

# David Offner

Associate Professor of Mathematics  
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## Employment

**Westminster College**, New Wilmington, PA

Assistant Professor

Fall 2009 to Spring 2015

Associate Professor

Fall 2015 to present

**Carnegie Mellon University**, Pittsburgh, PA

Shelly Visiting Associate Professor

Fall 2016 to Spring 2017

**Weston Public Schools**, Weston, MA

High School Teacher

Fall 1998 to Spring 2002

## Education

**Carnegie Mellon University**, Pittsburgh, PA

Ph.D. in Mathematics, concentration in Algorithms, Combinatorics, and Optimization, 2009.

**Yale University**, New Haven, CT

B.S. in Mathematics, 1998.

## Publications

### *Research Articles*

D. Offner, Polychromatic Colorings of Subcubes of the Hypercube, *SIAM J. Discrete Math.* 22 (2008), 450–454.

D. Offner, Some Turán type Results on the Hypercube, *Discrete Math.* 309 (2009), 2905–2912.

D. Offner, Packing the Hypercube, *Discuss. Math. Graph Theory* 34 (2014), 85–93. doi:10.7151/dmgt.1712

D. Offner and K. Ojakian, Cops and Robber on the Hypercube, *Australas. J. Combin.*, 59 (2014) 229–250.

L. Kaylor and D. Offner, Counting Matrices Over a Finite Field With All Eigenvalues in the Field, *Involve, a Journal of Mathematics*, 7–5 (2014), 627–645.

J. Goldwasser, B. Lidický, R. Martin, D. Offner, J. Talbot, and M. Young, Polychromatic Colorings on the Hypercube, submitted, 2016.

D. Offner and K. Ojakian, Cop-win Graphs: Optimal Strategies and Corner Rank, submitted, 2017.

M. Axenovich, J. Goldwasser, R. Hansen, B. Lidický, R. Martin, D. Offner, J. Talbot, and M. Young, Polychromatic colorings of complete graphs with respect to 1-,2-factors and Hamiltonian cycles, submitted, 2016.

D. Offner and K. Ojakian, Corner Ranking, Realizable Vectors, and Extremal Cop-Win Graphs, submitted, 2017.

M. Axenovich, J. Goldwasser, B. Lidický, R. Martin, D. Offner, J. Talbot, and M. Young, Polychromatic colorings on the integers, submitted, 2017.

### *Other publications*

J. Bonomo and D. Offner, Solution to Problem 1868 (posed by Donald Knuth), *Math. Magazine* Vol. 85, No. 2, April 2012, 154–155.

D. Offner, Review of *Book of Proof*, by Richard Hammack, in MAA Reviews, August 2012.  
<http://mathdl.maa.org/mathDL/19/?pa=reviews&sa=viewBook&bookId=73436>

## **Talks**

*Polychromatic Colorings on Hypercubes, Complete Graphs, and Integers*, West Virginia University Mathematics Colloquium, Morgantown, WV, April 26, 2017.

*Polychromatic Colorings of the Hypercube*, Graph Theory Day 73, CUNY, New York, NY, April 22, 2017.

*Polychromatic Colorings on Hypercubes, Complete Graphs, and Integers*, ACO seminar, Carnegie Mellon University, Pittsburgh, PA, December 8, 2016.

*Characterizing Cop-Win Graphs and Their Properties Using a Corner Ranking Procedure*, West Virginia University Mathematics Colloquium, Morgantown, WV, April 21, 2016.

*Characterizing Cop-Win Graphs and Their Properties Using a Corner Ranking Procedure*, New York Combinatorics Seminar, CUNY, New York, NY, April 8, 2016.

*Characterizing Cop-Win Graphs and Their Properties Using a Corner Ranking Procedure*, MAA Allegheny Mountain Section 2016 Meeting, Gannon University, Erie, PA, April 1-2, 2016.

*Tiling the Hypercube*, AMS Special Session on Graph Products, AMS/MAA Joint Mathematics Meetings, Seattle, WA, January 6-9, 2016.

*Packing Problems in Discrete Mathematics*, Faires Faculty Forum, Westminster College, New Wilmington, PA, November 11, 2015.

