Mathematical Biosciences Institute
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Homepage

# Colby Long

## Education

2016 **Ph.D., Mathematics**, *North Carolina State University*, Advisor: Seth Sullivant.

2013 **M.S., Mathematics**, *North Carolina State University*.

2008 **B.A., Mathematics**, *St. Mary's College of Maryland*, Summa Cum Laude.

## Professional Appointments

Aug 2019 **Assistant Professor of Mathematics**, *The College of Wooster*, Wooster, OH.

2018–2019 **Data Scientist**, *Nationwide Insurance (consultant with TekSystems)*, Columbus, OH.

2016–2018 **Postdoctoral Research Fellow**, *Mathematical Biosciences Institute*, The Ohio State University.

## Publications and Preprints

(13) **Machine Learning with Phylogenetic Network Invariants**, with Travis Barton, Elizabeth Gross, and Joseph Rusinko, (in preparation).

(12) **Phylogenetic Networks**, with Elizabeth Gross and Joseph Rusinko, chapter in *Foundations for Undergraduate Research in Mathematics*, edited by Pamela Harris, Erik Insko, and Aaron Wooton, (submitted).

(11) **PhylogeneticTrees: A Macaulay2 package for Phylogenetics**, with Hector Baños, Nathaniel Bushek, Ruth Davidson, Elizabeth Gross, Pamela Harris, Robert Krone, AJ Stewart, Robert Walker, arXiv:1611.05805, submitted.

(10) **Initial Ideals of Pfaffian Ideals**, arXiv:1610.06524, to appear in the *Journal of Commutative Algebra*.

(9) **Species Tree Inference From Genomic Sequences Using the Logdet Distance**, with Elizabeth S. Allman and John A. Rhodes, *SIAM J. Appl. Algebra Geometry* **3** (2019), no. 1, 107–127.

(8) **Dimensions of Group-based Phylogenetic Mixture Varieties**, with Hector Baños, Nathaniel Bushek, Ruth Davidson, Elizabeth Gross, Pamela Harris, Robert Krone, AJ Stewart, Robert Walker, *Bull. Math. Biol.* **81** (2019), no. 5, 316–336.

(7) **Identifiability and Reconstructibility of a Modified Coalescent**, with Laura Kubatko, *Bull. Math. Biol.* **81** (2019), no. 2, 408–430.

(6) **The Effect of Gene Flow on Coalescent-based Species Tree Inference**, with Laura Kubatko, *Syst. Biol.* **67** (2018), no. 5, 770–785.

(5) **Distinguishing Phylogenetic Networks**, with Elizabeth Gross, *SIAM J. Appl. Algebra Geometry* **2** (2018), no. 1, 72–93.

(4) **L-infinity Optimization to Linear Spaces and Phylogenetic Trees**, with Daniel Irving Bernstein, *SIAM J. Discrete Math.* **31** (2017), no. 2, 875-889.

(3) **Bounds on the Expected Size of the Maximum Agreement Subtree**, with Daniel Irving Bernstein, Lam Si Tung Ho, Mike Steel, Katherine St. John, Seth Sullivant, *SIAM J. Discrete Math.* **29** (2015), no. 4, 2065-2074.

(2) **Tying up Loose Strands: the defining equations of the strand symmetric model**, with Seth Sullivant, *J. Algeb. Stats.* **6(1)** (2015), 17-23.

(1) **Identifiability of 3-Class Jukes-Cantor Mixtures**, with Seth Sullivant, *Adv. In Appl. Math.* **64** (2015), 89-110.

## Awards and Honors

2017 **Mathematical Research Communities Collaboration Grant**, *$5250*, San Jose, CA, Apr 26-29.

2016 **Winton Rose Award**, *$1000*, for thesis: *Algebraic Geometry of Phylogenetic Models*, Apr 25.

2016 **Recognition for Excellence in Classroom Teaching**, *North Carolina State University*, Mar 21.

## Presentations and Professional Activities

### Invited Talks

2018 **Evolutionary Reconstruction With Linear Algebra**, *Mt. Holyoke College Math/Stat Club Seminar*, South Hadley, MA, Sep 19.

