Curriculum Vitae of William J. Keith, Oct 2026

Contact Information

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Education

Fall 2010 - Summer 2012	University of Lisbon
Postdoctorate	Supervisor: Carlos André
Fall 1999 - Summer 2007	Pennsylvania State University
Graduate study	Advisor: Prof. George Andrews
	Obtained Ph.D. Summer 2007
Fall 1995 - Summer 1999	University of Texas at Austin
Undergraduate study	B.Sc., Mathematics / B.Sc., Physics

Research Interests

- Number Theory
  - Partition theory
- Combinatorics
  - Tableaux, symmetric functions, q-series

Employment and Teaching Experience

Fall 2019 - Present	Michigan Tech University, Assoc. Prof.
Fall 2013 - Summer 2019	Michigan Tech University, Asst. Prof.
Fall 2012 - Spring 2013	Western Illinois University, Visiting Asst. Prof.
Fall 2010 - Summer 2012	Postdoc, University of Lisbon
Fall 2009 - Summer 2010	Drexel University, Teaching Assistant Professor
Fall 2007 - Summer 2009	Drexel University, Senior Lecturer
Fall 1999 - Spring 2007	Pennsylvania State University, Graduate assistant

Publications

1.) Ranks of Partitions and Durfee Symbols. Ph.D. Thesis, PSU, June 2007. URL: http://etda.libraries.psu.edu/theses/approved/WorldWideIndex/ETD-2026/index.html
2.) Translation: Dieter Stockhofe, *Bijektive Abbildungen auf der Menge der Partitionen einer Naturlichen Zahl*. Appendix to thesis; see above.
3.) Distribution of the full rank in residue classes for odd modulus. Discrete Mathematics 309 (16), 28 August 2009, pp. 4960-4968. Extract of thesis. URL: http://dx.doi.org/10.1016/j.disc.2009.02.032 .
4.) A bijective toolkit for signed partitions. Annals of Combinatorics, (2011) Volume 15, Number 1, 95-117. doi: 10.1007/s00026-011-0085-6
5.) Sequences of density $\zeta(k) - 1$. INTEGERS 10 (2010), Article A19, 233-241. URL: http://www.emis.de/journals/INTEGERS/papers/k19/k19.pdf
6.) Proof of a conjectured q, t-Schröder identity. Discrete Mathematics, Volume 310, Issue 19, 6 October 2010, Pages 2489-2494
7.) Recursively self-conjugate partitions. Proceedings, INTEGERS Conference 2009. URL: http://www.integers-ejcnt.org/vol11a.html, Article 12.
8.) A bijection for partitions with initial repetitions. Ramanujan Journal, Vol. 27 (2), 2011. doi:10.1007/s11139-011-9298-x
9.) (Joint w/ Rishi Nath, CUNY-York) Partitions with prescribed hooksets. J. Comb. and Num. Thy, Volume 3 (1) 2011. Preprint: http://arXiv.org/abs/1011.1945
10.) The 2-adic valuation of plane partitions and totally symmetric partitions. Elec. Journ. of Comb., Volume 19 (2012), paper 48.
11.) (Joint w/ Robert Boyer, Drexel University) Stabilization of coefficients for partition polynomials. INTEGERS 13 (2013), article 56.
12.) A Ramanujan congruence analogue for Han's hook-length formula mod 5, and other symmetries. Acta Arith. 160 (2013), 303-315
13.) (Joint with Ângela Mestre, Univ. of Lisbon, and Christian Brouder, IPMPC) Closed forms for a multigraph enumeration. Journal of Combinatorics and Number Theory, 2015 Vol. 6 Number 2, pp. 37-51
14.) Congruences for 9-regular partitions modulo 3. Ramanujan J., October 2014, Volume 35, Issue 1, pp 157-164
15.) (Joint w/ Giampiero Chiaselotti and Paolo Oliverio, Univ. della Calabria) Two Self-Dual Lattices of Signed Integer Partitions. Appl. Math. and Inf. Sci., Volume 8, No. 6 (Nov. 2014), 3191-3199. Volume 8, No. 6 (Nov. 2014), PP:3191-3199. doi:10.12785/amis/080661
16.) Congruences for m-regular partitions modulo 4. INTEGERS 15A (2015), http://www.integers-ejcnt.org/vol15a.html, paper #A11
17.) Restricted k-colored partitions. Ramanujan J., May 2016, Volume 40, Issue 1, pp 71-92. doi:10.1007/s11139-015-9704-x
18.) Partitions with a small number of part sizes. Int. J. Number Theory, 13, 229 (2017). doi:10.1142/S1793042117500130
19.) The part-frequency matrices of a partition. Proceedings of the Kliakhandler Conference 2015. doi:10.13069/jacodesmath.41075
20.) (Joint w/ undergraduate Sean Grindatti) Fair choice sequences. Involve 12 (2019) 1, 13-30. doi:10.2140/involve.2019.12.13

