Christine E. Heitsch

Contact Information

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Research Interests

Discrete mathematical biology, combinatorics on words, and string algorithms. Design, analysis, and prediction of RNA secondary structures. Sequence/structure/function relationships for RNA viral genomes.

Education

University of California at Berkeley, PhD in Mathematics, December 2000. Thesis: *Computational Complexity of Generalized Pattern Matching.* Advisor: John Rhodes.

University of Illinois at Urbana-Champaign, BS with Highest Distinction in Mathematics, Magna Cum Laude, May 1994.

Employment

Founding Director, the Southeast Center for Mathematics and Biology (SCMB), 2018 – present. *One of four NSF-Simons MathBioSys Research Centers nationally. Headquarted at Georgia Institute of Technology.*

Professor, School of Mathematics, Georgia Institute of Technology, 2016 – present.

- Courtesy Appointment: School of Biological Sciences.
- Courtesy Appointment: School of Computational Science & Engineering (CSE).
- Affiliated Faculty: Parker H. Petit Institute for Bioengineering and Bioscience.
- Affiliated Faculty: Interdisciplinary Graduate Program in Quantitative Biosciences (QBioS).
- Affiliated Faculty: PhD Program in Algorithms, Combinatorics, and Optimization (ACO).

Associate Professor, School of Mathematics, Georgia Institute of Technology, 2011 – 2016.

Assistant Professor, School of Mathematics, Georgia Institute of Technology, 2006 – 2011.

Postdoctoral Fellow, Genome Center of Wisconsin/Biotechnology Center, University of Wisconsin – Madison, Jan 2005 – Aug 2006.

Associate Director, BACTER (Bringing Advancement Computation to Environmental Research) Institute, University of Wisconsin – Madison, Aug 2004 – Dec 2004.

Postdoctoral Fellow, Computation and Informatics in Biology and Medicine, University of Wisconsin – Madison, 2002 – 2004.

Postdoctoral Fellow, Department of Computer Science, University of British Columbia, 2000 – 2002.

Visiting Positions

General Member, Program on Mathematics of Molecular and Cellular Biology, Institute for Mathematics and its Applications, Fall 2007.

Visiting Assistant Professor, Department of Mathematics, Duke University, Fall 2004.

Honors & Awards

Alumni Achievement Award, Department of Mathematics, University of Illinois at Urbana-Champaign, 2019.

Faculty Mentor Award, College of Science, Georgia Institute of Technology, 2019, 2014. *Based on nominations from junior faculty.*

"Above and Beyond" Award for Senior Faculty, Parker H. Petit Institute for Bioengineering and Bioscience, Georgia Institute of Technology, 2018. *Given to team-based individuals who demonstrate exemplary service to the institute and contribute significantly to the Petit Institute's collaborative environment.*

Thank a Teacher Certificate, Center for Teaching and Learning, Georgia Institute of Technology, 16 total, 2 featured during GT "Celebration of Teaching Day."
Sp22 (five), Fa21, Sp18, Fa17 (two), Sp17, Fa16, Sp15, Sp13, Sp11, Fa10 (two).

Visiting Lecturer Program, Mathematical Biosciences Institute (MBI) 2009 – 2012.

Research Council Visiting Scholar, Department of Mathematics, University of Nebraska – Lincoln, 2006.

Incredible Instructor Honorable Mention, Dept. of Computer Science, University of British Columbia, 2002.

Nikki Kose Memorial Teaching Prize, Mathematics Department, University of California at Berkeley, May 2000.

Outstanding Graduate Student Instructor, University of California at Berkeley, May 1996.

H. R. Brahana Prize in Mathematics, University of Illinois at Urbana-Champaign, May 1994.

Bronze Tablet, University of Illinois at Urbana-Champaign, May 1994. *Top 3% of graduating class.*

Phi Beta Kappa Award, University of Illinois at Urbana-Champaign, May 1994. *Four awards made.*

Phi Beta Kappa, May 1994.

Refereed Publications **Heitsch trainee $^\diamond$Other trainee $^\alpha$Alphabetical ordering*

34. C Heitsch, C Huynh*, G Johnston*, *On a barrier height problem for RNA branching*, To appear in Journal of Combinatorics. Preprint available at arXiv:2303.12227 [q-bio.BM].$^\alpha$

33. F Hurley* and C Heitsch, *RNAprofiling 2.0: Enhanced cluster analysis of structural ensembles*, To appear in Journal of Molecular Biology. Preprint available at arXiv:2303.15552 [q-bio.BM].

32. T Greenwood* and C Heitsch, *How parameters influence SHAPE-directed predictions*, to appear in R. Lorenz, ed, RNA Folding – Methods and Protocols, Springer Methods in Molecular Biology.

31. S Poznanović, C Wood$^\diamond$, M Cloer$^\diamond$, C Heitsch, *Improving RNA branching predictions: Advances and limitations.* Genes (Basel), 12(4): 469, 2021.