*Communicating Mathematics to Nonmathematicians* (Panelist), MAA Allegheny Mountain Section NExT 2015 Meeting, Clarion University of Pennsylvania, Clarion, PA, September 26, 2015.

*Polychromatic Colorings of the Hypercube*, Iowa State Mathematics Colloquium, Ames, IA, September 15, 2015.

*Polychromatically Coloring Two-Dimensional Subcubes of the Hypercube*, 27th Cumberland Conference on Combinatorics, Graph Theory & Computing, WVU, Morgantown, WV, May 16-17, 2014.

*Counting Matrices Over a Finite Field With All Eigenvalues in the Field*, MAA Allegheny Mountain Section 2014 Meeting, Westminster College, New Wilmington, PA, April 4-5, 2014.

*Polychromatic Colorings of the Hypercube*, Workshop on Polychromatic Colorings of the Hypercube, ICERM, Providence, RI, March 26, 2014.

*Polychromatic Colorings of the Hypercube*, West Virginia University Mathematics Colloquium, Morgantown, WV, February 19, 2014.

*Counting Matrices Over a Finite Field With All Eigenvalues in the Field*, MAA Contributed Paper Session, AMS/MAA Joint Mathematics Meetings, Baltimore, MD, January 15-18, 2014.

*A New Lower Bound for a Variation of Cops and Robber on the Hypercube, with an Application to Graph Searching*, MAA Allegheny Mountain Section 2013 Meeting, Indiana University of Pennsylvania, Indiana, PA, April 5-6, 2013.

*Extremal Problems on Hypercube Graphs*, Duquesne University, Pittsburgh, PA, February 7, 2013.

*A New Lower Bound for a Variation of Cops and Robber on the Hypercube, with an Application to Graph Searching*, MAA Contributed Paper Session, AMS/MAA Joint Mathematics Meetings, San Diego, CA, January 9-12, 2013.

*Enriching Experiences: Research with Undergraduates*, Faires Faculty Forum, April 18, 2012, Westminster College, New Wilmington, PA.

*Cops and Robber on the Hypercube*, MAA Allegheny Mountain Section 2012 Meeting, West Virginia University, Morgantown, WV, April 13-14, 2012.

*Cops and Robber on the Hypercube*, MAA Contributed Paper Session, AMS/MAA Joint Mathematics Meetings, Boston, MA, January 4-7, 2012.

*Packing the Hypercube*, MAA Allegheny Mountain Section 2011 Meeting, Clarion University, Clarion, PA, April 8-9, 2011.

*Packing the Hypercube*, MAA Contributed Paper Session, AMS/MAA Joint Mathematics Meetings, New Orleans, LA, January 5-8, 2011.

*How to Paint a Cube*, Faires Faculty Forum, September 22, 2010, Westminster College, New Wilmington, PA.

*Turán Type Problems and Polychromatic Colorings on the Hypercube*, Special Session on Probabilistic and Extremal Combinatorics, AMS 2009 Spring Central Sectional Meeting, Urbana, IL, March 27-29, 2009.

*Turán Type Problems on the Hypercube*, Graduate Student Seminar, November 5, 2008, Carnegie Mellon University, Pittsburgh, PA.

*Digraph Limits*, ACO seminar, April 10, 2008, Carnegie Mellon University, Pittsburgh, PA.

*Tutorial on the Regularity Lemma*, Workshop on Extremal Graphs and Hypergraphs, May 3, 2007, Carnegie Mellon University, Pittsburgh, PA.

*Turán Type Problems on the Hypercube*, ACO seminar, March 29, 2007, Carnegie Mellon University, Pittsburgh, PA.

## Selected Undergraduate Research Supervised

*2015-16*

Catherine Foltz, *Variations on CHOMP*

Jared Heck, *NFL After-Touchdown Decision Making*

Shawna Howard (1,2), *The Mathematics of Celtic Knots*

- (1) Presented talk at Pi Mu Epsilon Regional conference, YSU, Youngstown, Ohio, February 20, 2016.
- (2) Presented talk at AMS/MAA Joint Mathematics Meetings, Seattle, WA, January 6-9, 2016. Awarded MAA Outstanding Student Presenter Award in MAA Undergraduate Poster Session.