21.) (Joint with Fabrizio Zanello and graduate student Samuel Judge) On the density of odd values of the partition function. Annals of Combinatorics, https://link.springer.com/article/10.1007/s00026-018-0397-x
22.) (Joint with Xinhua Xiong) Euler's partition theorem for all moduli and new companions to Rogers-Ramanujan-Andrews-Gordon identities. Ramanujan J. (2019) 49:555-565, https://doi.org/10.1007/s11139-018-0103-y
23.) (Joint with Don Kreher and Dalibor Froncek) A note on nearly platonic graphs. Australasian Journal of Combinatorics **70(1)** (2017), pp. 86-103
23a.) (Joint with Don Kreher and Dalibor Froncek) Corrigendum to: A note on nearly platonic graphs. Australasian Journal of Combinatorics **72(1)** (2018), page 163
24.) Partitions into parts simultaneously regular, distinct and/or flat. Combinatorial and Additive Number Theory II: CANT, New York, NY, USA, 2015 and 2016. Springer Proceedings in Mathematics & Statistics, Volume 220. http://www.springer.com/us/book/9783319680309
25.) Major index over descent for pattern-avoiding permutations. INTEGERS 18 (2018), http://math.colgate.edu/ integers/vol18.html, paper #A55
26.) Families of major index distributions: closed forms and unimodality. Elec. J. of Combinatorics, Vol. 26 Issue 3 (2019), article P3.58. https://doi.org/10.37236/8585
27.) (Joint w/ undergraduate Emily Anible) Colored partitions and the hook-length formula: partition statistic identities. INTEGERS 20A, Proceedings of the Integers Conference 2018 (2020), http://math.colgate.edu/ integers/vol20a.html, paper #A2
28.) A note on partitions with short profile steps. Integers 20, paper A78, http://math.colgate.edu/ integers/vol20.html
29.) Restricted k-colored partitions, II. International Journal of Number Theory, Proceedings of Analytic and Combinatorial Number Theory: The Legacy of Ramanujan. https://www.worldscientific.com/doi/abs/10.1142/S1793042120400151
30.) (Joint w/Fabrizio Zanello) Parity of the coefficients of certain eta-quotients. Journal of Number Theory. https://doi.org/10.1016/j.jnt.2021.06.034
31.) Part-Frequency Matrices, II: Recent Work. In: Nathanson, M.B. (eds) Combinatorial and Additive Number Theory IV. CANT 2020. Springer Proceedings in Mathematics & Statistics, vol 347. Springer, Cham. https://doi.org/10.1007/978-3-030-67996-5_18
32.) (Joint w/ Augustine Munagi) Binary Compositions and Semi-Pell Compositions. Accepted, Online Journal of Analytic Combinatorics. Journal URL, https://hosted.math.rochester.edu/ojac/
33.) (Joint w/Augustine Munagi, Abdulaziz Alanazi, and Bashair Alenazi) Refining Overpartitions by Properties of Non-Overlined Parts. Contributions to Discrete Mathematics 17, No. 2 (2022). https://cdm.ucalgary.ca/article/view/70452
34.) (Joint w/George Andrews) A general class of Schmidt theorems. Journal of Number Theory 247, June 2023, 75-99. https://doi.org/10.1016/j.jnt.2022.12.006
35.) A bijection for partitions into parts simultaneously s-regular and t-distinct. Integers 23, http://math.colgate.edu/~integers/vol23.html, article A9
36.) (Joint w/Fabrizio Zanello) Parity of the coefficients of certain eta-quotients, II: the case of even-regular partitions. Journal of Number Theory 251, October