30. M D Schmidt*, A Kirkpatrick$^\diamond$, C Heitsch, *RNAStructViz: Graphical base pairing analysis*, Bioinformatics, 37(20): 3660-3661, 2021.

29. H Du, M M Ferrari$^\diamond$, C Heitsch, F Hurley$^\diamond$, C V Mennicke$^\diamond$, B D Sullivan, and B Xu$^\diamond$, *Secondary structure ensemble analysis via community detection*, in R. Segal et al. (eds.), Using Mathematics to Understand Biological Complexity, Springer Association for Women in Mathematics Series 22, pp. 55–81, 2021.$^\alpha$

28. T Greenwood* and C Heitsch, *On the problem of reconstructing a mixture of RNA structures*, Bull Math Biol, 82(10):133, 2020.

27. S Poznanović, F Barrera-Cruz*, A Kirkpatrick*, M Ielusic*, and C Heitsch, *The challenge of RNA branching prediction: A parametric analysis of multiloop initiation under thermodynamic optimization*, J Struct Biol, 210(1): 107475, 2020.

26. H R Yoon*, A Coria$^\diamond$, A Laederach, and C Heitsch, *Towards an understanding of RNA structural modalities: A riboswitch case study*, Comput Math Biophys, 7(1):48–63, 2019.

25. F Barrera-Cruz*, C Heitsch, S Poznanović, *On the structure of RNA branching polytopes*, SIAM J Appl Algebra Geometry, 2(3):444–461, 2018.$^\alpha$

24. E Rogers*, D Murrugarra*, and C Heitsch, *Conditioning and robustness of RNA Boltzmann sampling under thermodynamic parameter perturbations*, Biophys J, 113(2):321-329, 2017.

23. E Drellich$^{\diamond}$, A Gainer-Dewar$^{\diamond}$, H Harrington$^{\diamond}$, Q He$^{\diamond}$, C Heitsch, and S Poznanović, *Geometric combinatorics and computational molecular biology: Branching polytopes for RNA sequences*, in Algebraic and Geometric Methods in Applied Discrete Mathematics, AMS Contemp Math vol. 685, pp. 137–153, 2017.$^{\alpha}$

22. E Rogers* and C Heitsch, *New insights from cluster analysis methods for RNA secondary structure prediction*, Wiley Interdiscip Rev RNA, 3(7):278-94, 2016.

21. E Rogers* and C Heitsch, *Profiling small RNA reveals multimodal substructural signals in a Boltzmann ensemble*, Nucleic Acids Res, 42(22):e171, 2014.

20. S Poznanović* and C Heitsch, *Asymptotic distribution of motifs in a stochastic context-free grammar model of RNA folding*, J Math Biol, 69(6-7):1743-72, 2014.

19. C Heitsch and S Poznanović*, *Combinatorial insights into RNA secondary structure*, in N. Jonoska and M. Saito, ed, Discrete and Topological Models in Molecular Biology, Springer, Chapter 7, pp. 145–166, 2014.$^{\alpha}$

18. S Harvey, Y Zeng$^{\diamond}$, and C Heitsch, *The icosahedral RNA virus as a grotto: Organizing the genome into stalagmites and stalactites*, J Biol Phys, 39(2): 163-72, 2013.

17. J Cooper and C Heitsch, *Generalized Fibonacci recurrences and the lex-least De Bruijn sequence*, Adv Appl Math, 50(4): 465-473, 2013.$^{\alpha}$

16. Z Sükösd*, MS Swenson*, J Kjems, and C Heitsch, *Evaluating the accuracy of SHAPE-directed RNA secondary structure predictions*, Nucleic Acids Res, 41(5):2807-16, 2013.

15. Y Zeng$^{\diamond}$, S Larsen, C Heitsch, A McPherson, and S Harvey, *A model for the structure of satellite tobacco mosaic virus*, J Struct Biol, 180(1):110-6, 2012.

14. MS Swenson*, J Anderson*, A Ash*, P Gaurav$^{\diamond}$, Z Sükösd*, D Bader, S Harvey, and C Heitsch, *GTfold: Enabling parallel RNA secondary structure prediction on multi-core desktops*, BMC Res Notes, 5(1):341, 2012.