*2014-15*

Julie Bearer, *Optimizing Portfolios Using Linear Programming and Modern Portfolio Theory*

Stephanie Burkus, *Convergence Rates of Continued Fractions*

Brittany Erbe, *Power Law Distributions in Twitter Data*

Nicholas Hainsey, *Variable Speed Cops and Robber*

Brandon Saber, *Building a Recommendation System*

*2013-14*

Greg Clark (1,2), *A New Technique to Determine the Codensity of a Finite Set of Integers*

Amber Hill (1), *Rational Numbers and Their Decimal Expansions*

Jenna Huston (1,2), *Neural Network Hidden Layer Size*

Brandon Mosley (1), *Ninth Inning Decisions: A Statistical Analysis of the Sacrifice Bunt*

Emily Walther (1), *Unique Colorability of Maps that Contain Exactly Three Unique Hamiltonian Circuits*

- (1) Presented talk at Pi Mu Epsilon Regional conference, YSU, Youngstown, Ohio, February 22, 2014.
- (2) Presented talk at MAA Allegheny Mountain Section Meeting, Westminster College, New Wilmington, PA, April 4-5, 2014.

### 2012-13

Christina Erceg (1), *Backgammon End Game Doubling Strategies in Money Play and Match Play*

Lisa Kaylor (1), *Counting Matrices Over a Finite Field With All Eigenvalues in the Field, 2012-13.*

Paper published in *Involve*

Andrew Kieffer (1), *Using a Markov Chain Model to Compare the 2012 MLB Playoff System to the 2011 System*

Andrew Kyrargyros (2), *The Exactly 1 Cellular Automaton*

- (1) Presented talk at Pi Mu Epsilon Regional conference, YSU, Youngstown, Ohio, February 23, 2013.
- (2) Presented talk at MAA Allegheny Mountain Section Meeting, IUP, Indiana, PA, April 5-6, 2013.

### 2011-12

Josh Glasser, *Modeling Crowd Crushes and Evacuations*

Coty Hainsey (1), *A Look at Benford's Law*

Presented talk at NCUR, Ogden, Utah, March 30, 2012

Robert Rhodes (1), *A Markov Chain Model for Predicting Wins in Baseball*

Chelsea Schrock (1), *A Monte Carlo Simulation of the Game of Knockout*

- (1) presented talk at Pi Mu Epsilon Regional conference, YSU, Youngstown, Ohio, February 25, 2012.

2010-11

Greg Clark (1), *Tilings: Properties and Periodicity*

Presented talk at MAA Allegheny Mountain Section 2011 Meeting, Clarion University, Clarion, PA, April 8-9, 2011.

Presented poster at Westminster College Undergraduate Research and Arts Celebration, New Wilmington, PA, April 27, 2011. Awarded First Year Student Research Prize.

Jenna Huston (1), *Friendly Partitions of Graphs*

(1) Presented talk at Pi Mu Epsilon Regional conference, YSU, Youngstown, Ohio, February 26, 2011.

2009-10

Stephen Donnel, Richard Ligo, Aaron Zavora, *The Search for Extremal Graphs*

Presented talk at MAA Allegheny Mountain Section 2010 Meeting, UPJ, Johnstown, PA, April 9-10, 2010.

Presented talk at MAA MathFest 2010, Pittsburgh, PA, August 5-7, 2010. Awarded MAA Outstanding Presentation Award in Undergraduate Student Talks.

## Teaching

**Westminster College**, New Wilmington, PA

### Instructor

MTH 614 Discrete Dynamical Systems	Spring 2011
MTH 601 Capstone	Fall 2011, 2012, 2013, 2014, 2015
MTH 451 Real Analysis	Fall 2014
MTH 431 Teaching Math in Secondary Schools	Fall 2010, 2011, 2013, 2015
MTH 361 Abstract Algebra	Fall 2009, 2010
MTH 331 College Geometry	Spring 2013, 2015
MTH 311 Graph Theory	Spring 2014
MTH 302 Probability	Spring 2013
MTH 241 Discrete Mathematics	Fall 2013, Spring 2010, 2012, 2016
MTH 152 Calculus II	Fall 2009, 2010, 2011, 2014, 2015, Spring 2010, 2013, 2015
MTH 150 Calculus I	Fall 2012
MTH 131 Applied Calculus	Fall 2009, Spring 2012, 2014
MTH 110 Mathematical Perspectives	Spring 2011

