

Deena Rae Schmidt

dschmidt@mbi.osu.edu

<http://people.mbi.ohio-state.edu/dschmidt/>

Mathematical Biosciences Institute
1735 Neil Ave, 377 Jennings Hall
Ohio State University
Columbus, OH 43210
Office: (614) 688-3198

1771 Kenny Rd
Apt 22
Columbus, OH 43212
Home: (607) 227-9510

EDUCATION

Cornell University, Ithaca, NY

May 2007 Ph.D. Applied Mathematics
Dissertation: *A mathematical look at DNA regulatory sequence evolution*
Richard Durrett (Mathematics), advisor
Charles Aquadro (Genetics) and Laurent Saloff-Coste (Mathematics), committee members

Jan 2005 M.S. Applied Mathematics

The University of Akron, Akron, OH

May 2001 B.S. Mathematics, Biology and Dance *In Honors* and *Summa Cum Laude*
Honors Thesis: *Using singular value decomposition to explain gene expression patterns*
GPA: Overall 3.98/4.0, Major 4.0/4.0

Armstrong High School, Plymouth, MN

June 1997 Valedictorian

RESEARCH AREA / INTERESTS

My research interests are in applied probability and mathematical biology. In particular, I study stochastic processes with applications to population genetics and molecular biology. My PhD research focused on Markov chain models of DNA regulatory sequence evolution, analyzing how waiting times depend on an organism's population size and various mutation rates. Currently, I'm working on a gene regulatory network model and a model of microRNA regulation involved in cancer development. Please refer to my research statement for more information about my research.

RESEARCH EXPERIENCE

Sept 2008 **Postdoctoral Fellow - Mathematical Biosciences Institute (MBI)**
-Present Ohio State University, Columbus, OH
- Mentors: Timothy Newman (Arizona State University) and Avner Friedman (OSU)
- Actively participate in all workshops and activities of the MBI annual programs
"Mathematical Challenges in Developmental Biology" (2008-09)

Sept 2007 **Postdoctoral Associate - Institute for Mathematics and Its Applications (IMA)**
-Aug 2008 University of Minnesota, Minneapolis, MN
- Mentors: Timothy Newman (Arizona State University) and Maury Bramson (U of M)
- Actively participate in all workshops and activities of the IMA annual program
"Mathematics of Molecular and Cellular Biology"

- Jun-Aug 2007 **Project Director - Summer Research Experience for Undergraduates**
University of Akron, Akron, OH
- One of six co-directors, organized a project in mathematical population genetics
- Spring 2006 **Graduate Research Assistant**
Cornell University, Ithaca, NY
- Advisor: Rick Durrett
- Aug 2004 **IMA Mathematical Modeling in Industry Graduate Student Workshop**
University of Minnesota, St. Paul, MN, Aug 8-18, 2004
- Mentor: Ann DeWitt, 3M Pharmaceuticals
- Small group research project on the topic "Data to knowledge in pharmaceutical research", produced a paper and presentation
- May 2003 **Program for Women in Mathematics**
Institute for Advanced Study and Princeton University, May 12-22, 2003
- Topic: Mathematical Biology
- Courses in phylogenetics, fluid dynamics, topological stereochemistry, fish schooling (coordinated multi-vehicle dynamics) and seminars addressing issues faced by women in science
- Jun-Aug 2001 **Mathematical and Theoretical Biology Institute (MTBI) Summer Research Program**
Cornell University, Ithaca, NY
- Courses in differential and difference equations, probability and stochastic processes
- My small group modeled bacterial resistance to antibiotics and the effects of large-scale antibiotic misuse using Markov chain analyses, produced a paper and presentation
- Jun-Jul 2000 **Summer Mathematics Program for Women (SMP)**
Carleton/St. Olaf College, Northfield, MN
- Courses in game theory and low-dimensional dynamical systems
- Small group research project on chaos theory and presentation at the end of the program
- Apr 2004 **Additional Training:** National Center for Biotechnology Information (NCBI) Workshop
Cornell University Theory Center, Apr 26-27, 2004
- "A Field Guide to GenBank and NCBI Molecular Biology Resources"

