey, M. Konvalinka, T. K. Petersen, W. Slofstra, and B. E. Tenner, *Parabolic double cosets in Coxeter groups*, *Electronic Journal of Combinatorics*, **25** (2018), #P1.23, 66 pp.
28. C. Brittenham, A. Carroll, T. K. Petersen, and C. Thomas, *Unimodality via alternating gamma vectors*, *Electronic Journal of Combinatorics*, **20** (2016), #P2.40.
27. M. Aguiar and T. K. Petersen, *The Steinberg torus of a Weyl group as a module over the Coxeter complex*, *Journal of Algebraic Combinatorics*, **42** (2015), 1135–1175.
26. T. K. Petersen and B. E. Tenner, *The depth of a permutation*, *Journal of Combinatorics*, **6** (2015), 145–178.
25. M. Guay-Paquet and T. K. Petersen, *The generating function for total displacement*, *Electronic Journal of Combinatorics*, **21** (2014), #P3.37.
24. F. Heneghan and T. K. Petersen, *Power series for up-down min-max permutations*, *College Math Journal*, **45** (2014), 83–91.
23. S. Blanco and T. K. Petersen, *Counting Dyck paths by area and rank*, *Annals of Combinatorics*, **18** (2014), 171–197.
22. T. K. Petersen, *On the shard intersection order of a Coxeter group*, *SIAM Journal on Discrete Mathematics*, **27** (2013), 1880–1912.
21. T. K. Petersen and B. E. Tenner, *How to write a permutation as a product of involutions (and why you might care)*, *Integers*, **13** (2013), #A63.
20. T. K. Petersen, *Two-sided Eulerian numbers via balls in boxes*, *Mathematics Magazine*, **86** (2013), 159–176.
19. J. M. Ash and T. K. Petersen, *Many proofs that the primes are infinite*, *Journal of Recreational Mathematics*, **36** (2007), 294–298. (Despite the 2007 publication year, this paper was written in 2011 and appeared in 2012.)
18. J. McCammond and T. K. Petersen, *Bounding reflection length in an affine Coxeter group*, *Journal of Algebraic Combinatorics*, **34** (2011), 711–719.
17. T. K. Petersen, *The sorting index*, *Advances in Applied Mathematics*, **47** (2011), 615–630.
16. E. Nevo, T. K. Petersen, and B. E. Tenner, *The  $\gamma$ -vector of a barycentric subdivision*, *Journal of Combinatorial Theory, Series A*, **118** (2011), 1364–1380.
15. E. Nevo and T. K. Petersen, *On  $\gamma$ -vectors satisfying the Kruskal-Katona inequalities*, *Discrete and Computational Geometry*, **45** (2011), 503–521.

14. L. M. Lai and T. K. Petersen, *Euler-Mahonian distributions of type  $B_n$* , *Discrete Mathematics*, **311** (2011), 645–650.
13. T. K. Petersen and L. Serrano, *Cyclic sieving for longest reduced words in the hyperoctahedral group*, *Electronic Journal of Combinatorics*, **17** (2010) #R67.
12. S. Hsiao and T. K. Petersen, *Colored posets and colored quasisymmetric functions*, *Annals of Combinatorics*, **14** (2010), 251–289.
11. T. K. Petersen, P. Pylyavskyy, and D. Speyer, *A non-crossing standard monomial theory*, *Journal of Algebra*, **324** (2010), 951–969.
10. T. K. Petersen, P. Pylyavskyy, and B. Rhoades, *Promotion and cyclic sieving via webs*, *Journal of Algebraic Combinatorics*, **30** (2009), 19–41.
9. K. Dilks, T. K. Petersen, and J. R. Stembridge, *Affine descents and the Steinberg torus*, *Advances in Applied Mathematics*, **42** (2009), 423–444.
8. B. Drake and T. K. Petersen, *The  $m$ -colored composition poset*, *Electronic Journal of Combinatorics*, **14** (2007) #R23.
7. A. Claesson and T. K. Petersen, *Conway’s napkin problem*, *American Mathematical Monthly*, **114** (2007), 217–231.
6. T. K. Petersen, *Enriched  $P$ -partitions and peak algebras*, *Advances in Mathematics*, **209** (2007), 561–610.
5. S. Kitaev, T. McAllister, and T. K. Petersen, *Enumerating segmented patterns in compositions and encoding with restricted permutations*, *Integers*, **6** (2006) #A34.
4. T. K. Petersen, *A note on three types of quasisymmetric functions*, *Electronic Journal of Combinatorics*, **12** (2005) #R61.
3. T. K. Petersen, *Cyclic descents and  $P$ -partitions*, *Journal of Algebraic Combinatorics*, **22** (2005), 343–375.
2. T. K. Petersen and D. Speyer, *An arctic circle theorem for groves*, *Journal of Combinatorial Theory, Series A*, **111** (2005), 137–164.
1. N. Anzalone, J. Baldwin, I. Bronshtein, and T. K. Petersen, *A reciprocity theorem for monomer-dimer coverings*, *Discrete Mathematics and Theoretical Computer Science*, **AB** (2003), 179–194.