2023, 84-101. https://doi.org/10.1016/j.jnt.2023.04.009
37.) (Joint w/Robert Schneider and Drew Sills) Composition-theoretic series and false theta functions. Proceedings of the Integers Conference 2023. https://math.colgate.edu/~integers/a11Proc23/a11Proc23.pdf
38.) (Joint w/ Philip Cuthbertson, David Hemmer, and Brian Hopkins) Partitions with fixed points in the sequence of first-column hook lengths. Annals of Combinatorics. doi:10.1007/s00026-024-00714-1
39.) (Joint w/ Fabrizio Zanello) Parity of the Coefficients of Certain Eta-Quotients, III: Two Special Classes . Ann. Comb. (2026) https://doi.org/10.1007/s00026-026-00833-x
40.) Reciprocals of false theta functions. Ramanujan J. **68** number 27 (2025). https://link.springer.com/article/10.1007/s11139-025-01179-3
41.) (Joint w/ Eli DeWitt) Combinatorial proof of a congruence for partitions into two sizes of part. Int. J. of Number Theory Vol. 22, No. 05, pp. 1075-1084 (2026) . https://www.worldscientific.com/doi/10.1142/S1793042126500569
42.) (Joint w/ Rishi Nath and James Sellers) On simultaneous $(s, s+t, s+2t, \dots)$-core partitions. Discrete Math. **349** (5) .
https://www.sciencedirect.com/science/article/pii/S0012365X25005667
43.) (Joint w/ Bruce Sagan) Partitions with parity restrictions: a bijective approach. To appear, Discrete Mathematics.

Presentations

1. October 2026, AMS Eastern Sectional, Washington: Unordered tuples of partitions, or double partitions
2. March 2026, Alladi70: On the refined positivity of a series of Andrews and Bachraoui
3. September 2025, Online Partitions Seminar: On Simultaneous $(s, s+t, s+2t, \dots)$-core partitions
4. May 2025, Integers Conference: s (mod t)-cores
5. April 2025, AMS Eastern Section Hartford: Combinatorics of partitions into a small number of part sizes
6. March 2025, Univ. of Florida Math Dept. Colloquium: The Partition Parity Problem
7. October 2024, Online Partitions Seminar: Parity of the coefficients of certain eta-quotients, III: The case of pure eta-powers (Rescheduled from **invited** talk at September 2024 AMS Southeastern Sectional Meeting, cancelled due to hurricane)
8. June 2024, The Legacy of Ramanujan **(invited)**: Reciprocals of False Theta Functions
9. April 2024, Online Partitions Seminar: Fixed points among hook lengths

10. January 2024, Joint Mathematics Meetings: Congruences for reciprocals of false theta functions

11. May 2023, Integers Conference 2023: Reciprocals of False Theta Functions

12. March 2023, Drexel University Colloquium **(invited)**: Ramanujan-Kolberg identities, regular partitions, and multipartitions

13. Nov 2022, Vanderbilt Number Theory Seminar **(invited)**: Ramanujan-Kolberg identities, regular partitions, and multipartitions

14. Apr 2022, Joint Mathematics Meetings (Virtual)**(invited)**: Open problems in combinatorics and modular forms, II

15. Mar 2022, Online Partitions Seminar: Schmidt-type theorems for partitions with uncounted parts (joint w/George Andrews)

16. April 2021, Online Partitions Seminar: A bijection for partitions into parts simultaneously s-regular and t-distinct

17. December 2020, Penn State Partitions Seminar: On Bergeron's $bc - ad$ unimodality conjecture

18. October 2020, AMS Eastern Section Meeting: On Bergeron's $bc - ad$ unimodality conjecture

19. June 2020, Combinatorics and Additive Number Theory 2020: Part-frequency matrices of partitions

20. November 2019, University of the Witwatersrand, Johannesburg, South Africa, Colloquium **(invited)**: Connections between Schur functions and major index distributions

21. November 2019, AMS Sectional Meeting Gainesville, Special Session on Partition Theory and Related Topics **(invited)**: Connections between Schur functions and major index distributions

22. June 2019, Analytic and Combinatorial Number Theory: The Legacy of Ramanujan (Berndt 80): (k, j)-*colored partitions: congruences and other behaviors*

23. April 2019, Graduate Colloquium Univ. of Minn. Duluth **(invited)**: Distribution of the major index over standard Young tableaux

24. March 2019, Math Dept. Colloquium, Northern Michigan University: Distribution of the major index over standard Young tableaux

25. January 2019, Joint Math Meetings 2019 Baltimore, AMS Special Session on Partition Theory and Related Topics **(Invited)**: *Iterated differences in Gaussian coefficients*

26. October 2018, INTEGERS Conference 2018: *Iterated differences in Gaussian coefficients*

27. July 2018, Combinatory Analysis 2018, Pennsylvania State University **(Invited)**: *Unimodality of q-Binomial Differences via Kirillov/Reshetihkin*

28. Jan 2018, Joint Math Meetings 2018 San Diego, AMS Special Session on Special Functions and Combinatorics (contributed): *Refinements by descents of the q-analog of the Frame-Robinson-Thrall formula*

