

# Jonathan S. Bloom

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Department of Mathematics  
Lafayette College  
Easton, PA 18042

## EDUCATION

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### Dartmouth College

Ph.D., Mathematics June 2014  
Thesis: "Pattern Avoiding Permutations & Rook Placements"  
Advisor: Sergi Elizalde

### Dartmouth College

M.A., Mathematics June 2012

### University of California, Berkeley

M.S., Financial Engineering May 2007

### University of California, San Diego

M.S., Mathematics June 2003

### Colgate University

B.A. Mathematics (High Honors), Computer Science (Honors) May 2001  
Graduated Summa Cum Laude

## TEACHING & WORK EXPERIENCE

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**Assistant professor** Lafayette College 2015 - present

Taught numerous math classes at all levels of the curriculum (see below). Advised several Excel scholars and one thesis student in mathematics. Also revamped the Math 306 curriculum to be lab-based and culminate with a semester-long community-based consulting project.

**Harold H. Martin postdoctoral fellow of mathematics** Rutgers University 2014-2015

Worked on combinatorics research under the guidance of Doron Zeilberger. Also taught courses in Graph Theory, Elementary Linear Algebra, and Vector Spaces.

**Instructor** Dartmouth College 2012-2014

Taught an introductory course in abstract algebra and the equivalent of Lafayette's Math 162 course.

**Teaching assistant** Dartmouth College 2010-2012

Held recitation sessions and helped grade exams for several different levels of calculus.

**Visiting instructor** Colgate University 2009-2010

Taught the equivalent of Lafayette's Math 161 and Math 162 courses.

**Exotic derivatives pricing research** BNP Paribas, New York, N.Y. 2006-2009

Developed, enhanced, and supported mathematical pricing models for fixed income based securities. Mathematical tools used included differential equations, stochastic calculus, and numerical analysis.

## LAFAYETTE COURSES TAUGHT

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### Fall 2015

- Math 162 - Calculus II
- Math 325 - Combinatorics

### Spring 2016

- Math 306 - Operations Research
- Math 374 - Graph Theory

**Fall 2016**

- Math 162 - Calculus II (2 sections)
- Math 290 - Transition to Theoretical Mathematics

**Spring 2017**

- Math 306 - Operations Research (2 sections)

**Fall 2017**

- Math 165 - Calculus I+
- Math 325 - Combinatorics

**Spring 2018**

- Math 290 - Transition to Theoretical Mathematics
- Math 306 - Operations Research

**Fall 2019**

- Math 125 - Modeling and Differential Calculus
- Math 290 - Transition to Theoretical Mathematics

**Spring 2020**

- Math 300 - Vector Spaces
- Math 306 - Operations Research

**HONORS PROJECTS & STUDENT RESEARCH ACTIVITIES** 

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**Dantong Zhu** Independent study Fall 2015

This student read about combinatorial algorithms and their relation to the theory of symmetric functions.

**Sam Miller-Brown** Honors thesis 2017-2018

This student read about group representations and their combinatorics for her thesis. She is now working on a PhD in this area at Lehigh University.

**Trisha Agarwal** Excel student Summer 2017

This student explored the notion of “rook placements” in 3-dimensions. Together we proved several new theorems and paved the way for future student research.

**Xiaonan Chen** Excel student Interim 2017-2018

This student further explored the notion of 3-dimensional “rook placements”.

**Keith Vreeland** Independent study Fall 2019

This student looked at applications of linear algebra to combinatorial problems.

**PUBLICATIONS** 

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The symbol  $\otimes$  indicates research completed at Lafayette College.

1.  $\otimes$  *On cyclic Schur-positive sets of permutations* (with S. Elizalde, Y. Roichman), Electron. J. Combin., accepted March 2020.
2.  $\otimes$  *Counting pattern-avoiding integer partitions* (with N. McNew), Ramanujan J., accepted pending minor revisions December 2019.
3.  $\otimes$  *Symmetric multisets of permutations*, J. Combin. Theory Ser. A, accepted March 2020.
4.  $\otimes$  *Revisiting pattern avoidance and quasisymmetric functions* (with B. Sagan), Ann. Comb., accepted March 2020.
5.  $\otimes$  *On criteria for rook equivalence* (with D. Saracino), European J. Combin., vol 76, 199-207, published 2019.
6.  $\otimes$  *Rook and Wilf equivalence of integer partitions* (with D. Saracino), European J. Combin., vol 72, 246-267, published 2018.
7.  $\otimes$  *Pattern avoidance for set partitions á la Klazar* (with D. Saracino), Discrete Math. Theor. Comput. Sci., vol 18(2), published 2016.
8. *Two vignettes on full rook placements* (with V. Vatter), Australas. J. Combin., vol 64(1), 77-87, published 2016.
9.  $\otimes$  *Proofs and generalizations of a homomesy conjecture of Propp and Roby* (with O. Pechenik and D. Saracino), Discrete Math., vol 339(1), 194-206, published 2015.
10. *Edge triples and unbalanced Wilf-equivalence* (with A. Burstein), Australas. J. Combin., vol 64(1), 232-251, published 2016.
11. *A refinement of Wilf-equivalence for patterns of length 4*, J. Combin. Theory Ser. A, 124, 166177, published 2014.
12. *Pattern avoidance in matchings and partitions* (with S. Elizalde), Electron. J. Combin. vol 20(2), Paper 5, published 2013.