PUBLICATIONS

- Schmidt, D. and Newman, T.J. A stochastic model of gene regulation. (in preparation)
- Durrett, R. and Schmidt, D. 2008. Waiting for two mutations: with applications to regulatory sequence evolution and the limits of Darwinian evolution. *Genetics* 180: 1501-1509.
- Durrett, R., Schmidt, D., and Schweinsberg, J. 2008. A waiting time problem arising from the study of multi-stage carcinogenesis. (to appear in *Ann. Appl. Probab.*)
- Schmidt, D. 2007. A mathematical look at DNA regulatory sequence evolution. Ph.D. Thesis, Cornell University.
- Durrett, R. and Schmidt, D. 2007. Waiting for regulatory sequences to appear. *Annals of Applied Probability* 17: 1-32.
- Schmidt, D. and Durrett, R. 2004. Adaptive evolution drives the diversification of zinc-finger binding domains. *Molecular Biology and Evolution* 21: 2326-2339.
- Do we really have to take all our medicine? Predicting the consequences of large-scale antibiotic misuse. Cornell University BSCB Dept. Technical Report BU-1527-M, 2001.

PRESENTATIONS

(Future) Banff International Research Station for Mathematics Innovation and Discovery, Workshop: “New Mathematical Challenges from Molecular Biology and Genetics ” (Sept 6-11, 2009)

- Invited speaker

Applied Math/Physics Seminar, University of California at Merced (Dec 5, 2008)

- Invited speaker: *A waiting time problem with applications to DNA regulatory sequence evolution, cancer, and the limits of Darwinian evolution*

Institute Partners Meeting, Mathematical Biosciences Institute, Ohio State University (Oct 19, 2008)

- Short talk and poster: *A mathematical look at DNA regulatory sequence evolution*

Workshop for Women in Probability, Cornell University (Oct 5-7, 2008)

- Invited speaker: *Waiting for two mutations: with applications to DNA regulatory sequence evolution and the limits of Darwinian evolution*

Seventh World Congress in Probability and Statistics, Singapore (July 14-19, 2008)

- Invited speaker in the session “Probability Problems from Genetics”

Mathematics Colloquium, Carleton College (May 1, 2008)

- Invited speaker: *Mathematical Modeling in Biology*

National AMS/MAA/SIAM Joint Meetings, San Diego, CA (Jan 6-9, 2008)

- Talk by my REU students, Sara Jensen and Anna Sparacino: *A mathematical model describing the evolution of the ABO blood group*

Probability Seminar, Department of Mathematics, University of Minnesota (Nov 9, 2007)

- Talk: *Waiting for k mutations: with applications to DNA regulatory sequence evolution and cancer*

IMA Postdoc Seminar, University of Minnesota (Nov 6, 2007)

- Talk: *Waiting for k mutations: with applications to DNA regulatory sequence evolution and cancer*

IMA Postdoc “Show and Tell”, University of Minnesota (Sept 6, 2007)

- Short talk and poster: *A mathematical look at DNA regulatory sequence evolution*

MathFest, San Jose, CA (Aug 3-7, 2007)

- Talk by my REU student, Sara Jensen: *The population genetics of the ABO blood group*

- Outstanding presentation award

Conference Jacques-Monod: Evolutionary Genomics, CNRS in Roscoff, France (May 2-6, 2007)

- Contributed talk: *Rapid turnover of transcription factor binding sites in organisms with large effective population size*

Mathematical Sciences Colloquium, Cornell University (Apr 24, 2007)

- Talk: *Mathematical models of DNA regulatory sequence evolution*

MBI Workshop for Young Researchers in Mathematical Biology, Ohio State University (Mar 12-15, 2007)

- Poster: *Mathematical models of DNA regulatory sequence evolution*

Cornell Summer School in Probability: Probability problems that arise from genetics, Cornell University (June 30, 2006)

- Contributed talk: *Waiting for regulatory sequences to appear*

SMBE (Society for Molecular Biology and Evolution) Genomes, Evolution, and Bioinformatics conference, Arizona State University (May 25-28, 2006)

- Contributed talk: *Waiting for regulatory sequences to appear*

Women in Mathematics Program, University of Akron (Apr 26, 2005)

- Invited speaker: *Mathematical approaches to problems in genetics*

Mathematical Sciences Graduate Student Seminar, Cornell University (Nov 15, 2004)

- Talk: *A mathematical look at two problems in genetics*

SMBE Genomes and Evolution conference, Penn State University (June 17-20, 2004)