**Carnegie Mellon University**, Pittsburgh, PA

### Instructor

21-111 Calculus I	Spring 2007
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21-122 Integration, Differential Equations and Approximation	Summer 2006
21-127 Concepts of Mathematics	Spring 2017
21-228 Discrete Mathematics	Summer 2004
21-393 Operations Research II	Fall 2016

**Teaching Assistant**

21-111 Calculus I	Fall 2008
21-120 Differential and Integral Calculus	Fall 2003
21-121 Integration and Differential Equations	Fall 2006
21-122 Integration, Diff. Eq. and Approximation	Spring 2004, Fall 2004
21-131 Analysis I	Fall 2005
21-132 Analysis II	Spring 2006
21-257 Models and Methods for Optimization	Spring 2008
21-259 Calculus in Three Dimensions	Spring 2005

**Peer Tutor Supervisor**, Office of Academic Development      Fall 2005 to Spring 2009

Supervised over 100 student tutors who offer walk-in tutoring 5 nights a week and individual tutoring appointments.

Taught 99-250, training course for new tutors, each spring.

Conducted observations of and follow-up conferences with tutors.

**Summer Academy for Math and Science**      Summer 2007, Summer 2008

**Teaching Assistant**, Game Theory course in program for underrepresented minority high school students.

**Summer Undergraduate Applied Mathematics Institute**      Summer 2016

**Instructor**, 21-470 Cryptography

**Brandeis University**, Waltham, MA

**Graduate Student**      Fall 2002 to Spring 2003

**Graduate Assistant**, Research in Algebraic Combinatorics at Harvard.

**Weston Public Schools**, Weston, MA

**High School Teacher**      Fall 1998 to Spring 2002

Taught Geometry, Honors Geometry, Math IV (Precalculus), Honors Math IV, Math V (Survey course for seniors).

## Professional Development for Secondary Educators

### Pittsburgh Public Schools, Pittsburgh, PA

Led mathematics content summer workshops for middle and high school teachers as part of partnerships with Education Development Center (2013-15 PA DOE MSP grant, Co-PI) and Education Development Center, Carnegie Mellon University, University of Pittsburgh and Duquesne University (2014-18 NSF MSP grant, leadership team)

Two week (80 hours) workshop (PA DOE)	Summer 2013
One week (40 hours) workshop (PA DOE)	Summer 2014
One week (40 hours) workshop (PA DOE)	Summer 2015
Three week (45 hours) workshop (NSF)	Summer 2014
One week (15 hours) workshop (NSF)	Summer 2015
Four week (50 hours) workshop (NSF)	Summer 2016

### IAS/Park City Mathematics Institute, Park City, UT

High School Teacher Program: Three-week professional development program organized by the Institute for Advanced Study.

**Instructor**, HSTP Number Theory course and problem sessions. Summer 2002

**Participant** Summer 2001

### PROMYS for Teachers, Boston, MA

Six-week professional development program for high school mathematics teachers.

Innovative collaboration of Boston University's Department of Mathematics with the Education Development Center in Newton, MA.

**Counselor** Summer 2002

**Participant** Summer 1999, Summer 2000

## Awards and Grants

2014-15 Westminster College McCandless Scholar

2013-15 Co-PI on a 3 year PA Department of Education Math Science Partnership grant in partnership with Pittsburgh Public Schools and Education Development Center

2009-10 MAA Project NExT fellow



## Conferences and Workshops Organized

Co-organizer, Workshop on Polychromatic Colorings, Iowa State University, Ames, IA, September 14-20, 2015.

Co-organizer, Workshop on Polychromatic Colorings of the Hypercube, ICERM, Providence, RI, March 26-30, 2014.

Co-organizer, WaterMellon Workshop on Extremal Graph Theory, Carnegie Mellon University, Pittsburgh, PA, May 21-23, 2005.

## Conferences and Workshops Attended

Graph Theory Day 73, CUNY, New York, NY, April 22, 2017.

MAA Allegheny Mountain Section Meeting, Duquesne University, Pittsburgh, PA, April 6-7, 2017.

MAA Allegheny Mountain Section NExT Meeting, Duquesne University, Pittsburgh, PA, April 6, 2017.

