

## CURRICULUM VITAE

**Blair Dowling Sullivan****CONTACT INFORMATION**

Oak Ridge National Laboratory  
P.O. Box 2008, MS6015  
Oak Ridge, TN 37831-6015

**Phone:** (865) 241-0250  
**Fax:** (865) 241-0253  
**Email:** sullivanb@ornl.gov

**EDUCATION**

**Doctorate of Philosophy, Mathematics;** June 2008  
Princeton University, Princeton, NJ  
Advisor: Paul D. Seymour

**Master of Arts, Mathematics;** January 2005  
Princeton University, Princeton, NJ

**Bachelor of Science, Applied Mathematics;** *summa cum laude* (GPA: 4.0); May 2003  
**Bachelor of Science, Computer Science;** *summa cum laude* (GPA: 4.0); May 2003  
Georgia Institute of Technology, Atlanta, GA

**EXPERIENCE**

**R&D Staff Member,** Oak Ridge National Laboratory, Computer Science & Mathematics Division  
Oak Ridge, TN, July 2008 – present

**Ph.D. Research,** Princeton University  
Princeton, NJ, September 2003 – June 2008

Work on extremal directed graph theory questions related to the Caccetta-Haggkvist conjecture, an open problem from 1978. Research has connections with additive number theory and linear programming.

**Visiting Researcher,** Renyi Institute  
Budapest, Hungary, October 2007 – April 2008

**Theory Group Internship,** Microsoft Research  
Redmond, WA, Summer 2007

Investigated a variety of topics including the facets of spherical embeddings of strongly regular graphs, holes in complex projective codes, and directed graph theory. Mentor: H. Cohn.

**Department of Homeland Security Internship,** Oak Ridge National Laboratory  
Oak Ridge, TN, Summer 2004

Center for Engineering Science & Advanced Research; Mentors: N. Rao, W. Grimmell, J. Barhen.

Developed an approximation algorithm for an NP-complete problem of quickest paths in networks with message scaling and implemented a gene-clustering algorithm on a new optical-core processor in development.

**Bio-PRISM Project,** Georgia Institute of Technology  
Atlanta, GA, August 2002 – August 2003

Bio-PRISM (Predicting Retroviral Immunology with Stochastic Models) was a project with D. Randall (Georgia Tech) & G. Silvestri (Emory University).

We created a stochastic mathematical model for in vitro progression of HIV and a graphical interface for viewing the projections using a 3-dimensional cell lattice to represent the human body. Probability functions simulated the spread of HIV and the immune responses to the infection. This project won first place in the Georgia Tech College of Computing Undergraduate Research Symposium, Spring 2003.

**Undergraduate Research**, Georgia Institute of Technology  
Atlanta, GA, Summer 2001/Fall 2002

Work with P. Tetali investigating quadratic residue tournaments and their reconstruction from minimal hitting sets. Work supported by NSF Supplemental Funding. This research had applications to data compression algorithms, number theory, and undirected graph theory.

## **SCHOLARSHIPS/FELLOWSHIPS & GRANTS**

Department of Homeland Security Dissertation Grant (2006-2007)

Department of Homeland Security Graduate Fellowship (2003-2006)

Phi Kappa Phi Scholarship Cup, *Georgia Tech senior with most outstanding academic record* (2003)

Georgia Tech President's Scholarship, *full tuition & stipend support* (1999-2003); Jo Baker Scholar (2003)

J. C. Currie Outstanding Math Junior Scholarship (2001); Outstanding Math Senior Award (2003)

National Merit Scholarship (1999-2003)

## **RESEARCH PAPERS**

Chudnovsky, M., Seymour, P., Sullivan, B.D., *Cycles in Dense Digraphs*, *Combinatorica* 28(1):1-18, 2008.

Nathanson, M., Sullivan, B.D., *Heights in Finite Projective Space, and a Problem on Directed Graphs*, *Integers* 8:A13, 2008.

Seymour, P., Sullivan, B.D., *Counting Paths in Digraphs*, to appear, *European Journal of Combinatorics*.

Sullivan, B.D., *Series Classes and Primes in Graphs* (submitted).

Sullivan, B.D., *On a Conjecture of Andrica & Tomescu* (submitted).

Sullivan, B.D., *A Summary of Results and Problems Related to the Caccetta-Haggkvist Conjecture*.

Sullivan, B.D., Dowling, W.A., *Intellectual Property and Academia*, *International Business and Economics Research Journal*, 2003.

## **TEACHING EXPERIENCE**

Introduction to Calculus & Analytic Geometry (MAT 101), Princeton University, Instructor (Fall 2006)  
Responsible for lectures, homework and exam preparation, syllabus creation, and grading of exams.

Graph Theory (MAT 306), Princeton University, Grader (Spring 2006, Spring 2007)  
Graded weekly proof-based homework sets for forty-five students.