### Other Works

- S. Hsiao and T. K. Petersen, *The Hopf algebras of type  $B$  quasisymmetric functions and peak functions*, arXiv: math.CO/0610976.
- T. K. Petersen, *Descents, peaks, and  $P$ -partitions* Ph.D. Thesis, Brandeis University. 2006. 100 pp. ISBN: 978-0542-56318-8, ProQuest LLC.
- T. K. Petersen, *Polynomials over finite fields whose values are squares*, *Rose-Hulman Undergraduate Mathematics Journal*, **2** (2001), no. 1.
- Radio stories for *KUNC-FM*, (AAAS Mass Media Fellowship, summer 2002): “Chronic Wasting Disease Conference, Parts 1 and 2” (for *NPR News*); “Pharmaceuticals and a Frenchman”; “Chronic Wasting Disease”; “SpiderGoat”; “Monsoons and Global Warming”; “Extreme Lasers”; “21st Century Cryptography”; “The Colorado Rainforest, Parts 1 and 2”; “Yellowstone Wildfire”; “The Human Genome”

---

### Scholarly presentations

#### Refereed conference presentations

- 2018 *Reflection length for affine Coxeter groups*, with J. B. Lewis, J. McCammond, and P. Schwer, 30th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Dartmouth College, July
- 2013 *The module of affine descent classes of a Weyl group*, with M. Aguiar, 25th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Paris, France, June
- 2008 *Affine descents and the Steinberg torus*, with K. Dilks and J. R. Stembridge, 20th FPSAC conference, Viña del Mar, Chile, June
- 2004 *An arctic circle theorem for groves*, with D. Speyer, 16th FPSAC conference, Vancouver, Canada, June
- 2003 *A reciprocity theorem for monomer-dimer coverings*, with N. Anzalone, J. Baldwin, and I. Bronshtein, Discrete Models for Complex Systems conference, Lyon, France, June

#### Refereed conference posters

- 2016 *A two-sided analogue of the Coxeter complex*, 28th FPSAC conference, Vancouver, July
- *Parabolic double cosets in Coxeter groups*, with S. C. Billey, M. Konvalinka, W. Slofstra, and B. E. Tenner, 28th FPSAC conference, Vancouver, July
- 2010 *On  $\gamma$ -vectors satisfying the Kruskal-Katona inequalities*, with E. Nevo, 22nd FPSAC conference, San Francisco, June
- *Cyclic sieving for longest reduced words in the hyperoctahedral group*, with L. Serrano, 22nd FPSAC conference, San Francisco, June
- 2006 *Enriched  $P$ -partitions and peak algebras of types  $A$  and  $B$* , 18th FPSAC conference, June