13. *Modified growth diagrams, permutation pivots, and the BWX map  $\phi^*$* , (with D. Saracino), J. Combin. Theory Ser. A (119), 1280-1298, published 2012.
14. *A simple bijective proof of the shape-Wilf-equivalence of the patterns 231 and 312*, (with D. Saracino), J. Combin. Math. Combin. Comput., published 2012.
15. *Another look at bijections for pattern-avoiding permutations* (with D. Saracino), Adv. in Appl. Math (45), 395-409, published 2010.
16. *On bijections for pattern-avoiding permutations* (with D. Saracino), J. Combin. Theory Ser. A (116), 1271-1284, published 2009.

## RECENT PRESENTATIONS

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<b>University of Florida</b> AMS Special Session	October 2019
<i>Rationality and growth of integer partition patterns</i> (invited talk)	
<b>Bar Ilan University</b> Seminar	June 2019
<i>Pattern avoidance and symmetric functions</i> (invited talk)	
<b>Technion University</b> Seminar	April 2019
<i>Pattern avoidance and symmetric functions</i> (invited talk)	
<b>Bar Ilan University</b> Seminar	February 2019
<i>Pattern avoidance and symmetric functions</i> (invited talk)	
<b>University of Massachusetts Amherst</b> Seminar	November 2018
<i>Pattern avoidance and symmetric functions</i> (invited talk)	
<b>University of Towson</b> Seminar	October 2017
<i>Rook and Wilf equivalence of integer partitions</i> (invited talk)	
<b>Lehigh University</b> Colloquium	April 2017
<i>Rook and Wilf equivalence of integer partitions</i> (invited talk)	
<b>University of Pennsylvania</b> CAGE Seminar	February 2017
<i>Rook and Wilf equivalence of integer partitions</i> (invited talk)	
<b>Dartmouth College</b> Colloquium	February 2017
<i>Rook and Wilf equivalence of integer partitions</i> (invited talk)	
<b>Lafayette College</b> Department Seminar	February 2017
<i>Rook and Wilf equivalence of integer partitions</i> (invited talk)	
<b>AMS Special Sessions</b> Minneapolis	October 2015
<i>Wilf-equivalence of integer partitions</i> (invited talk)	
<b>University of Paris Diderot</b> 11th International Conference on Permutation Patterns	July 2013
<i>Another look at shape-Wilf-equivalence and its consequences</i> (Talk)	

## SERVICE: PROFESSION

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<b>FPSAC organizing committee</b>	Summer 2018
The conference "Formal Power Series and Algebraic Combinatorics" (FPSAC) is a large annual international conference. My service to this committee was to help run and execute conference logistics.	
<b>Journal referee</b>	2015-present
Refereed research paper submissions for the following journals: Advances in Applied Mathematics, Combinatorica, Discrete Mathematics, Discrete Mathematics and Theoretical Computer Science, Electronic Journal of Combinatorics( $\times 3$ ), European Journal of Combinatorics ( $\times 2$ ), Journal of Combinatorial Theory Series A ( $\times 3$ ).	
<b>Guest editor</b> Special Permutation Patterns Issue	2016 & 2015
Served twice as invited guest editor for special issues in the journal "Discrete Mathematics and Theoretical Computer Science".	

**Permutation patterns conference co-chair**

Summer 2016

Invited by the steering committee of this annual international conference to help organize and run the Permutation Patterns conference held at Howard University, Washington, DC. As co-chair, I received all submissions for contributed talks and organized the week-long schedule of contributed talks. Additionally, I created the conference program in L<sup>A</sup>T<sub>E</sub>X.

**SERVICE: DEPARTMENT** 

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**Team Barge competition**

2017-present

In addition to running this weekly math puzzle competition, I have arranged to have a bimonthly column in The Lafayette to feature that week's Barge problem.

**Pi Mu Epsilon**

spring 2020

Co-chair for Lafayette's chapter of this national honor society in mathematics.

**Department webmaster**

2016-present

**Calculus committee**

2016-2018

**Mathematical adventures and diversions (MAAD) committee**

2016-2017

Invited Walter Stromquist to speak on the 4-color theorem. Also, invited Bruce Sagan for a week-long visit to the department. During this visit he gave both a seminar talk and a MAAD talk.

**Mathematics hiring committee**

spring 2017

**Barge individual exam**

2016

**SERVICE: COLLEGE** 

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The symbol ⊗ indicates an elected committee.

**⊗Faculty academic policy committee**

2019-2020

**⊗Academic progress committee**

2016-present

**⊗Center for community engagement advisory committee**

2017-present

**⊗Student life committee**

Spring 2018

**Special interest house faculty advisor**

2016-2018

**Phi Beta Kappa committee**

2015-2017

**Judge for community based learning & research award**

2017

**Civil engineering hiring committee**

2016

**Experience Lafayette day**

2016

**PROFESSIONAL DEVELOPMENT** 

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**Project NExT Fellow** Mathematical Association of America

2015-present

A program for recent Ph.D.s, whose mission is to address all aspects of teaching and learning in mathematics. As part of this program I attended several workshops during 2015 and 2016.