Calculus II (Math 1502), Georgia Institute of Technology, Teaching Assistant (Fall 2001, Spring 2002)  
Led recitation sections twice a week; graded homeworks and examinations.

Program in Mathematics for Young Scientists, Boston University, Head Counselor (2001)  
Guided high school students in elementary number theory; graded problem sets; taught mini-course.

## **INVITED TALKS/POSTERS**

PROMYS 20<sup>th</sup> Reunion, Boston Univ., Boston, MA, July 2009 – *Using Mathematics to Connect the Dots*

AWM Workshop, AMS-MAA Joint Mathematics Meetings, Washington, D.C., January 2009 – *Counting Paths in Digraph*.

Princeton-Oxford Graph Theory Workshop, Oxford University, Oxford, England, June 2008 – *Directed Cycles in Dense Digraphs*.

Oak Ridge National Laboratory, Oak Ridge, TN, May 2008 – *Extremal Problems in Digraphs*.

AMS-MAA Joint Mathematics Meetings, San Diego, CA, January 2008 – *Feedback Arc Sets and Girth in Digraphs*.

Alfred Renyi Mathematics Institute, Budapest, Hungary, November 2007 – *Bounding Feedback Arc Sets using Girth in Digraphs*.

University of California, San Diego Combinatorics Seminar, San Diego, CA, October 2007 – *Feedback Arc Sets and Girth in Digraphs*. (slides available at [www.ornl.gov/~b7r](http://www.ornl.gov/~b7r))

Microsoft Research Theory Group, Redmond, WA, October 2007 – *Feedback Arc Sets and Girth in Digraphs*.

Simon Fraser University Discrete Math Seminar, Burnaby, B.C., October 2007 – *Feedback Arc Sets in Circular Interval Digraphs*.

Georgia Tech Graph Theory Seminar, Atlanta, GA, September 2007 – *Bounding Minimum Feedback Arc Sets by Girth*.

Microsoft Research Theory Group, Redmond, WA, April 2007 – *Dense Triangle-Free Digraphs*. (talk available online – see [www.ornl.gov/~b7r](http://www.ornl.gov/~b7r))

Grad Student Combinatorics Conference, Seattle, WA, April 2007 – *Directed Cycles in Dense Digraphs*.

38th Southeastern International Conference on Combinatorics, Graph Theory, and Computing, Florida Atlantic University, Boca Raton, FL – March 2007 – *Directed Cycles in Dense Digraphs*.

New York Number Theory Seminar, New York, NY, February 2007 – *Additive Number Theory and Cycles in Digraphs*.

Nassau Presbyterian Church Adult Education Series, Princeton, NJ, February 2007 – *Connect the Dots*.

Princeton University Graduate Student Seminar, Princeton, NJ, December 2006 – *The Angel and the Devil*.

Princeton University Discrete Math Seminar, Princeton, NJ, December 2006 – *Directed cycles in digraphs*.

American Institute of Mathematics Workshop on the Caccetta-Haggkvist Conjecture, Palo Alto, CA, January 2006 – *Opening talk for conference; presented known results & new related conjectures in field*.

Princeton University Graduate Student Seminar, Princeton, NJ, March 2006 – *A proof of Caccetta-Haggkvist for Cayley graphs*.

Department of Homeland Security Research Conference, Boston, MA, April 2005 – *Poster on research at Oak Ridge National Laboratory during summer 2004*.

Princeton University Graduate Student Seminar, Princeton, NJ, September 2005 – *“A Minor Theorem” (the graph minors project – what it is, how it’s useful, and an idea of the proof)*.

Microsoft Research Theory Group, Redmond, WA, June 2002 – *Bio-PRISM: Predicting Retroviral Immunity with Stochastic Models*.

## **OTHER CONFERENCES & WORKSHOPS**

SIAM Annual Meeting, Denver, CO – July 2009

DHS HS-STEM Career Development Conference, Washington DC – Oct 2008

PIMS Workshop on the Cycle Double Cover Conjecture, Univ. of British Columbia, Vancouver – Aug 2007

C&O@40 Conference, University of Waterloo, Waterloo, Ontario – June 2007

EXCILL: Extremal Combinatorics at Illinois, Univ. Illinois, Urbana-Champaign – Nov 2006

SIAM Conference on Discrete Mathematics, Victoria, British Columbia – June 2006

Princeton-Oxford Graph Theory Workshop, Oxford University, Oxford, England – July 2005

Advances in Graph and Matroid Theory, Ohio State University, Columbus OH – December 2003

SIAM Conference on Discrete Mathematics, Nashville, TN – June 2004

Program for Women in Mathematics, Institute for Advanced Study, Princeton, NJ –  
May 2003 (Mathematical Biology), May 2005 (Geometry of Groups), May 2006 (Zeta Functions)