#### Invited presentations

- 2023 *Napkin problems*, Mathematics Colloquium, Howard University, March
- 2023 *Napkin problems*, Mathematics Colloquium, George Washington University, March
- 2023 *Napkin problems*, Mathematics Colloquium, Marquette University, March
- 2022 *Alicia and Ben have lunch*, QED Math Symposium Plenary Speaker, Math Circles of Chicago, December
- 2022 *Napkin problems*, DePaul math/cs seminar, DePaul University, November
- 2019 *Farey permutations*, AMS Special Session on Algebraic and Geometric Combinatorics, University of Wisconsin-Madison, September
- *Farey permutations*, AMS Special Session on Algebraic and Geometric Combinatorics, University of Hawaii-Manoa, March
- 2018 *Alice and Bob have lunch*, College of Science and Health fall meeting, Mid-Career Excellence in Research Award invited address, DePaul University, October
- 2017 *Reflection length in affine Coxeter groups*, Discrete Geometry and Combinatorics seminar, Cornell University, November
- *The pinnacle set of a permutation*, Combinatorics seminar, Michigan State University, April
- 2016 *Eulerian numbers*, Colloquium, University of Northern Arizona, December

- *A two-sided Coxeter complex*, Algebra and combinatorics seminar, University of Northern Arizona, December
- *Eulerian numbers*, Discrete geometry and combinatorics seminar, University of California–Santa Barbara, October
- *Unimodality the hard way*, AMS special session on geometric combinatorics, Fargo, April
- 2015 *Unimodality the hard way*, AMS special session on topological combinatorics, Memphis, October
  - *Surrounding Gessel’s conjecture*, Midwest combinatorics conference, Minneapolis, May
  - *Surrounding Gessel’s conjecture*, Ira Gessel retirement conference, Brandeis University, May
  - *On a conjecture of Gessel regarding bivariate Eulerian polynomials*, University of Washington Combinatorics seminar, April
- 2014 *Characterizing depth in a Coxeter group*, AMS special session on patterns in permutations and words, Eau Claire, September
  - *What is the  $\gamma$ -vector? (And what does it count?)*, Colloquium, University of Colorado–Boulder, April
- 2013 *How to write a permutation as a product of involutions*, CMS special session on symmetric functions and generalizations, Ottawa, December
  - *Combinatorics of the shard intersection order*, AMS special session on topological combinatorics, St. Louis, October
- 2012 *The depth of an element of a Coxeter group*, Séminaire de combinatoire du LaCIM, Montreal, December
  - *A funny thing happened on the way to Steppenwolf Theatre: From lattice paths to polytopes and Hopf algebras*, MathFest, Madison, August
  - *What is the  $\gamma$ -vector? (And what does it count?)*, Colloquium, Dartmouth College, March
  - *What is the  $\gamma$ -vector? (And what does it count?)*, Everytopic seminar, Brandeis University, March
- 2011 *The module of affine descents*, AMS special session on species and Hopf algebraic combinatorics, Ithaca, September
  - *What is the  $\gamma$ -vector? (And what does it count?)*, Colloquium, University of Southern California, March
- 2010 *The module of affine descents*, Workshop on quasisymmetric functions, Banff International Research Station, November
  - *What does the  $\gamma$ -vector count?*, AMS special session on topology and combinatorics, Syracuse, October
  - *Combinatorial interpretations for  $\gamma$ -vectors*, AMS special session on permutations, joint mathematics meetings, January
- 2009 *Promotion and cyclic sieving*, Algebra and combinatorics seminar, Texas A&M University, March
  - *Combinatorics of Coxeter groups*, Colloquium, DePaul University, February
  - *Combinatorics of Coxeter groups*, Colloquium, Western Michigan University, February