AMS/MAA Joint Mathematics Meetings, Atlanta, GA, January 4-7, 2017.

MAA Allegheny Mountain Section Meeting, Gannon University, Erie, PA, April 1-2, 2016.

MAA Allegheny Mountain Section NExT Meeting, Gannon University, Erie, PA, April 1, 2016.

AMS/MAA Joint Mathematics Meetings, Seattle, WA, January 6-9, 2016.

NCTM Regional Conference, Atlantic City, NJ, October 21-23, 2015.

MAA Allegheny Mountain Section NExT Meeting, Clarion University of Pennsylvania, Clarion, PA, September 26, 2015.

MAA Allegheny Mountain Section Meeting, Washington and Jefferson College, Washington, PA, April 10-11, 2015.

MAA Allegheny Mountain Section NExT Meeting, Washington and Jefferson College, Washington, PA, April 10, 2015.

27th Cumberland Conference on Combinatorics, Graph Theory & Computing, WVU, Morgantown, WV, May 16-17, 2014.

MAA Allegheny Mountain Section Meeting, Westminster College, New Wilmington, PA, April 4-5, 2014.

MAA Allegheny Mountain Section NExT Meeting, Westminster College, New Wilmington, PA, April 4, 2014.

Workshop on Polychromatic Colorings of the Hypercube, ICERM, Providence, RI, March 26-30, 2014.

Pi Mu Epsilon Regional Conference, YSU, Youngstown, Ohio, February 22, 2014.

AMS/MAA Joint Mathematics Meetings, Baltimore, MD, January 15-18, 2014.

NCTM Regional Conference, Baltimore, MD, October 16-18, 2013.

A Workshop Celebrating Ravindran Kannan's 60th Birthday, Carnegie Mellon University, Pittsburgh, PA, May 23-25, 2013.

MAA Allegheny Mountain Section Meeting, IUP, Indiana, PA, April 5-6, 2013.

MAA Allegheny Mountain Section NExT Meeting, IUP, Indiana, PA, April 5, 2013.

Pi Mu Epsilon Regional Conference, YSU, Youngstown, Ohio, February 23, 2013.

AMS/MAA Joint Mathematics Meetings, San Diego, CA, January 9-12, 2013.

Functions, Parameters, and Fitting for Teaching Calculus, MAA workshop, San Diego, CA, January 8, 2013.

MAA Allegheny Mountain Section Meeting, WVU, Morgantown, WV, April 13-14, 2012.

MAA Allegheny Mountain Section NExT Meeting, WVU, Morgantown, WV, April 13, 2012.

Pi Mu Epsilon Regional Conference, YSU, Youngstown, Ohio, February 25, 2012.

Minicourse on Backgammon, AMS/MAA Joint Mathematics Meetings, Boston, MA, January 4-7, 2012.

AMS/MAA Joint Mathematics Meetings, Boston, MA, January 4-7, 2012.

NCTM Regional Conference, Atlantic City, NJ, October 19-21, 2011.

MAA Allegheny Mountain Section NExT Fall Meeting, Pittsburgh, PA, September 17, 2011.

MAA Allegheny Mountain Section Meeting, Clarion University, Clarion, PA, April 8-9, 2011.

MAA Allegheny Mountain Section NExT Meeting, Clarion University, Clarion, PA, April 8, 2011.

Pi Mu Epsilon Regional Conference, YSU, Youngstown, Ohio, February 26, 2011.

AMS/MAA Joint Mathematics Meetings, New Orleans, LA, January 6-9, 2011.

NCTM Regional Conference, Baltimore, MD, October 14-15, 2010.

MAA Allegheny Mountain Section NExT Fall Meeting, Pittsburgh, PA, September 18, 2010.

MAA Mathfest, Pittsburgh, PA, August 5-7, 2010.

Project NExT, Pittsburgh, PA, August 4, 2010.

MAA Allegheny Mountain Section Meeting, UPJ, Johnstown, PA, April 9-10, 2010.

MAA Allegheny Mountain Section NExT Meeting, UPJ, Johnstown, PA, April 9, 2010.

NSF Regional Grants Conference, Cleveland, OH, March 22-23, 2010.

Pi Mu Epsilon Regional Conference, YSU, Youngstown, Ohio, February 27, 2010.