13. D Bader, C Heitsch, and K Madduri$^{\diamond}$, *Large-scale network analysis*, in J. Kepner and J. Gilbert, eds, Graph Algorithms in the Language of Linear Algebra, SIAM Press, Chapter 12, pp. 253-285, 2011.$^{\alpha}$

12. C Heitsch and P Tetali, *Meander graphs*, 23rd International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2011), 469-480, Discrete Math. Theor. Comput. Sci. Proc., AK, Assoc. Discrete Math. Theor. Comput. Sci., Nancy, 2011.$^{\alpha}$

11. V Hower* and C Heitsch, *Parametric analysis of RNA branching configurations*, Bull Math Biol, 73(4): 754-776, 2011.

10. J Cooper and C Heitsch, *The discrepancy of the lex-least De Bruijn sequence*, Discrete Math, 310(6-7): 1152-1159, 2010.$^{\alpha}$

9. A Apostolico, G Ciriello$^{\diamond}$, C Guerra, C Heitsch, C Hsiao$^{\diamond}$, and L Williams, *Finding 3D motifs in ribosomal RNA structures*, Nucleic Acids Res, 37(4):e29, 2009.$^{\alpha}$

8. A Mathuriya*, D Bader, C Heitsch, and S Harvey, *GTfold: A scalable multicore code for RNA secondary structure prediction*, in Proceedings of the 24th Annual ACM Symposium on Applied Computing (SAC), Computational Sciences Track, Honolulu, HI, March 9-12, 2009.

7. A Apostolico, G Ciriello$^{\diamond}$, C Guerra, and C Heitsch, *Discovering 3D motifs in RNA*, in J. Chen and S. Lonardi, editors, Biological Data Mining, Chapman & Hall/CRC Press, Chapter 3, pp. 49 - 68, 2009.$^{\alpha}$

6. Y Bakhtin and C Heitsch, *Large deviations for random trees and the branching of RNA secondary structures*, Bull Math Biol, 71(1):84-106, 2009.$^{\alpha}$

5. Y Bakhtin and C Heitsch, *Large deviations for random trees*, J Stat Phys, 132(3):551-560, 2008.$^{\alpha}$

4. C Heitsch, *Insufficiency of four known necessary conditions on string unavoidability*, J Algorithms, 56(2):96-123, 2005.

3. C Heitsch, A Condon, and H Hoos, *From RNA secondary structure to coding theory: A combinatorial approach*, in Proceedings of the Eighth International Meeting on DNA Based Computers (DNA8), Lecture Notes in Computer Science, Springer-Verlag, Sapporo, Japan, June 2002.

2. C Heitsch, *Exact distribution of deletion sizes for unavoidable strings*, in Proceedings of the 8th International Symposium on String Processing and Information Retrieval (SPIRE'01), IEEE Computer Society Press, Laguna de San Rafael, Chile, November 2001.

1. C Heitsch, *Generalized pattern matching and the computational complexity of unavoidability testing*, in Proceedings of the 12th Annual Symposium on Combinatorial Pattern Matching (CPM 2001), Lecture Notes in Computer Science, Springer-Verlag, Jerusalem, Israel, July 2001.

Submitted Publications

C Heitsch, *Counting orbits under Kreweras complementation.* Preprint available at arXiv:2303.12240 [math.CO].

Publications in Progress

H Banos*, CS Simonti$^\diamond$, L Wang$^\diamond$, AB Paaby, C Heitsch, *A substitution model for tRNA microevolution in the presence of transcription associated mutagenesis.*

A Saaidi*, A Laederach, C Heitsch, *Reconciling RNA structural profiling with correlated mutation analysis from DMS-MaP footprinting.*

CS Simonti$^\diamond$, L Wang$^\diamond$, H Banos*, C Heitsch, J Lachance, AB Paaby, *Selection, constraint and microevolution of nuclear tRNAs in a natural population.*

O Cardwell*, S Poznanović, and C Heitsch, *Polytope geometry and RNA prediction accuracy.*

E Rogers* and C Heitsch, *Predicting RNA consensus stems through unsupervised clustering of unaligned sequences*, available http://rnaconsensus.math.gatech.edu/consensus_paper.pdf.

Open Source Software *Github.com/gtDMMB*

`RNAprofiling` (Github) — Ensemble-based cluster analysis of suboptimal RNA secondary structures.
- `RNAprofilingV2`, version 2.0, 2022.
- `RNAStructProfiling`, version 1.0, 2013.
- Run online: `http://rnaprofiling.gatech.edu`.

`ConsensusStems` (Github) — Homologous RNA secondary structure prediction. Demonstration website: `http://rnaconsensus.math.gatech.edu`.

`RNAStructViz` (Github) — Visual comparison and analysis of RNA secondary structures.

`GTfold` (Sourceforge) — A scalable multicore code for RNA secondary structure prediction.

Fellowships & Grants

Principal Investigator, NSF-Simons Research Centers for Mathematics of Complex Biological Systems.
- Title: *A Southeast Center for Mathematics and Biology.*
- 5 year award of $5,000,000 (NSF) plus $5,000,000 (Simons) for 07/01/18 – 06/30/23.
- Co-PI: Hang Lu, Department of Chemical and Biomolecular Engineering, Georgia Tech.
- GT Senior Personnel: Greg Blekherman (Math), Dan Goldman (Physics), Melissa Kemp (BME), Annalise Paaby (Biosci), Francesca Storici (Biosci), Matt Torres (Biosci).