- 2008 *The Steinberg torus*, Discrete geometry and combinatorics seminar, Cornell University, November
- *Plücker algebras and driving rules*, Combinatorics seminar, University of Minnesota–Twin Cities, October
  - *Plücker algebras and driving rules*, Algebra, geometry and combinatorics seminar, University of Illinois–Urbana/Champaign, September
  - *A case study in IBL methods at the University of Michigan*, Legacy of R. L. Moore meeting, Austin, July
  - *The napkin problem*, University of Michigan Undergraduate Math Club talk, February
- 2007 *Affine descents and the Steinberg torus*, AMS special session on geometric combinatorics, Central sectional meeting, Chicago, October
- *Colored combinatorial Hopf algebras*, Workshop on Macdonald polynomials and Hopf algebras, Centre de Recherches Mathématiques, Montreal May
- 2006 *The Hopf algebra of posets*, Combinatorics seminar, University of Michigan, October
- *The P-partition method*, AMS special session in algebraic combinatorics, joint mathematics meetings, San Antonio, January
- 2005 *The P-partition method*, Applied Algebra seminar, York University, October
- *Aztec diamond tilings, quadratic recurrences, groves, and arctic circle theorems*, Combinatorics seminar, University of Illinois–Chicago, April
  - *The napkin problem*, CS/Math/Physics Everyperson Seminar, Brandeis University, March
  - *Descents, peaks, and P-partitions*, Combinatorics seminar, MIT, February
  - *A dinner party problem*, Pre/post-doc seminar, Institut Mittag-Leffler, February
  - *Descents, peaks, and P-partitions*, Institute seminar, Institut Mittag-Leffler, February
- 2004 *Descent algebras and P-partitions*, Applied Algebra seminar, York University, November
- *Descent algebras and P-partitions*, Joint Combinatorics/Lie theory seminar, University of Wisconsin–Madison, September

## Grants and awards

### External grants

- 2015–2022 Simons Foundation Collaboration Travel Grant, *Algebraic, geometric, and enumerative combinatorics*
- 2010–12 National Security Agency Young Investigator grant, *Investigations in enumerative and algebraic combinatorics*
- 2010 Educational Advancement Foundation grant, *Developing IBL course notes in enumerative combinatorics*

### Internal grants

- 2019 College of Science and Health summer grant, *Random combinatorial models*
- 2014 College of Science and Health summer grant, *Understanding gamma-nonnegativity in combinatorics and topology*
- 2012 College of Science and Health summer grant, *Enumerative combinatorics of Coxeter groups*

### Other awards

- 2018 DePaul CSH Mid-Career Excellence in Research award
- 2016 DePaul University Excellence in Teaching award
- 2007 University of Michigan summer research fellowship
- 2005 Brandeis University Prize Instructorship
- 2002 Mass Media Science and Engineering Fellow, American Association for the Advancement of Science

## Teaching

### Courses taught

- 2002–05, '07, '10–'22 Single-variable Calculus
- 2019, '20 Multivariable Calculus
- 2010, '12–'15, '17–'21 Combinatorics
- 2009, '11, '12, '18, '20 Discrete Mathematics
- 2018 Applied Graph Theory\*
- 2010, '12, '14–'17 Introduction to Mathematical Reasoning
- 2016 Generating Functions\*
- 2009–12 Foundations of Mathematics for Elementary School Teachers
- 2010 Pre-calculus
- 2006–08 Introduction to Cryptology
- 2008, '13 Linear Algebra
- 2005 Theory of Graphs and Tilings

Courses prior to 2006 were taught at Brandeis University, courses from 2006–08 were taught at the University of Michigan. All other courses were taught at DePaul University. An asterisk (\*) indicates the course is for graduate students.

### Independent study

- 2022 Reed Acton, Blake Shirman, Daniel Toal, Generating functions
- 2021 Elijah Leake, Combinatorics
- 2020 Rodrigo Smith, Combinatorics
- 2015 Charles Brittenham, Combinatorics
- 2010 Rachel Johnson, Topology

### Undergraduate research advising

- 2020 K. Agrawal (DePaul): “Geometry and Combinatorics of zig-zag permutations”
- 2020 R. Acton (DePaul): “Two-sided gamma positivity”
- 2018 K. Mittelstaedt (DePaul): “A stochastic approach to Eulerian numbers”
- 2017 B. Asztalos (DePaul): “Cyclic sieving for plane partitions”
- 2015 C. Thomas (DePaul): “A sign-reversing involution proof of unimodality”
- 2013 X. Arreola, A. Devine, F. Heneghan (DePaul): “Gamma nonnegativity for involutions”
- 2012 A. Gluszek, F. Heneghan, A. Sliva, S. Wagner (DePaul): “Alternating permutations”