2018 **Identifiability and Reconstructibility of a Modified Coalescent**, *AMS Spring 2018 Eastern Sectional*, Boston, MA, Apr 21.

2018 **Rank Conditions for Phylogenetic Inference**, *MBI Postdoctoral Seminar*, Columbus, OH, Apr 5.

2017 **Identifiability and Reconstructibility of a Modified Coalescent**, *SIAM Conference on Applied Algebraic Geometry*, Atlanta, GA, Jul 31.

2017 **L-infinity Optimization to Linear Spaces and Phylogenetic Trees**, *AMS Spring 2017 Eastern Sectional*, New York, NY, May 7.

2017 **Identifiability and Reconstructibility of a Modified Coalescent**, *Phylogenetics Research Group*, University of Alaska Fairbanks, Fairbanks, AK, Mar 28.

2016 **Bounds on the Expected Size of the Maximum Agreement Subtree**, *International Symposium on Biomathematics and Ecology Education and Research*, Charleston, SC, Oct 16.

2015 **Initial Ideals of Pfaffian Ideals**, *Algebraic Geometry and Number Theory Seminar*, Clemson University, Clemson, SC, Oct 20.

2015 **Tying up Loose Strands: the defining equations of the strand symmetric model**, *AMS Fall 2015 Western Sectional*, Chicago, IL, Oct 2.

2015 **Tying up Loose Strands: the defining equations of the strand symmetric model**, *Algebraic Statistics 2015*, Genoa, Italy, Jun 8.

2014 **Identifiability of 3-Class Jukes-Cantor Mixtures**, *AMS Fall 2014 Western Sectional*, San Francisco, CA, Oct 26.

### Other Presentations

2017 **Distinguishing Phylogenetic Networks**, *Algebraic and Combinatorial Phylogenetics (poster)*, Barcelona, Spain, Jun 28 .

2017 **Algebraic Geometry of Phylogenetic Models**, *MBI Postdoc Seminar (talk)*, Columbus, OH, Feb 2.

2016 **Initial Ideals of Pfaffian Ideals**, *Joint Mathematics Meeting 2016 (contributed talk)*, Seattle, WA, Jan 7.

2015 **Applications of Algebra in Phylogenetics**, *NCSU Graduate Student Algebra Seminar (talk)*, Raleigh, NC, Sep 30.

2015 **IBL in the Mathematics Classroom**, *NCSU OFD Teaching and Learning Symposium (poster)*, Raleigh, NC, Apr 14.

2015 **Tying up Loose Strands: the defining equations of the strand symmetric model**, *Triangle Area Graduate Math Conference (talk)*, Raleigh, NC, Feb 21.

2014 **Identifiability of 3-Class Jukes-Cantor Mixtures**, *NCSU Graduate Student Algebra Seminar (talk)*, Raleigh, NC, Nov 5.

2014 **Identifiability of 3-Class Jukes-Cantor Mixtures**, *Algebraic Statistics 2014 (poster)*, Chicago, IL, May 20.

### Workshops and Conferences

2017 **Joint Mathematics Meeting 2017**, *Atlanta, GA*, Jan 4-7.

2011–2015 **Triangle Lectures in Combinatorics**, *University of North Carolina, North Carolina State University, Duke University*.

2014 **Teaching and Learning Conference 2014**, *Elon University, Elon, NC*, Aug 14.

2014 **NSF/CBMS Conference: Mathematical Phylogeny**, *Rock Hill, SC*, Jun 28-Jul 2.

2011 **Joint Mathematics Meeting 2011**, *Boston, MA*, Jan 6-9.

## Teaching

To view artifacts of my teaching, please visit the online teaching portfolio I prepared while teaching Foundations of Advanced Mathematics and Calculus I.