- Subaward PIs: Peter Bubenik (Florida, Math), Elena Dimitrova (Clemson, Math), Natasha Jonoska (South Florida, Math), Scott McKinley (Tulane, Math), Julie Mitchell (ORNL), Christine Payne (Duke, MEMS, previously GT Chem & Biochem).

Co-Principal Investigator, NSF DMS Mathematical Biology.
- Title: *Collaborative research: Branching in RNA secondary structures.*
- 3 year award of $190,000 for 9/1/18 – 8/31/21. (No cost extension to 8/31/23.)
- PI: Svetlana Poznanović, Department of Mathematical Sciences, Clemson University.

Principal Investigator, NIH NIGMS Division of Cell Biology and Biophysics.
- Title: *Multimodal RNA structural motifs in alphavirus genomes: discovery and validation.*
- 5 year R01 award of $1,684,990 for 8/01/17 – 7/31/23.
- Subaward PI: Alain Laederach, Biology Department, University of North Carolina – Chapel Hill.

Principal Investigator, NSF DMS EMSW21-MCTP.
- Title: *IMPACT: A postdoctoral program for interdisciplinary mathematics preparation and career training.*
- 5 year award of $1,299,994 for 1/1/14 – 12/31/18. (No cost extension to 12/31/19.)
- Funded 8 postdoctoral fellows, 18 summer REU students, and 6 graduate student REU assistants.
- Co-PIs in GT Math: Doug Ulmer, Brett Wick, and Hao Min Zhou.

Georgia Tech Fund for Innovation in Research and Education (GT-FIRE).
- Title: *Proofs in action.*
- 1 year award of $20,000 for 7/1/13 – 6/30/14.

Principal Investigator, NIH NIGMS Division of Cell Biology and Biophysics.
- Title: *Combinatorial and computational methods for the analysis, prediction, and design of viral RNA structures*.
- 5 year award of $1,317,210 for 9/1/07 – 8/31/12. (No cost extension to 8/31/13.)
- Co-PIs at GT: Steve Harvey (Biology) and David Bader (CSE).

Principal Investigator, Career Award at the Scientific Interface, Burroughs Wellcome Fund.
- Title: *A combinatorial and computational approach to deciphering the biological information encoded by single-stranded nucleotide sequences.*
- 5 year award of $500,000 for 1/1/05 – 12/31/09. (No cost extension to 12/31/17.)

Collaborative Graduate Student Award, Georgia Tech Integrative BioSystems Institute, 2008 – 2009.
- 50% support for Yingying Zeng, Biology PhD student in the Harvey laboratory.
- Research project: *Design of RNA Structures.*

Postdoctoral Fellowship, Computation and Informatics in Biology and Medicine (CIBM), NIH NLM Training Program, UW Madison, 2002 – 2004.

Invited Talks ** indicates funded speaker*

Most Notable
- Plenary, 20th Intl Conf on Uncon Comp & Nat Comput (UCNC), U North Florida* — March 2023
- Plenary, AMS Southeastern Sectional Meeting, U Central Florida* — Sept 2017
- Applied Combinatorics Summer School (8 lectures), PIMS-U Saskatchewan* — May 2015
- Opening Address, Comput Analysis of RNA Struct & Func Workshop, Benasque, Spain — July 2015
- Featured Speaker, Comput RNA Bio, Wellcome Trust Conference, Cambridge, UK* — Nov 2014
- International Summer School on Bioinfo & Comp Bio (1 lecture), Lipari, Italy* — June 2009

Other Significant
- Online Seminar on Mathematical Molecular Biosciences (virtual), World-wide — Oct 2022
- Workshop on Disc and Top Models in Mol Bio, U South Florida *(Orig May 2020)** — May 2022
- Rational Design of RiboNucleic Acids Workshop, Schloss Dagstuhl *(Orig Oct 2020)* — Sept 2022

