

EMILY CAIRNCROSS

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EDUCATION

University of Illinois at Chicago (UIC)
PhD Candidate, Advisor: Dhruv Mubayi

Chicago, IL
Expected Graduation Spring 2026

Oberlin College
BA in Mathematics with Honors, 4.09 GPA

Oberlin, OH
Class of 2021

SUBMITTED FOR PUBLICATION

Inducibility of rainbow graphs, with Clayton Mizgerd, Dhruv Mubayi (27 pages).

PUBLICATIONS

E. Cairncross, and D. Mubayi, Ordered and colored subgraph density problems, *SIAM Journal on Discrete Mathematics*. Vol. 39 (2025), No. 1, pp. 75–91.

¹E. Cairncross, J. Ogland-Hand, B. Adams, and R. Middleton, Nationwide cost and capacity estimates for sedimentary basin geothermal power and implications for geologic CO₂ storage, *Frontiers in Energy Research*. Vol. 12 (2024), pp. 1–11.

E. Cairncross, J. Carlson, P. Hollander, B. Kitchen, E. Lopez, and A. Zhuang, Throttling for standard zero forcing on directed graphs, *The Australasian Journal of Combinatorics*. Vol. 84 Part 1 (2022), pp. 1–27.

E. Cairncross, S. Ford, E. Garcia, K. Jabbusch, Classifying toric surface codes of dimension 7, *Involve*. Vol. 14 (2021), No. 4, pp. 605–616.

AWARDS

Louise Hay Award (2021-2022)

Established by Professor Louise Hay, head of the MSCS Department at UIC 1980-1989, this award honors a student's excellent work in mathematics and supports their current and future contributions to the field.

NSF GRFP Honorable Mention (2023)

TEACHING EXPERIENCE

- Spring 2025:
 - MCS 275 Programming Tools and File Management (Python)
 - MCS 360 Introduction to Data Structures (C++)
- Fall 2024: MATH 160 Finite Math for Business
- Fall 2023: MATH 180 Calculus I
- Fall 2022: MATH 160 Finite Math for Business
- Spring 2022: MATH 110 College Algebra
- Fall 2021: MATH 160 Finite Math for Business

¹This project was completed as part of a summer internship with Carbon Solutions LLC in Energy Research (as opposed to Mathematics), and lists co-authors in order of most contribution to least instead of alphabetically.

TALKS

Joint Mathematics Meetings (JMM) Title: “A colored subgraph density problem” Title: “Inducibility of rainbow graphs”	<i>January 2025</i>
Early Career Conference in Combinatorics Title: “Subgraph densities of ordered stars”	<i>June 2024</i>
9th Lake Michigan Workshop on Combinatorics and Graph Theory Title: “Inducibility of rainbow graphs”	<i>April 2024</i>
ISU Discrete Math Seminar Title: “The feasible region of colored graphs”	<i>November 2023</i>
UIC Combinatorics and Probability Seminar Title: “The feasible region of colored, ordered, and hyper- graphs”	<i>March 2023</i>
Nebraska Conference for Undergraduate Women in Mathematics (NCUWM) Title: “Throttling for zero forcing on directed graphs”	<i>January 2021</i>
Northeast Math REU Conference Title: “Throttling for zero forcing on directed graphs”	<i>July 2020</i>
NCUWM Title: “Classifying toric surface codes of dimension 7”	<i>February 2020</i>
Young Mathematicians Conference (YMC) Title: “Classifying toric surface codes of dimension 7”	<i>August 2019</i>
Summer Undergraduate Michigan Mathematics Research Conference (SUMMR) Title: “Classifying toric surface codes of dimension 7”	<i>July 2019</i>

SKILLS

C++, Eclipse, Java, LaTeX, Mathematica, Python, Sage, Spanish

SERVICE

Graduate Combinatorics and Probability Seminar <i>Co-organizer</i>	UIC <i>August 2024 - current</i>
• Organized weekly seminar for graduate students in combinatorics and probability. • Encouraged younger graduate students to speak and offered support.	
Symbols of Inclusion <i>Member</i>	UIC <i>August 2022 - current</i>
• Actively supported the creation of this new club at UIC to serve a similar role to that of an AWM chapter, but to support all historically underrepresented groups in mathematics, not just women. • Collaborated on plans for the year such as a undergrad-grad mentorship program, revitalization of undergraduate math club talks, a designated study space, and more.	
Directed Reading Program <i>Mentor</i>	UIC <i>Spring 2024</i>
• Helped an undergraduate student develop confidence and learn about ideals and varieties.	
MSCS Open Day <i>Speaker, Host</i>	UIC <i>March 2023</i>
• Presented research results to prospective graduate students in an accessible way, encouraging and answering questions throughout. • Co-hosted a lunch and graduate student panel for visiting prospective students.	

Mathematics Graduate Students Association (MGSA)**UIC***Co-president**June 2022 - May 2023*

- Coordinated weekly Math Teas for graduate students, faculty, and staff to come together and socialize.
- Acted as a liaison between the graduate students and the department.
- Ensured that the UIC community stayed strong, e.g. by checking in with first year students and welcoming them personally to events and to ask for advice.

Grad School Panel**Oberlin College***Panelist**November 2022*

- Answered questions from undergraduates on applying to grad school, life in grad school, and mathematical research.

Undergraduate Math Club**UIC***Speaker**September 2022*

- Clearly defined the primary mathematical object in my research and proved a recent result for about ten undergraduates attending, with their active participation throughout.
- Lent my advice and experience to undergraduates who stayed afterwards to ask questions about continuing to pursue mathematics.

GROW (Graduate Research Opportunities for Women) Conference Dinner**UIC***Mentor**15 October 2021*

- Took four undergraduates attending GROW out to dinner as part of the conference.
- Provided insight and advice on graduate school and careers in mathematics in general and from the perspective of being a woman in STEM.

Math Majors Committee**Oberlin College***Member**October 2019 - April 2021*

- Organized weekly, themed Math Teas open to all students.
- Provided perspective to other students considering the major.