

Chris Wells (née Cox)

Curriculum Vitæ

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<https://mathematicaster.org/>

Research interests

Extremal combinatorics and graph theory, probabilistic methods, algebraic methods, discrete geometry, coding theory.

Education

PhD in Algorithms, Combinatorics and Optimization..... 2020

@ Carnegie Mellon University, Pittsburgh, PA

- Thesis: “Problems in coding theory and extremal combinatorics”
- Major professor: Boris Bukh

MS in Mathematics 2015

@ Iowa State University, Ames, IA

- Thesis: “Ordered and partially-ordered variants of Ramsey’s theorem”
- Major professor: Derrick Stolee

BS in Mathematics 2014

@ Iowa State University, Ames, IA

- Thesis: “Isospectral drums and cospectral graphs”
- Thesis advisor: Steve Butler

Academic positions

Postdoctoral research fellow 2023–Cur

@ Auburn University, Auburn, AL

RTG postdoctoral research associate 2020–2023

@ Iowa State University, Ames, IA

- Supported by U.S. taxpayers through NSF Research Training Grant DMS-1839918

Teaching assistant 2015–2020

@ Carnegie Mellon University, Pittsburgh, PA

REU graduate research mentor 2015

@ Iowa State University, Ames, IA

- The papers “A generalization of Eulerian numbers via rook placements” and “Counting prime juggling patterns” are a result of this research workshop.

Teaching assistant 2014–2015

@ Iowa State University, Ames, IA

Publications

★ indicates an undergraduate co-author

† indicates an early graduate co-author

Published

- [1] **The maximum number of 10- and 12-cycles in a planar graph.** In: *Discrete Mathematics* 346.2 (Feb. 2023), p. 113245. DOI: [10.1016/j.disc.2022.113245](https://doi.org/10.1016/j.disc.2022.113245). arXiv: [2106.02966](https://arxiv.org/abs/2106.02966) [[math.CO](#)]
With: Ryan R. Martin.
- [2] **Accumulation points of the edit distance function.** In: *Discrete Mathematics* 345.7 (July 2022), p. 112857. DOI: [10.1016/j.disc.2022.112857](https://doi.org/10.1016/j.disc.2022.112857). arXiv: [2107.06706](https://arxiv.org/abs/2107.06706) [[math.CO](#)]
With: Ryan R. Martin and Daniel McGinnis[†].
- [3] **Periodic words, common subsequences and frogs.** In: *Annals of Applied Probability* 32.2 (Apr. 2022), pp. 1295–1332. DOI: [10.1214/21-AAP1709](https://doi.org/10.1214/21-AAP1709). arXiv: [1912.03510](https://arxiv.org/abs/1912.03510) [[math.PR](#)]
With: Boris Bukh.
- [4] **Counting paths, cycles and blow-ups in planar graphs.** In: *Journal of Graph Theory* 101.3 (Apr. 2022), pp. 521–558. DOI: [10.1002/jgt.22838](https://doi.org/10.1002/jgt.22838). arXiv: [2101.05911](https://arxiv.org/abs/2101.05911) [[math.CO](#)]
With: Ryan R. Martin.
- [5] **Restricted online Ramsey numbers of matchings and trees.** In: *Electronic Journal of Combinatorics* (Sept. 2020). DOI: [10.37236/8649](https://doi.org/10.37236/8649). arXiv: [1904.00246](https://arxiv.org/abs/1904.00246) [[math.CO](#)]
With: Joseph Briggs.
- [6] **Nearly orthogonal vectors and small antipodal spherical codes.** In: *Israel Journal of Mathematics* 238.1 (July 2020), pp. 359–388. DOI: [10.1007/s11856-020-2027-7](https://doi.org/10.1007/s11856-020-2027-7). arXiv: [1803.02949](https://arxiv.org/abs/1803.02949) [[math.CO](#)]
With: Boris Bukh.
- [7] **Inverting the Turán problem.** In: *Discrete Mathematics* 342.7 (July 2019), pp. 1865–1884. DOI: [10.1016/j.disc.2019.03.005](https://doi.org/10.1016/j.disc.2019.03.005). arXiv: [1711.02082](https://arxiv.org/abs/1711.02082) [[math.CO](#)]
With: Joseph Briggs.
- [8] **On a fractional version of Haemers’ bound.** In: *IEEE Transactions on Information Theory* 65.6 (June 2019), pp. 3340–3348. DOI: [10.1109/tit.2018.2889108](https://doi.org/10.1109/tit.2018.2889108). arXiv: [1802.00476](https://arxiv.org/abs/1802.00476) [[cs.IT](#)]
With: Boris Bukh.
- [9] **Ramsey numbers for partially-ordered sets.** In: *Order* 35.3 (Jan. 2018), pp. 557–579. DOI: [10.1007/s11083-017-9449-9](https://doi.org/10.1007/s11083-017-9449-9). arXiv: [1512.05261](https://arxiv.org/abs/1512.05261) [[math.CO](#)]
With: Derrick Stolee.
- [10] **(4,2)-choosability of planar graphs with forbidden structures.** In: *Graphs and Combinatorics* 33.4 (June 2017), pp. 751–787. DOI: [10.1007/s00373-017-1812-5](https://doi.org/10.1007/s00373-017-1812-5). arXiv: [1512.03787](https://arxiv.org/abs/1512.03787) [[math.CO](#)]
With: Zhanar Berikkyzy, Michael Dairyko, Kirsten Hogenson, Mohit Kumbhat, Bernard Lidický, Kacy Messerschmidt, Kevin Moss, Kathleen Nowak, Kevin Palmowski and Derrick Stolee.