- Poster: *Adaptive evolution drives the diversification of zinc-finger binding domains*

EGLME (Eastern Great Lakes Molecular Evolution Meeting), Cornell University (Apr 24, 2004)

- Poster: *Adaptive evolution drives the diversification of zinc-finger binding domains*

IMA (Institute for Mathematics and Applications), University of Minnesota (Aug 18, 2004)

- Presentation of research: *Data to knowledge in pharmaceutical research*

Invited panelist - Graduate School Panel held at Carleton Colleges SMP (June, 2001)

Undergraduate poster presentations *Do we really have to take all our medicine? Predicting the consequences of large-scale antibiotic misuse* (MTBI 2000)

- National MAA/AMS Joint Meetings in New Orleans, Jan 2001
 - Outstanding undergraduate research poster award
- MIT Howard Hughes Undergraduate Medical Research Symposium, Spring 2001
 - Poster award
- The University of Akrons Undergraduate Research Poster Session, Apr 2001

HONORS AND AWARDS

Travel Grants to attend the World Congress in Probability and Statistics, Singapore (July 2008)

- Institute of Mathematical Statistics Laha Travel Award

- NSF Travel Award (combined total \$1500)

National Science Foundation Graduate Research Fellow (2003-2007)

Travel Grant to attend SACNAS (Society for Advancement of Chicanos and Native Americans in Science)

National Conference, Denver, CO and participate in the REUnion (Oct 2005)

Nominated for Department of Mathematics Teaching Award, Cornell University (2005 and 2006)

NSF Training Grant Fellowship in Mathematical Biology, Cornell University (2001-2003) "Evolution from DNA to the organism: the interface between evolutionary biology and the mathematical sciences"

University Honors Scholar, University of Akron (2001)

Outstanding Senior Award, University of Akron (2001)

University and National Deans List, University of Akron (1997-2001)

Undergraduate Scholarships, University of Akron:

- Presidential Scholarship (1997, 1998, 1999, 2000)
- King Scholarship Math Department (2000)
- Shelby Scholarship Math Department (1999)
- Dr. Mary E. Maxwell Memorial Math Scholarship (1997, 1998)

Undergraduate Honor Societies, University of Akron:

- Mortar Board National Honor Society (VP 2000-01, Treasurer 1999-2000)
- Omnicron Delta Kappa Leadership Honor Society (Member 1999-2001)
- Golden Key International Honor Society (Director of Communication 1999-2001)
- Pi Mu Epsilon Mathematics Honorary (Secretary 1999-2000, Member 2000-01)

TEACHING EXPERIENCE

OHIO STATE UNIVERSITY:

Project Mentor - Calculus I for Life Sciences (Math 151L), Fall 2008

Created a small group project for approximately 30 students (6 groups of 5 students) which explored population growth in fisheries. Short in-class presentation and then met with each group of students to discuss problems. Wrote up solutions for TAs to grade the projects.

CORNELL UNIVERSITY:

Course Instructor - Finite Mathematics in the Life and Social Sciences (Math 105), Fall 2006

Lectured three times per week for a class of 28 undergraduate students. Developed detailed worksheets to encourage in class group work, discussion and “thinking outside of the box”. Held office hours each week, managed the course grader, co-created course exams, graded exams and assigned grades to students.

Course Instructor - Calculus I (Math 111), Fall 2005

Lectured three times per week for a class of 22 undergraduate students. Created quizzes and detailed review worksheets to encourage in class group work. Worked with interactive online homework assignments (Maple TA) and included problems from the “Good Questions Project” in lectures. Held office hours twice each week and managed the course grader. Contributed to the creation of course exams, graded exams and assigned grades to students.

Seminar Instructor - Ithaca High School Senior Seminar, Spring 2005

Taught a class of 10-15 highly motivated seniors at Ithaca High School who wanted to learn more math before college. Developed the topic, syllabus, and daily problem sets for an 8-week module in probability theory. Class met three times per week. Focused on applications of probability ranging from gambling to genetics. Sponsored by Cornell University.

Teaching Assistant - Research Experience for Undergraduates Program, Summer 2003

Along with director Rick Durrett (Cornell math dept), I worked with six undergraduate students on small group projects under the topic: probability problems from genetics.