- MathBioSys Annual Meeting, Simons Foundation* Apr 2022
- 4th Annual Symposium on Multiscale Cell Fate *(Talk cancelled)*, UC Irvine* Oct 2021
- Cancelled: Conference on Theory & Biology, Simons Foundation* Apr 2020
- CQuB Conference on Quantitative Approaches in Biology, Northwestern* Oct 2019
- Structure in the Micro-World Workshop, TGDA@OSU TRIPODS Center* May 2019
- NSF-CMBS Conf on Mathematical Molecular Bioscience and Biophysics, U Alabama* May 2019
- Conference on Theory & Biology, Simons Foundation* Apr 2019
- Special Session on Alg and Disc Methods in Math Bio (1 hour talk), AMS SE Sec Mtg Mar 2019
- AWM Workshop on WinCompTop: Applied & Comput Topology (1 hour talk), JMM Jan 2019
- Genomics, Pattern Avoidance, and Statistical Mechanics Workshop, Schloss Dagstuhl Nov 2018
- Topology of the Biomolecular World, AIM Workshop* July 2017
- Discrete Math Day of the Northeast, Saint Michael's College* Oct 2016
- Top, Geom, and Stat Techniques in Bio Data, MBI Emphasis Workshop* Sept 2016
- Geometric and Topological Modeling of Biomolecules, MBI Emphasis Workshop* Sept 2015
- PIMS Analytic RNA Combinatorics Workshop, Simon Fraser University* April 2014
- Spring Opportunities Workshop for Women in the Mathematical Sciences, NIMBioS* April 2014
- Topological Structures in Computational Biology, IMA Annual Program Year Workshop* Dec 2013
- Undergraduate Research Conf at the Interface of Biology and Mathematics, NIMBioS* Nov 2012
- Women In Mathematics In New England, Smith College* Sept 2012
- CIBM Training Program Retreat, UW Madison* Oct 2011
- Model & Comput of Biomol Struct & Dynam, MBI Current Topic Workshop* April 2011
- Workshop on Applications of Schubert Calculus, U Iowa* March 2011
- Frontiers in Mathematical Biology: NSF-NIH PIs Meeting, U Maryland April 2010
- Algorithms in MacroMolecular Modeling Conference, UT Austin* Nov 2009
- Mathematical Developments Arising from Biology, MBI Current Topic Workshop* Nov 2009
- Opening Workshop, SAMSI Program on Alg Methods in Sys Bio & Stat* Sept 2008
- 23rd Mini-Conference on Discrete Mathematics and Algorithms, Clemson University* Oct 2008
- RNA in Bio, Bioeng & Nanotech, IMA Annual Program Year Workshop* Oct 2007
- 20th Cumberland Conference on Discrete Mathematics, Emory University May 2007

Conferences (since 2007)

- Comput Approaches to RNA Struct & Func Workshop, Benasque, Spain *(Unable to attend)* Aug 2022
- Minisymposium on Molecular Biosciences, SIAM LS (hybrid) July 2022
- AMS Special Session on Applied Combinatorial Methods, JMM (virtual) April 2022
- Special Session on Alg, Comb, and Top in Bio Struct, AMS SE Sec Mtg (virtual) Nov 2021
- Minitutorial on Combinatorial Frontiers in Computational Biology, SIAM ACDA July 2021
- AMS Special Session on Applied Combinatorial Methods, JMM (virtual) Jan 2021
- Cancelled: Challenges in RNA Structural Modeling and Design, TSRC Workshop June 2020
- Cancelled: Minisymposium on Alg, Comb, and Top in Bio Struct, SIAM LS June 2020
- Session on Chord Diagrams Everywhere, CMS Winter Meeting Dec 2019
- Comput Approaches to RNA Struct & Func Workshop, Benasque, Spain July 2018
- Minisymposium on Computational Biology, SIAM DM June 2018
- Challenges in RNA Structural Modeling and Design, TSRC Workshop June 2018
- AMS Special Session on Applied and Computational Combinatorics, JMM Jan 2018
- Minisymposium on Algebraic and Topological Biology, SIAM AG Aug 2017
- Minisymposium on Discrete Methods in Molecular Biology, SIAM Annual Meeting July 2017
- Minisymposium on Topological and Geometric Algorithms, CanaDAM June 2017
- Minisymposium on Mol Biosci & Biophys – Macromol Struct & Interact, SIAM LS July 2016
- Challenges in RNA Structural Modeling and Design, TSRC Workshop June 2016

- Minisymposium on Discrete Mathematical Biology, SIAM DM — June 2016
- Special Session on Alg & Comb Methods in Math Bio, AMS SE Sec Mtg — March 2016
- Challenges in RNA Structural Modeling and Design, TSRC Workshop — July 2014
- Recent Applications of Statistical Discrete Models and Inference in Biology, JSM — Aug 2013
- Minisymposium on Model & Comput of Macromol Struct & Interact, SMB — July 2012
- Minisymposium on Computational Methods for RNA Structure Analysis, SIAM DM — June 2012
- Special Session on Enumerative and Geometric Combinatorics, AMS Central Sec Mtg — March 2012
- Special Session on Discrete Models in Molecular Biology, AMS SE Sec Mtg* — March 2012
- AMS Special Session on Mathematics and Statistics in Computational Biology, JMM — Jan 2012
- Special Session on Disc Method & Models in Biomath, AMS Central Sec Mtg — Oct 2011
- Special Session on Applied Combinatorics, AMS SE Sec Mtg — March 2011
- Minisymposium on Discrete Mathematical Biology, SIAM DM — June 2010
- SIAM Minisymposium on New Trends in Mathematical Biology, JMM — Jan 2010
- Special Session on Applications of Alg & Geom Comb, AMS SE Sec Mtg — April 2009
- The Biology-Combinatorics Interface, BIRS 5-Day Workshop — July 2008
- Minisymposium on Graph Theor Methods in Comp Bio, SIAM DM — June 2008
- Special Session on Mathematical Modeling in Biology, AMS SE Sec Mtg — March 2008
- Special Session on Applicable Algebra, AMS SE Sec Mtg — March 2007