### The Ohio State University

2017-2018 **Instructor of Record**,
*MATH 2174: Linear Algebra and Differential Equations for Engineers, Fall 2018*
*STAT 2450: Introduction to Statistical Analysis I, Fall 2017.*

### North Carolina State University

2013–2016 **Instructor of Record**,
*MA225: Foundations of Advanced Mathematics, Summer 2016.*
*MA231: Calculus II for Life Sciences, Spring 2016.*
*MA141: Calculus I, Fall 2015.*
*MA225: Foundations of Advanced Mathematics, Spring 2015.*
*MA141: Calculus I, Fall 2013.*
*MA103: Topics in Contemporary Mathematics, Summer 2013.*

2012 **Teaching Assistant/Recitation Leader**,
*MA141: Calculus I, Fall 2012.*
*MA131: Calculus I for Life Sciences, Spring 2012.*

2011-2013 **Lecture Assistant**,
*MA341: Applied Differential Equations, Spring 2013.*
*MA231: Calculus II for Life Sciences, Fall 2011.*

## Mentoring

2017, 2018 **REU Assistant**, *Mathematical Biosciences Institute*, Mentored REU students during orientation week; gave an *Introduction to R Programming*, *An Introduction to LaTeX*, and advised on research posters and presentations, Jun 5-9, 2017; Jun 11-15, 2018.

2016 **Phylogenetics Group Assistant**, *Mathematical Research Communities: Algebraic Statistics*, Snowbird, Utah, Jun 12-16.

2015-2016 **Graduate Student Mentor**, *Undergrads Under Grads: Mentoring program to prepare undergraduates from underrepresented groups for careers in mathematics*, Aug 2015-May 2016.

2014 **REU Mentor**, *Mathematical Phylogenetics and the Space of Trees*, Met daily with four REU students to answer questions, establish goals, and direct research. **Award:** *Best Poster, MAA-SE Sectional 2015*, May 27-Aug 1.

## Professional Development

2014–2015 **Preparing the Professoriate**, *A selective yearlong future faculty preparation program*, Observed and then independently taught an advanced proof-writing course. Completed teaching workshops, conducted peer and faculty observations, presented a professional development project, and created a teaching portfolio.

2013–2015 **Certificate of Accomplishment in Teaching Program**, *A teaching development program for graduate students at North Carolina State University*, Completed teaching workshops, faculty observations, two semesters of teaching, and created a teaching portfolio.

### Teaching Seminars and Workshops

2018 **Diversity 101: The Role of Implicit Bias and Privilege**, *Facilitator: Marcela Hernandez*, Aug 2.

2015 **Active Learning: The Learner-Centered Classroom**, *Facilitators: Maxine P. Atkinson and Scott Grether*, Jan 28.

2014 **Course Design: From Assessment to Zombies**, *Facilitator: Beth Overman*, Oct 28.

2014 **Leading With Care: Recognizing and Responding to Emotional Distress in Others**, *Facilitators: Pete Adams and Jenny Policari*, Oct 14.

2014 **Effective Teaching With Technology**, *Facilitator: Beth Overman*, Sep 23.

2013 **Introduction to Teaching**, *Facilitator: Susanna Klingenberg*, Aug 30.

2011,2012 **NCSU Mathematics Teaching Assistant Workshops**, *Facilitators: Molly Fenn and Brenda Burns Williams.*

## Service and Outreach

2018 **Organizer**, *Special Session on "The Mathematics of Phylogenetics"*, AMS Spring 2018 Central Sectional Meeting, Mar 17-18.

2017-2018 **Organizer**, *MBI Postdoc Seminar*, The Ohio State University, Sep 2017 - May 2018.

2017 **Referee**, *Discrete Applied Mathematics.*

2017 **Panelist**, *Sampling Advanced Mathematics for Minority Students*, Mathematical Biosciences Institute, Jul 25.

2017 **Judge**, *Ohio State Chapter of Sigma Xi*, Ohio Academy of Science State Science Day, May 13.

2016 **Referee**, *SIAM Journal on Discrete Mathematics*.

2016 **Referee**, *SIAM Journal on Applied Algebra and Geometry*.

2015 **Judge**, *MAA Student Poster Session*, JMM 2016, Jan 8.

2015 **Panelist**, *NCSU Graduate Student Recruitment Weekend*, Feb 28.

## Programming and Software

R, Maple, Macaulay2, LaTeX, Github