Mathematics Department TA Trainer, Aug 2006

Assisted in the TA training program for new graduate students at Cornell University.

Mathematics Department TA Training, Aug 2001

UNIVERSITY OF AKRON:

Project Director - Research Experience for Undergraduates, Jun - Aug 2007

Peer Tutor - Mathematics and Genetics, Jan 1998 - May 2001

- Level II Tutor Training certification
- Tutor college students in math from college algebra through multivariable calculus
- Provided one-on-one tutoring in genetics for a deaf student

Grader - Linear Algebra, Spring 1999 and 2001

Graded weekly homework assignments for classes of approximately 30 undergraduate students.

Other Work Experience:

Clerical work at U.S. Bancorp in Hopkins, MN, Summer and Winter 1998 - 1999

OTHER CONFERENCES / WORKSHOPS

SIAM Conference on the Life Sciences, Montreal (Aug 3-7, 2008)

Cornell Summer School in Probability: Probability and ecology, Cornell University (June 23 - July 4, 2008)

History, Computing, and Gender Conference, Institute of Technology, University of Minnesota (May 30, 2008)

Carleton SMPosium (Summer Math Program for Women) reunion/conference (June 28 - July 1, 2007)

Joint SIAM (Society for Industrial and Applied Mathematics)/SMB (Society for Mathematical Biology) Conference on the Life Sciences, Raleigh, NC (July 31 - Aug 4, 2006)

Stochastic Models in Cell Biology Workshop, Cornell University (Apr 9-11, 2006)

Cornell Summer School in Probability: Random networks, Cornell University (July 10-23, 2005)

Mathematical Biosciences Institute (MBI) Workshop, Ohio State University (Jun 13-17, 2005)
"Recombination: hotspots and haplotype structure"

EGLME (Eastern Great Lakes Molecular Evolution Meeting), University of Toronto (Apr 30, 2005)

Finite Markov Chains and Random Algorithms Conference, Cornell University (May 9-11, 2004)

ACTIVITIES**Reviewer for the following journals:**

- PLoS Genetics
- Journal of Mathematical Biology
- Electronic Journal of Probability

Volunteer:

CoMC Focus Group participant, Joint MAA/AMS Meetings, San Diego, CA (Jan 7, 2008)

Expanding Your Horizons - Annual national program that encourages middle school girls to pursue their interests in math and science, Cornell University

- Workshop co-organizer "Math - Its Contagious!" (Apr 2006)
- Workshop assistant "Math Modeling and the Menstrual Cycle" (Apr 2005)
- Workshop assistant "Symmetry and Tessellations" (Apr 2002)

Peer Mentor for first year graduate students Center for Applied Mathematics, Cornell University (2003-04, 2005-06, 2006-07)

Graduate student orientation volunteer Cornell University (Aug 2002, 2003)

Dance:

Metropolitan Ballet Dancer, Minneapolis, MN (2007-2008)
Ithaca Ballet Company Principal Dancer, Ithaca, NY (2002-2007)
Perform with Cornell University Dance Department, Ithaca, NY (2003-2005)

ASSOCIATION MEMBERSHIPS

American Mathematical Society (AMS), member since 2001
Society for Industrial and Applied Mathematics (SIAM), member since 2003
Institute of Mathematical Statistics (IMS), member since 2008

COMPUTER SKILLS

Software Packages/Languages:

MATLAB, Maple, C, C++, R, Gimp, HTML, MapleTA (online testing software), L^AT_EX

Operating Systems:

Windows XP, Unix/Linux

REFERENCES

Prof. Richard Durrett
Dept. of Mathematics
523 Malott Hall
Cornell University
Ithaca, NY 14853
(607) 255-8282
rtd1@cornell.edu

Prof. Charles Aquadro
Dept. of Molecular Biology and Genetics
235 Biotechnology Bldg
Cornell University
Ithaca, NY 14853
(607) 254-4838
cfa1@cornell.edu

Prof. Timothy Newman
Center for Biological Physics
Dept. of Physics
Arizona State University
PO Box 871504
Tempe, AZ 85287
(480) 727-6799
timothy.newman@asu.edu

Dr. Maria Terrell (Teaching Reference)
Dept. of Mathematics
255 Malott Hall
Cornell University
Ithaca, NY 14853
(607) 255-3905
mst1@cornell.edu