- [11] **A generalization of Eulerian numbers via rook placements.** In: *Involve, a Journal of Mathematics* 10.4 (Mar. 2017), pp. 691–705. DOI: [10.2140/involve.2017.10.691](https://doi.org/10.2140/involve.2017.10.691). arXiv: [1508.03673](https://arxiv.org/abs/1508.03673) [math.CO]
With: Esther Banaian*, Steve Butler, Jeffrey Davis*, Jacob Landgraf* and Scarlitte Ponce*.
- [12] **Counting prime juggling patterns.** In: *Graphs and Combinatorics* 32.5 (May 2016), pp. 1675–1688. DOI: [10.1007/s00373-016-1711-1](https://doi.org/10.1007/s00373-016-1711-1). arXiv: [1508.05296](https://arxiv.org/abs/1508.05296) [math.CO]
With: Esther Banaian*, Steve Butler, Jeffrey Davis*, Jacob Landgraf* and Scarlitte Ponce*.
- [13] **Ordered Ramsey numbers of loose paths and matchings.** In: *Discrete Mathematics* 339.2 (Feb. 2016), pp. 499–505. DOI: [10.1016/j.disc.2015.09.026](https://doi.org/10.1016/j.disc.2015.09.026). arXiv: [1411.4058](https://arxiv.org/abs/1411.4058) [math.CO]
With: Derrick Stolee.
- [14] **How to make the perfect fireworks display: Two strategies for *Hanabi*.** In: *Mathematics Magazine* 88.5 (Dec. 2015), pp. 323–336. DOI: [10.4169/math.mag.88.5.323](https://doi.org/10.4169/math.mag.88.5.323)
With: Jessica De Silva, Philip DeOrsey, Franklin Kenter, Troy Retter and Josh Tobin.

Accepted

- [15] **Orthogonal realizations of random sign patterns and other applications of the SIPP.** arXiv: [2212.05207](https://arxiv.org/abs/2212.05207) [math.CO]
With: Zach Brennan[†], Bryan Curtis, Enrique Gomez-Leos[†], Kimberly Hadaway[†], Leslie Hogben and Conor Thompson[†].