Colloquia (since 2007)

- Genetics, Bioinformatics and Systems Biology, University of California at San Diego* — April 2019
- Petit Breakfast Club, Georgia Institute of Technology — Feb 2019
- Quantitative Systems Biology Center, Vanderbilt University* — Oct 2018
- Department of Mathematics, Vanderbilt University* — Oct 2018
- Department of Mathematical Sciences, University of Wisconsin-Milwaukee* — April 2017
- Department of Mathematical Sciences, Clemson University* — April 2014
- Women in Mathematics Lecture, University of Waterloo* — Mar 2013
- L. H. Baker Center for Bioinformatics and Biological Statistics, Iowa State University* — Feb 2011
- School of Mathematics, Georgia Institute of Technology — Nov 2009
- Center for Computational Molecular Biology, Brown University* — Nov 2008
- Discovery Science for Quantitative Biology, IASI-CNR, Rome, Italy* — March 2007
- Department of Mathematics, Florida State University* — Jan 2007

Seminars (since 2007)

- Mathematical Biology, Department of Mathematics, University of California at Davis* — Nov 2017
- Mathematical Biology, Department of Mathematics, Duke University* — April 2017
- Institute for Quantitative Biology, East Tennessee State University* — Oct 2010
- Algebra and Combinatorics, Department of Mathematics, Texas A&M University* — April 2010
- Algebraic and Combinatorics, Department of Mathematics, North Carolina State University — Sept 2009
- Mathematical Biology, Department of Mathematics, University of Georgia* — Sept 2008
- Combinatorics, School of Mathematics, Georgia Institute of Technology — April 2008
- Computational Biology, Department of Computer Science, University of Illinois at Chicago* — April 2008
- Mathematical Biology & Ecology, School of Mathematics, Georgia Institute of Technology — April 2008
- Molecular Biophysics, School of Chemistry & Biochemistry, Georgia Institute of Technology — Jan 2008
- Mathematics of Molecular and Cellular Biology, IMA, University of Minnesota* — Oct 2007
- Combinatorics and Probability, Department of Mathematics, University of Pennsylvania* — Sept 2007
- Combinatorics, School of Mathematics, University of Minnesota* — Sept 2007
- Research Horizons, School of Mathematics, Georgia Institute of Technology — Feb 2007
- Bioinformatics and Computational Biology, Georgia Institute of Technology — Jan 2007

Professional Service

Board of Advisors
- QBio/NSF-Simons Center at Harvard, Feb 2020 – present.
- Computational and Mathematical Biophysics journal, Feb 2018 – present.
- National Institute for Mathematical and Biological Synthesis (NIMBioS), UT Knoxville, 2008 – 2012.

Editorial Boards
- SIAM Journal on Discrete Mathematics, Jan 2020 – present.
- Bulletin of Mathematical Biology, Mar 2016 – present.
- Biophysical Journal, Section I: Nucleic Acids and Genomic Biophysics, Jan 2016 – Dec 2021.

Committee Appointments
- AMS Centennial Fellowship, July 2020 – June 2023. *Chair for 7/21 – 6/22.*
- SIAM George Polya Prize in Applied Combinatorics, 2020, 2019.
- AMS Southeastern Section Program, Feb 2018 – Jan 2020. *Chair for 2019.*
- AMS Committee on Women in Mathematics (CoWIM), Feb 2015 – Jan 2018.
- AWM Workshop at JMM, Fall 2011, Fall 2010, Fall 2005.

Research Immersion Project Lead
- Collaborative Workshop for Women in Mathematical Biology, IPAM, June 2019. *With Associate Professor Blair Sullivan (CS, NCSU).*
- AMS Mathematics Research Community, Snowbird, June 2014. *With Assistant Professor Svetlana Poznanović (Math, Clemson).*

Conference Organization
- SCMB Annual Symposium Jan 2019, Feb 2020, Dec 2020, Dec 2021.
- NIMBioS/SCMB Investigative Workshop, Dec 2020.
- AMS Southeastern Sectional Meeting Special Session, March 2023, Sept 2017, March 2016.
- SIAM ACDA21 Minitutorial, July 2021.
- SIAM ACDA21 Organizing Committee, 2020.
- SIAM Annual Meeting Minisymposium, July 2017.
- CanaDAM Conference Minisymposium, June 2017.
- SIAM Conference on Discrete Mathematics Minisymposium, June 2016, June 2012.
- 2017 CanaDAM Conference Program Committee, Spring 2016.
- MBI Emphasis Program Workshop, Sept 2015.
- IMA Annual Program Year Workshop, Dec 2013.
- SAMSI Year-long Research Program, 2008 – 2009.