29. May 2017, CANT 2017, CUNY GC: *Maj over descent for pattern avoidance classes*

30. January 2017, Joint Math Meetings 2017 Atlanta, Special Session on Partition Theory and Related Topics **(Invited)**: *Parity similarity formulas for partitions and multipartitions* (work joint w/ F. Zanello and S. Judge)

31. November 2017 Partitions Seminar, Pennsylvania State University **(Invited)**: *Parity similarity formulas for partitions and multipartitions* (work joint w/ F. Zanello and S. Judge)

32. October 2016, INTEGERS Conference 2016: *Partitions into a small number of part sizes*

33. September 2016, Combinatorics Seminar, Michigan Tech: *Partitions into a small number of part sizes*

34. May 2016 CANT 2016, CUNY GC: *Partitions into parts simultaneously regular, distinct and/or flat*

35. Jan 2016, Joint Meetings of the AMS and the MAA: *Partitions into parts simultaneously regular, distinct, and/or flat*

36. Aug 2015, Kliakhandler Conference, Michigan Tech: *The part-frequency matrices of a partition*

37. Aug 2015, Illinois Number Theory Conference: *The part-frequency matrices of a partition*

38. Jan-Mar 2014, Combinatorics Seminar, Michigan Tech: *An introduction to partition theory* (4-part series)

39. Oct 2014, Combinatorics Seminar, Michigan Tech: *Colored partitions with restrictions on the number of colors appearing*

40. Sep 2014, AMS Central Section Meeting: *Restricted k-colored partitions*

41. Apr 2014, Combinatorics Seminar, Michigan Tech: *m-Regular partitions and eta-function symmetries*

42. Apr 2014, UMN-Duluth Combinatorics Seminar: *m-Regular partitions and eta-function symmetries*

43. October 2013, Combinatorics Seminar, Michigan Tech: *The Robinson-Schensted-Knuth Algorithm: a gentle introduction*

44. May 2013 , Departmental Colloquium, Western Illinois University: *The Indeterminate Multipartition*

45. April 2013, Number Theory Seminar, Univ. of Illinois Urbana-Champaign (Invited): *The Indeterminate Multipartition*

46. Dec 2011, Seminário do CELC, Univ. Lisbon: *Ramanujan congruence analogues for the Han/Nekrasov-Okounkov formula*

47. Oct 2011, Integers Conference 2011, University of West Georgia: *Ramanujan congruence analogues for the Han/Nekrasov-Okounkov formula*

48. Sep 2011, 67th Séminaire Lotharingien de Combinatoire, Bertinoro, Italy: *Vexillary involutions and Motzkin paths* (joint w/Maria Torres and Fátima Rodrigues)

49. Mar 2011, Combinatorics Seminar, University of Coimbra: *Counting simultaneous s/t-core partitions* (50 min. version)

50. Mar 2011, q-Series Conference 2011, Georgia Southern University: *Counting simultaneous s/t-core partitions* (20 min. version)

51. Nov 2010, Seminário do CELC, Univ. Lisbon: *Partitions as a bridge between settings*

52. Jan 2010, Combinatorics and Probability Seminar, Univ. of Penn. *Proof of a conjectured q,t-Schröder identity*

53. Nov 2009, CUNY-York Number Theory Seminar: *Recursively Self-Conjugate Partitions* (50 min. version)

54. Oct 2009, INTEGERS 2009, AMS 2009 East. Sec. Mtg (Invited): *Recursively Self-Conjugate Partitions* (20 min. version)

55. Dec 2008, Combinatory Analysis 2008, Penn State: *Partitions in $\mathbb{Z}_p$*

56. Feb 2008, Departmental Colloquium, Drexel University: *Signed Partitions: New Theorems for Old*

57. April 2007, Graduate Student Combinatorics Conf., U. Washington: *Flat Partitions, Permutation Descents, and Classical Partition Identities*

58. Oct 2006, Midwest Number Theory Conf. for Graduate Students IV, U. Illinois: *Congruences for the Full Rank*

59. April 2006, Graduate Student Combinatorics Conf., U. Wisconsin-Madison: *Lecture Hall Partitions Generalized Toward Glaisher*