Submitted

- [16] **Frogs, hats and common subsequences.** arXiv: [2404.07285](https://arxiv.org/abs/2404.07285) [math.CO]
With: Joseph Briggs, Alex Parker[†] and Coy Schwieder[†].
- [17] **Phase transitions in isoperimetric problems on the integers.** arXiv: [2402.14087](https://arxiv.org/abs/2402.14087) [math.CO]
With: Joseph Briggs.
- [18] **The maximum number of odd cycles in a planar graph.** arXiv: [2307.00116](https://arxiv.org/abs/2307.00116) [math.CO]
With: Emily Heath and Ryan R. Martin.

Teaching

Auburn University 2023–Cur

Instructor

- MATH 1120: Precalculus
– Fall 2023

Iowa State University 2014–2015, 2020–2023

Instructor

- MATH 595: Longest Common Subsequences

- Early graduate research seminar
- Fall 2022
- MATH 595: Algebraic Methods in Combinatorics
 - Graduate reading course
 - Spring 2022
- MATH 595: Edit Distance in Graphs
 - Early graduate research seminar
 - Fall 2020
- MATH 314: Graph Theory
 - Spring 2022
- MATH 165: Calculus I
 - Large lecture: Spring 2023, Fall 2022
 - Small lecture: Spring 2021

Teaching assistant

- MATH 267: Elementary Differential Equations and Laplace Transforms
 - Fall 2021, Fall 2020, Spring 2015
- MATH 165: Calculus I
 - Fall 2014

Carnegie Mellon University 2015–2020

Instructor

- 21-241: Matrices and Linear Transformations
 - SummerII 2019
- 21-127: Concepts of Mathematics
 - SummerII 2017

Teaching assistant

- 21-242: Matrix Theory
 - Fall 2017
- 21-237: Mathematical Studies Algebra I
 - Fall 2018
- 21-228: Discrete Mathematics
 - Spring 2020, Spring 2016
- 21-127: Concepts of Mathematics
 - Fall 2015
- 21-115: Calculus I
 - SummerI 2016

Professional service _____

- Co-organizer of the *Special Session on Advances in Combinatorics* at the Fall 2023 AMS South-eastern Sectional Meeting.....2023
- Co-organizer of the *Iowa State University Discrete Math Seminar*2020–2023

- Co-organizer of the *5th Mostly annual Mostly Manitoba, Michigan and Minnesota Combinatorics Graduate Student Workshop* 2022

Awards/Grants

Guy C. Berry Graduate Research Award 2020

- Recognizes excellence in research by graduate students in the Mellon College of Science: <https://www.cmu.edu/mcs/discover/awards/mcs/berry.html>.

Buncher Graduate and Faculty Fellows Research Collaboration Fund 2018
(with Boris Bukh)

- Provides support for a faculty member and a graduate student to spend time in Israel at the Technion Institute with the intent of building long term research collaborations between the two universities. The funding provides travel support for the faculty member to spend one week in Haifa and for the graduate student to stay on for 1–2 months working in the relevant Technion laboratory.