Grant Reviewer
- NSF panelist, Fall 2017, Spring 2015, Fall 2012, Fall 2011, Fall 2008, Fall 2007. *Scheduling conflict: Fall 2022, Spring 2022, Fall 2021, Fall 2020, Fall 2019.*
- NSF external, Fall 2022, Summer 2009.
- NSA external, Spring 2011.
- DoE panelist, Spring 2004, Spring 2002.

Journal Reviewer (in past 13 years)
- Mathematics: Adv in Appl Math, Bull Math Biol, Electron J Combin (x2), FPSAC conference, J Algebra, SIAM J Discrete Math (x 3), Trans Amer Math Soc.
- Biology: Biophys J (x 2), PLoS One, J Mol Biol (x 2), J Struct Biol, Nature Methods, Nucleic Acids Res, PNAS (x 2), RNA.

- Computer science: Bioinformatics (x 4), Comput Sci Discov, IEEE/ACM Trans Comput Biol Bioinform, PLoS Comput Biol, Theoret Comput Sci.

External Letter Writer (with Carnegie Classification)

- Senior Promotion: 2022 (R1), 2019 (R1), 2018 (R1), 2017 (R1).
- Junior Promotion & Tenure: 2023 (R1), 2022 (BC), 2021 (BC), 2020 (R2), 2019 (R1), 2018 (R1), 2016 (R1), 2013 (R2), 2010 (M1).
- PhD Dissertation Reviewer, École Polytechnique, Fall 2021.
- PhD Dissertation Examiner, Australian National University, 2009 – 2010.

Postdoctoral Fellow Supervision

Brandon Legried, 2022 – present. *2020 UW Madison mathematics PhD advised by S Roch. Michigan statistics RTG postdoc mentored by J Terhost.*

Afaf Saaidi, 2019 – 2022. *Placement: Data science consultant, Capgemini Engineering, France.*

Hector Baños Cerevantes, 2019 – 2021. *Placement: Postdoc, Biochem & Mol Bio Dept, Dalhousie U.*

Hee Rang (Iris) Yoon, 2018 – 2019. *Placement: Postdoc with R. Ghrist, ECE Dept, U Penn.*

Torin Greenwood, 2015 – 2018. *Placement: TT Asst Prof, Math Dept, Rose-Hulman. (Moved to NDSU).*

Fidel Barerra-Cruz, 2016 – 2017. *Joint with T. Trotter (Math, GT). Placement: Google software engineer.*

David Murrugarra, 2012 – 2014. *Placement: TT Asst Prof, Math Dept, U Kentucky. (Tenured 2020.)*

M. (Shel) Swenson, Spring 2011 – Fall 2012. *Placement: Research Assoc with D. Bader, CSE, GT.*

Svetlana Poznanović, 2010 – 2012. *Placement: TT Asst Prof, Math Dept, Clemson. (Tenured 2018.)*

Valerie Hower, 2008 – 2009. *Placement: NSF Postdoc Fellow, Math Dept, UC Berkeley.*

Graduate Student Supervision

Alfie Brownless, Summer 2022. *Incoming QBioS PhD student, post-bac REU from Wofford College, SC.*

Forrest Hurley, Spring 2020 – 2021. *Math MS May 2021. Placement: UNC Biostatistics PhD student.*

Maxie Schmidt, 2018 – 2021. *Computational RA. Math PhD 2022 advised by J. Yu (M. Lacey, E. Croot).*

Anna Kirkpatrick, 2016 – 2019. *ACO PhD student.*

Emily Rogers, Spring 2009 – Summer 2018. *CSE PhD Aug 2018, co-advised with David Bader (CSE, GT). Bioinf MS Dec 2009. Placement: GTRI Research Scientist.*

Abhishek Abhishek, Spring 2013 – Fall 2013. *CS MS research student.*

Chris Mize, Spring 2012 – Fall 2012. *CS MS research student.*

Zsuzsanna Sükösd, Spring 2011. *Visiting PhD student from Aarhus University, Denmark.*

Amrita Mathuriya, 2007 – 2009. *CS MS May 2009, co-advised with David Bader (CSE, GT). Placement: Intel.*

Award-winning Undergraduate Research Students *Over 23 semesters*

Kalen Patton, Spring 2019, Summer 2019. *3rd place in 2016 GT HMC. CoS Early Research Award for Spring 2019, GT PURA for Summer 2019.*

Ngoc Yen Chi Huynh, 2015 – 2017. *GT PURA for Fall 2016. Went on to UIUC PhD program in mathematics.*

Martin Copenhaver, 2011 – 2013. *GT CoS 2012 Wartell–Brossette Award for Multidisciplinary Studies. Went on to MIT PhD program in operations research with NDSEG graduate fellowship (declined NSF).*

David Esposito, Summer 2011 – Summer 2012. *First place in GT UROC Symposium for poster presentation. Went on to Lithium Technologies as software engineer.*

Joshua Anderson, Summer 2009 – Spring 2011. *SMART scholarship winner. Went on to US Army Space and Missile Defence Command in Huntsville, AL.*

Nicole Larsen, 2007 – 2009. *Honorable Mention for 2009 AWM Schafer Prize. Went on to Yale PhD program in mathematical physics with NSF graduate fellowship.*

Have mentored 13 other undergraduate students over 23 semesters in research projects at Georgia Tech.