- 2011 E. Gwetta, A. Pacurar, E. Smith (DePaul): “An identity of Brenti and Welker”
- 2010 W. Fink, A. Pacurar, A. Wood (DePaul): “Length and reflection length”
- 2008 K. Dilks (Michigan): “Total promotion” and L. Lai (Michigan): “Flag descents”
- 2007 K. Dilks (Michigan): “Affine descents”
- 2002 N. Anzalone (U. Massachusetts-Boston), J. Baldwin, (Harvard), I. Bronshtein, (Brandeis): “Reciprocity for monomer-dimer coverings”

#### Inquiry Based Learning workshops

- 2020 JEDIBL 4-day workshop, Staff leader, June
- 2019 University of Michigan 3-day department workshop, Staff, August
  - University of St. Thomas 4-day workshop, Staff leader, August
- 2018 DePaul University 4-day workshop, Staff leader, June
- 2017 MichMATYC 1-day workshop, Staff, October
  - DePaul University 4-day workshop, Staff leader, June
- 2016 San Luis Obispo 4-day workshop, Staff, June
- 2015 San Luis Obispo 4-day workshop, Staff, June
- 2011 Ann Arbor 2-day workshop, Staff, May
- 2010 Austin 4-day workshop, Staff, June
- 2006 Costa Mesa 4-day workshop, Participant, June

#### Peer Mentoring for the Academy of Inquiry Based Learning

- 2016–18 A. Steurer (Dominican University)
- 2013–14 K. Schreck (Moraine Valley CC)
  - 2011 A. Knecht (Villanova University)
  - 2010 D. Shaw (University of Northern Iowa)
- 2009–11 T. Hitchman (University of Northern Iowa)

---

## Service

### University

- 2021–current Faculty council CSH representative
  - 2020–2021 Promotion and tenure policy committee
  - 2012–2015 Committee on Learning and Teaching

### College

- 2019–current CSH curriculum committee
- 2019–current CSH STEM Center advisory committee
  - 2014–2020 Research and faculty development committee
  - 2012–2018 Colloquium committee
    - 2010 NSF S-STEM grant committee

### Department

- 2020–2021 Diversity, Equity, and Inclusion committee
  - 2009–12, Undergraduate curriculum committee
  - 19–21
- 2018–2021 Undergraduate advising committee

2019 Adjunct Personnel committee  
 2011–12, Assistant Professor search committee  
 13–14, 15–16,  
 18–19  
 (Chair)  
 2010–12, NTT Professor search committee  
 2018, 2019  
 2018 Strategic planning committee  
 2013–16, Personnel committee  
 2018  
 2011–16 Website committee  
 2010–14 Math club faculty sponsor  
 2009–14 Colloquium committee  
 2011–13 Discrete Mathematics redesign committee  
 2009 Student evaluation committee

## Professional activities

### Journal refereeing

*Advances in Applied Mathematics*  
*Advances in Mathematics*  
*American Mathematical Monthly*  
*Annals of Combinatorics*  
*Australasian Journal of Combinatorics*  
*Discrete Analysis*  
*Discrete Mathematics*  
*Discrete Mathematics and Theoretical Computer Science*  
*Electronic Journal of Combinatorics*  
*European Journal of Combinatorics*  
*Integers: the Electronic Journal of Combinatorial Number Theory*  
*Journal of Algebraic Combinatorics*  
*Journal of Combinatorial Theory, Series A*  
*Journal of Combinatorial Theory, Series B*  
*Journal of Combinatorics*  
*Journal of Symbolic Computation*  
*Mathematics Magazine*  
*Order*  
*Pacific Journal of Mathematics*  
*The Ramanujan Journal*  
*Random Structures and Algorithms*  
*Séminaire Lotharingien de Combinatoire*  
*SIAM Journal on Discrete Mathematics*  
*Transactions of the American Mathematical Society*

### Other reviewing

Article reviews (post-publication) for *Mathematical Reviews*

Book review (pre-publication) for Princeton University Press

Book review (pre-publication) for Mathematical Surveys and Monographs (AMS book series)

National Security Agency grant review

National Science Foundation grant review (panel member three times)

### Professional affiliations

American Mathematical Society

Mathematical Association of America

National Association of Mathematicians

Academy of Inquiry Based Learning