AMS/MAA Joint Mathematics Meetings, San Francisco, CA, January 13-16, 2010.

MAA Allegheny Mountain Section NExT Fall Meeting, Pittsburgh, PA, September 19, 2009.

MAA MathFest, Portland, OR, August 6-8, 2009.

Project NExT, Portland, OR, August 3-5, 2009.

Watermellon Workshop on Extremal Graph Theory, University of Waterloo, Waterloo, ON, May 21-23, 2009.

AMS 2009 Spring Central Sectional Meeting, University of Illinois, Urbana, IL, March 27-29, 2009.

Paul Erdős Memorial Lecture Series, University of Memphis, Memphis, TN, March 28-29, 2008.

Workshop on Extremal Graphs and Hypergraphs, Carnegie Mellon University, Pittsburgh, PA, May 5-6, 2007.

Paul Erdős Memorial Lecture Series, University of Memphis, Memphis, TN, March 23-24, 2007

US - Hungarian Workshop on Large-Scale Random Graph Methods for Modeling Mesoscopic Behavior in Biological and Physical Systems, Alfred Renyi Institute of Mathematics, Budapest, Hungary, August 28 - September 4, 2006.

Paul Erdős Memorial Lecture Series, University of Memphis, Memphis, TN, March 24-25, 2006.

Frieze Fest 2005, Carnegie Mellon University, Pittsburgh, PA, Oct 21-22, 2005.

WaterMellon Workshop on Extremal Graph Theory, Carnegie Mellon University, Pittsburgh, PA, May 21-23, 2005.

## Professional Organizatioins

American Mathematical Society (AMS)  
Mathematical Association of America (MAA)  
Council on Undergraduate Research (CUR)  
National Council of Teachers of Mathematics (NCTM)

## Disciplinary Service

Referee for

*SIAM Journal on Discrete Mathematics*

*Discrete Mathematics*

*Australasian Journal of Combinatorics*

*Rose-Hulman Undergraduate Mathematics Journal*

*Discrete Applied Mathematics*

*Theoretical Computer Science*

Reviewer for MathSciNet.

First Vice Chair of the Allegheny Mountain Section of the MAA, 2016-17.

Judge, Undergraduate Research Poster Session, AMS/MAA Joint Mathematics Meetings, Seattle, WA, January 6-9, 2016.

Second Vice Chair of the Allegheny Mountain Section of the MAA, 2015-16.

Member of curriculum adoption committees for Pittsburgh Public Schools, 2011, 2013.

Judge, CUR “Posters on the Hill” 2013.

Judge, Undergraduate Research Poster Session, AMS/MAA Joint Mathematics Meetings, San Diego, CA, January 9-12, 2013.

Judge, Undergraduate Research Poster Session, AMS/MAA Joint Mathematics Meetings, Boston, MA, January 4-7, 2012.

Judge, Undergraduate Research Poster Session, AMS/MAA Joint Mathematics Meetings, New Orleans, LA, January 5-8, 2011.

Judge, MAA Undergraduate Student Talk Sessions, MAA MathFest, Pittsburgh, PA, August 5-7, 2010.

Co-organizer, panel discussion: Tenure and Promotion, Project NExT, Pittsburgh, PA, August 4, 2010.

Judge, Undergraduate Research Poster Session, AMS/MAA Joint Mathematics Meetings, San Francisco, CA, January 13-16, 2010.

Co-organizer, panel discussion: Conducting Research with Undergraduates, Project NExT winter meeting 2010, San Francisco, CA.

## **Westminster College Service**

Member of Westminster College Academic Standards Committee, 2015-16.

Member of Westminster College Research Professions Advisory Committee (ResPAC), 2013 to present.

Member of Westminster College Outcomes Assessment Advisory Council, 2013-2015.

Member of Westminster College Honors Committee, 2012-2015.

Advisor, Westminster College Ultimate Frisbee Club, Fall 2010 to present.

Advisor, Westminster College chapter of Colleges Against Cancer, 2011-16.

Advisor to two Westminster College teams, COMAP Mathematical Contest in Modeling, Spring 2011.

Advisor to two Westminster College teams, COMAP Mathematical Contest in Modeling, Spring 2010.

## **References**

Available upon request

Compiled April 6, 2017.