Courses Taught at Georgia Tech

Math 4108 – Abstract Algebra II.
- Spring 2022, 15 undergraduates, 1 graduate student.
- Spring 2018, 12 undergraduates, 1 graduate student.
- Spring 2009, 11 undergraduates. *Offered at students' request.*

Math 4107 – Abstract Algebra I.
- Fall 2021, 46 undergraduates, 1 graduate student.
- Fall 2017, 30 undergraduates.
- Fall 2008, 21 undergraduates, 3 graduate students.

Math 1551 – Differential Calculus. Fall 2020. 84 undergraduates.

Math 8803 – Special Topics: Fundamentals of Discrete Mathematical Biology. Spring 2020. 10 graduate students.

Math 4318 – Analysis II.
- Spring 2017, 15 undergraduates, 2 graduate students, 4 visitors through exchange program.
- Spring 2012, 17 undergraduates, 2 graduate students.

Math 4317 – Analysis I.
- Fall 2016, 11 undergraduates, 5 graduate students.
- Fall 2011, 25 undergraduates, 13 graduate students.

Math 2803 – Foundations of Mathematical Proof. *New "bridge" class offered on trial basis. Made permanent (Math 2106) in Fall 2015, replacing previous prerequisite for Abstract Algebra and Analysis.*
- Spring 2015, 26 undergraduates.
- Fall 2014, 19 undergraduates.
- Spring 2013, 9 undergraduates.
- Fall 2012, 15 undergraduates.

Math 2602 – Linear and Discrete Mathematics.
- Spring 2011, 120 undergraduates.
- Fall 2010, 97 undergraduates.

Math 2406 – Abstract Vector Spaces, Fall 2009, 24 undergraduates.

Math 4803/8803 – Special Topics: Discrete Mathematical Biology, Spring 2008, 2 undergraduates, 10 graduate students.

Math 3012 – Applied Combinatorics.
- Spring 2007, 21 undergraduates.
- Fall 2006, 10 undergraduates.

Outreach

IMPACT REU program, 2014 – 2017. *An eight-week research experience for six undergraduates from Atlanta-area institutions with an emphasis on mentoring, diversity, and professional development.*
- Summer 2017 (lead by Michael Lacey): Amadou Bah (Georgia State Perimeter College), Bryson Kagy (Georgia Tech), and Emily Smith (Agnes Scott) presented at JMM undergraduate poster session. Amdaou Bah transferred to MIT in Fall 2018.
- Summer 2016: Ida De Vierno (Georgia Tech) and Isabella Nang (Georgia State) presented at JMM undergraduate poster session. Taylor Strickland (Agnes Scott) transfered to GT as Public Policy major.

- Summer 2015: Veronica Fulton (Spelman College) won 1st Place Oral Presentation Award on 2016 Research Day. Austin Little (Morehouse College) transfered to GT as Computer Engineering major.

Georgia Tech Service & Committee Appointments

Postdoctoral Professional Development

- SoM Faculty Liason for Postdoctoral Scholars, 2017 – 2020.
- Office of Postdoctoral Services Advisory Council, 2014 – 2017.
- Professional Development Seminar for GT Math Postdocs, 2013 – 2017. *Online resources available.*
- SoM Postdoctoral Committee, 2013 – 2016.

Math-Bio Interface

- QBioS Graduate Committee, Spring 2014 – Spring 2019.
- SoM Mathematical Biology & Ecology Seminar co-organizer, 2006 – present.
- SoM Discrete Mathematical Biology Working Seminar organizer, 2011 – 2013.
- GT-Emory-UGA CIMBS team, 2007 – 2008. *Co-wrote proposal with Joshua Weitz (Bio, GT). One of 3 finalists for $16M NSF Center for research at the Interface of the Mathematical and Biological Sciences.*
- IBSI Committee on Graduate Students, Spring 2007, 2007 – 2008.
- SoM Stelson Lecture Series (Simon Levin, Princeton) organizer, 2007 – 2008.
- CSE Faculty Recruitment Bio Subcommittee, 2007 – 2008.

Other GT Committee Appointments

- College of Science Dean Search, 2012 – 2013.
- Sigma Xi Best Faculty Paper Award, Spring 2013.

Other SoM Committee Appointments

- Space Task Force, 2021.
- Chair Search, Spring 2015 – Spring 2016.
- Undergraduate, 2011 – 2015.
- Elections & Nominations, 2007 – 2011.
- Colloquium, 2006 – 2007.

College of Science New Faculty Mentoring Program, 2012 – 2013.