

EDUCATION	<b>Ph.D., Mathematics</b> North Carolina State University	2020-2025 Raleigh, NC
	<ul style="list-style-type: none"> <li>• Thesis: <i>Schur's Q-functions: Pfaffian Construction, Vertex Operator Identity, Plethysm, and Generalizations</i></li> <li>• Advisor: Naihuan Jing</li> </ul>	
	<b>M.S., Mathematics</b> North Carolina State University	2022 Raleigh, NC
RESEARCH INTERESTS	<b>B.A., Mathematics</b> College of the Holy Cross	2016-2020 Worcester, MA
	<ul style="list-style-type: none"> <li>• Thesis: <i>Partitions with Distinct Parts and the Parity of Their Rank</i></li> <li>• Advisor: Cristina Ballantine</li> <li>• Minor: Computer Science</li> </ul>	
	<p><b>General:</b> Algebraic combinatorics, representation theory, number theory, symbolic computation, algebraic geometry</p> <p><b>Specific:</b> Symmetric functions, plethysm, Hall-Littlewood functions, vertex operators, stability properties, Schur's <math>Q</math>-functions, raising operators, integer partitions</p>	
AWARDS AND HONORS	<b>Norris-Franke-Griggs Award for Teaching</b> Department of Mathematics, NCSU	Spring 2024
PUBLICATIONS	<ol style="list-style-type: none"> <li>1. <b>John Graf.</b> The Hall-Littlewood vertex operator, and stability of the Hall polynomials. (In preparation)</li> <li>2. <b>John Graf</b> and Naihuan Jing. Plethysm stability of Schur's <math>Q</math>-functions. arXiv:2409.01479, 2024. (Submitted to Journal of Algebras and Representation Theory)</li> <li>3. <b>John Graf</b> and Naihuan Jing. Pfaffian formulation of Schur's <math>Q</math>-functions. <i>J. Algebra</i>, 669:1–25, 2025.</li> </ol>	
SOFTWARE PACKAGES	<ol style="list-style-type: none"> <li>1. <b>John Graf.</b> Tableaux. A package for <i>Macaulay2</i>.</li> </ol>	

- TALKS AND PRESENTATIONS
1. *Schur's  $Q$ -functions and Plethysm Stability*. GSCC 2025, USC. March 15, 2025. Las Angeles, CA.
  2. *Symmetric functions and plethysm*. TAGMaC Conference. November 2, 2024. Raleigh, NC.
  3. *Symmetric functions, plethysm, and Schur's  $Q$ -functions*. Algebra and combinatorics seminar, NCSU. October 9, 2024. Raleigh, NC.
  4. *Partitions with distinct parts and the parity of their rank*. Thesis presentation, Holy Cross. May 2020. Worcester, MA.
  5. *Consecutive increases related to the  $3x + 1$  function*. Poster presentation, JMM. January 2020. Denver, CO.
  6. *Analysis of topic models*. Poster presentation, Holy Cross. September 7, 2018. Worcester, MA.
  7. *Analysis of topic models*. Summer research presentation, Holy Cross. August 2018. Worcester, MA.

TEACHING HISTORY

North Carolina State University, 2020-2025

Course	Title	Role	Class Size	Semester
MA 242	Calculus III	Instructor	95	Spring 2025
MA 242	Calculus III	Instructor	95	Fall 2024
MA 242	Calculus III	Instructor	15	Summer 2024
MA 242	Calculus III	Instructor	95	Spring 2024
MA 242	Calculus III	Instructor	95	Fall 2023
MA 131	Calculus for Life and Management Sciences A	Instructor	10	Summer 2023
MA 141	Calculus I	Instructor	15	Summer 2023
MA 242	Calculus III	TA	115	Spring 2023
MA 242	Calculus III	TA	95	Fall 2022
MA 141	Calculus I	Instructor	15	Summer 2022
MA 242	Calculus III	TA	115	Spring 2022
MA 141	Calculus I	TA	115	Fall 2021
MA 241	Calculus II	TA	25	Summer 2021
MA 241	Calculus II	TA	20	Spring 2021
MA 341	Differential Equations I	TA	90	Fall 2020

SKILLS

**Languages:** English, Spanish.

**Programming:** Macaulay2, Python, Java, C++.