Presentations

Invited

- [1] **Maximum likelihood estimators and subgraph counts in planar graphs.** *AMS Special Session on Topics in Graph Theory*. Tallahassee, FL, Mar. 2024.
- [2] **Small projective codes and equiangular lines.** *Auburn Mathematics Colloquium*. Auburn, AL, Mar. 2023.
- [3] **Subgraph counts in planar graphs and maximum likelihood estimators of graphs.** *Auburn Combinatorics Seminar*. Auburn, AL, Mar. 2023.
- [4] **Maximum likelihood estimators and subgraph counts in planar graphs.** *AMS Special Session on Topics in Graphs, Hypergraphs and Set Systems*. Salt Lake City, UT, Oct. 2022.
- [5] **Periodic words, common subsequences and frogs.** *Auburn Combinatorics Seminar*. Online, Nov. 2021.
- [6] **The maximum number of cycles in a planar graph.** *AMS Special Session on New Trends in Combinatorics*. Online, Oct. 2021.
- [7] **Periodic words, common subsequences and frogs.** *KIT Combinatorics Seminar*. Online, May 2021.
- [8] **The maximum number of paths and cycles in planar graphs.** *U South Carolina Discrete Math Seminar*. Online, Feb. 2021.
- [9] **Restricted online Ramsey numbers of matchings.** *AMS Special Session on Advances in Graph Theory*. Online, Oct. 2020.
- [10] **Nearly orthogonal vectors.** *CodEx Seminar*. Online, May 2020.
- [11] **Nearly orthogonal vectors.** *ISU Discrete Math Seminar*. Online, May 2020.
- [12] **Periodic words, common subsequences and frogs.** *U Virginia Probability Seminar*. Charlottesville, VA, Feb. 2020.

- [13] **Periodic words, common subsequences and frogs.** *UCSD Combinatorics Seminar*. La Jolla, CA, Feb. 2020.
- [14] **Periodic words, common subsequences and frogs.** *MIT Combinatorics Seminar*. Cambridge, MA, Oct. 2019.
- [15] **Periodic words, common subsequences and frogs.** *Warwick Combinatorics Seminar*. Coventry, UK, Sept. 2019.
- [16] **Algorithmic re-proofs of some Ramsey numbers.** *ISU Discrete Math Seminar*. Ames, IA, Mar. 2019.
- [17] **A fractional version of Haemers' bound.** *AMS Special Session on Graph Theory*. Newark, DE, Sept. 2018.
- [18] **Inverting the Turán problem.** *ISU Discrete Math Seminar*. Ames, IA, July 2018.
- [19] **A fractional version of Haemers' bound.** *Ben-Gurion Combinatorics Seminar*. Be'er Sheva, Israel, June 2018.
- [20] **Nearly orthogonal vectors.** *Technion Combinatorics Seminarl*. Haifa, Israel, June 2018.
- [21] **Nearly orthogonal vectors.** *Hebrew University of Jerusalem Combinatorics Seminarl*. Jerusalem, Israel, June 2018.
- [22] **Nearly orthogonal vectors.** *ISU Discrete Math Seminar*. Ames, IA, Mar. 2018.
- [23] **Ramsey numbers on the Boolean lattice.** *AMS Special Session on Structural and Computational Graph Theory*. Raleigh, NC, Nov. 2016.
- [24] **Ramsey numbers of ordered hypergraphs.** *AMS Special Session on Extremal and Structural Graph Theory*. Las Vegas, NV, Apr. 2015.
- [25] **Ramsey numbers of ordered hypergraphs.** *U Colorado Denver Discrete Math Seminar*. Denver, CO, Mar. 2015.

Contributed

- [26] **Nearly orthogonal vectors.** *Finite Geometry and Extremal Combinatorics*. Newark, DE, Aug. 2019.
- [27] **Nearly orthogonal vectors and small antipodal spherical codes.** *Euopean Combinatorics Conference*. Bratislava, Slovakia, Aug. 2019.
- [28] **Inverting the Turán problem.** *ICGT*. Lyon, France, July 2018.
- [29] **Nearly orthogonal vectors (poster).** *Building Bridges II*. Budapest, Hungary, July 2018.
- [30] **Inverting the Turán problem.** *MIGHTY LIX*. Morgantown, WV, Apr. 2018.
- [31] **A degree-sequence variant of Ramsey's theorem.** *Connections in Discrete Mathematics*. Vancouver, CA, June 2015.
- [32] **Normally regular digraphs resulting from Cayley graphs (poster).** *SACNAS*. San Antonio, TX, Oct. 2013.
- [33] **Isospectral drums and cospectral graphs.** *MAA Mathfest*. Hartford, CT, Aug. 2013.