60. Feb 2004, Partitions Seminar, Penn State: *Fibonacci-Like Sequences Among Hyperbinary Partitions*

Advising and Thesis Committees

Fall 2024 - Spring 2025	Doctoral committee, Karlee Westrem (Supv David Hemmer)
(Defended Spring 2025) Fall 2024	Thesis examiner, Abinash Sarma IISER Thiruvananthapuram (Supv. Srilakshmi Krishnamoorthy)
Fall 2022 - Spring 2023	Thesis committee (external examiner), Phodiso Seleka Univ. Witwatersrand (Supv. Darlison Nyirenda)
Fall 2022, ongoing	Doctoral Advisor, Philip Cuthbertson
Spring 2022, ongoing	Doctoral Advisor, Hunter Waldron
Spring 2021	Thesis committee (external examiner), Ntendeni Annah Takalani Univ. Witwatersrand (Supv. Augustine Munagi)
Fall 2020 - Spring 2021	Doctoral committee, Tim Wagner (Supv. Fabrizio Zanello)
Fall 2020, ongoing	Undergraduate advisor, Discrete Mathematics major concentration
Fall 2019, ongoing	Advisor, Master's thesis, Emily Anible
Summer 2018	MA 4990 Undergraduate research, Emily Anible
Summer 2018	SURF Project, Marshal Dunham
Jan 2016 - Spring 2017	Advisor, Master's thesis, J. T. Davies
Summer 2015 - Spring 2018	Doctoral committee, Samuel Judge (Sup. Fabrizio Zanello)
Spring 2013	Thesis committee (external examiner), Miehleketo Ndlovu Univ. Witwatersrand (Supv. Augustine Munagi)
2010	Thesis committee, Derek Heilman Drexel Univ. (Supv. Jennifer Morse)

Awards and Honors

Spring 2022	Outstanding Service Award, Associate Professor Rank, MTU
Spring 2018	Outstanding Research Award, Assistant Professor Rank, MTU *Quality of research among Math Dept. Asst. Profs. at Michigan Tech*
Spring 2006	ZZRQ Award, Penn State *For service rendered to the Department by a graduate student*
Fall 2005	Departmental Award for Graduate Teaching *Penn State Math graduate students. Shared.*

Professional Service

Spring - Summer 2025	Organizer, special session in Partition Theory, January 2026 AMS Joint Meetings
March 2024, ongoing	Editor, Ramanujan Journal
Spring - Summer 2024	Organizer, special session in Partition Theory, January 2025 AMS Joint Meetings
Spring - Summer 2023	Organizer, special session in Partition Theory, January 2024 AMS Joint Meetings (w/ D. Eichhorn UC-Irvine and B. Kronholm UT-RGV)
Fall 2021 - Spring 2024	MTU Faculty Senator, Dept. of Math. Sciences
Spring 2021, ongoing	Organizer, online Specialty Seminar in Partition Theory https://pages.mtu.edu/~wjkeith/PartitionsSpecialtySeminar/
Spring 2021	Organizer, special session in Partition Theory, April 2022 AMS Joint Meetings (w/ D. Eichhorn UC-Irvine and B. Kronholm UT-RGV)
Fall 2018, ongoing	Team advisor, MTU Putnam Exam team
Jan 2016, ongoing	Reviewer, Zentralblatt Math
Fall 2015, ongoing	Reviewer, Mathematical Reviews
Spring 2013 - Fall 2015	Organizer, MTU Algebra & Combinatorics Seminar
Fall 2013, ongoing	Undergraduate Committee, MTU Math Dept
Ongoing	Referee work for journals
Spring 2010	Team advisor, Mathematical Contest in Modeling
2007 - 2010	Variety of Drexel Math Dept events as needed
Fall 2007	Volunteer, Fall 2007 EPaDel section MAA meeting
Fall 2003 - Spring 2007	Organizer, Penn State Slow Pitch Seminar
Fall 2004 - Spring 2005	Math Dept. Rep., Graduate Student Association

Grants and Funding

1. August 2020 (joint w/ David Hemmer): NSF REU Site: Partitions and Representation Theory at Michigan Technological University. Rejected.

2. August 2019 (joint w/ David Hemmer, Vladimir Tonchev, and Zeying Wang): NSF REU Site: Codes, Combinatorics & Designs at Michigan Technological University. Rejected.

3. September 2018: NSF Combinatorics program. Project: Algebraic and combinatorial approaches to parity in partitions. Rejected.

4. July 2018: NSF CAREER proposal. Project: Algebraic and combinatorial approaches to parity in partitions. Rejected.

5. January 2018: SURF funding, student Marshal Dunham. Project: Enumeration of tree-like tableaux. Approved.

6. Applied, September 2017: NSF Combinatorics program. Project: Distribution of statistics for standard Young tableaux. Rejected.

7. Applied, September 2015: NSF Combinatorics program. Project: A unified structural framework for the m-regular partitions. Rejected.

8. Visiting speaker funding, Visiting Women and Minority Lecturer and Scholar Series, for visit of Bridget Tenner (DePaul) to Combinatorics Seminar, Fall 2015. Approved.