

## BRENDAN C. FRY

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### CONTACT INFORMATION

Program in Applied Mathematics  
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### RESEARCH INTERESTS

Mathematical biology, modeling oxygen transport and blood flow regulation in the microcirculation

### EDUCATION

#### **University of Arizona, Tucson, Arizona USA**

Doctoral Student, Applied Mathematics, entered August 2008  
Minor: Biomedical Engineering  
GPA: 4.0 out of 4.0  
Expected graduation date: May 2013  
Advisor: Timothy Secomb  
Comprehensive exam completed: April 2011  
Qualifying exam completed: August 2009  
Graduate coursework completed:  
MATH 527 (Real Analysis: year-long sequence)  
MATH 575 (Numerical Analysis: year-long sequence)  
MATH 583 (Methods of Applied Mathematics: year-long sequence)  
MATH 586 (Case Studies in Applied Mathematics: year-long sequence)  
MATH 563 (Probability Theory)  
MATH 567A (Theoretical Statistics)  
MATH 576 (Numerical Analysis of Partial Differential Equations: year-long sequence)  
PSIO 572 (Quantitative Modeling of Biological Systems)  
BME 511 (Physiology for Biomedical Engineering)  
BME 510 (Molecular Cell Biology for Biomedical Engineering)  
BME 516 (Biomedical Imaging)  
MCB 695E (Science, Society, and Ethics)  
ECOL 553 (Functional, Evolutionary, and Computational Genomics)  
CPH 576A (Biostatistics in Public Health)

#### **University of Arizona, Tucson, Arizona USA**

M.S., Applied Mathematics, December 2009  
GPA: 4.0 out of 4.0  
Graduated Summa cum laude

#### **University of Arizona, Tucson, Arizona USA**

B.S., Mathematics, May 2008  
Minors: Computer Science, Spanish  
GPA: 3.8 out of 4.0  
Graduated with Honors, Magna cum laude

### HONORS AND AWARDS

Society for Mathematical Biology Landahl Travel Award (\$500), June 2012  
University of Arizona Graduate Interdisciplinary Programs: Travel award (\$600), May 2012  
The Microcirculatory Society: Travel award (\$1000), May 2012  
University of Arizona Graduate and Professional Student Council: Travel award (\$500), April 2012

The Microcirculatory Society: Selected to present at the President's Symposium on Young Investigators Novel Trends at Experimental Biology 2012, April 2012

University of Arizona Graduate Interdisciplinary Programs: Winner of Student Poster Competition, November 2011

National Institute of General Medical Sciences (NIGMS) Computational and Mathematical Modeling of Biomedical Systems: Predoctoral Trainee Appointment, January 2010 - December 2011

National Science Foundation VIGRE Fellowship, 2008-2009

Department of Mathematics: Excellence in Undergraduate Research Award, 2008

University of Arizona: National Merit Scholar, 2004-2008

## PUBLICATIONS

Fry BC and Secomb TW. Flow modulation and recruitment in a theoretical model for blood flow regulation in heterogeneous microvascular networks, in preparation.

Fry BC, Lee J, Smith NP, and Secomb TW. Estimation of blood flow rates in large microvascular networks. *Microcirculation* 19(6): 530-538, 2012.

## RESEARCH EXPERIENCE

**University of Arizona**, Tucson, Arizona USA

*Graduate Research Assistant*

**January 2012 - present**

Currently doing research in mathematically modeling metabolic blood flow regulation and oxygen transport in the microcirculation.

- Research topic: "Mathematical model for metabolic blood flow regulation in heterogeneous microvascular networks"
- Advisor: Timothy Secomb

*NIH Grant Trainee*

**January 2010 - December 2011**

Did research in mathematically modeling oxygen transport in the microcirculation.

- Research topic: "Modeling the effect of blood flow regulation on oxygen delivery in heterogeneous microvascular networks"
- Advisor: Timothy Secomb

*Research Tutorial Group*

**August - December 2009**

Modeled the response of arteriolar diameters to changes in intraluminal pressure.

- Research topic: "Time-dependent myogenic behavior of arterioles"
- Advisor: Timothy Secomb

*Graduate Student Term Paper*

**January - May 2009**

Developed and tested a model for tumor growth with viral therapy.

- Research topic: "A mathematical model of diffusion-driven tumor growth with viral therapy"
- Advisor: Alain Goriely

*Undergraduate Research Assistant*

**August 2007 - May 2008**

Researched the effects of adding a predator variable to a previous periodical insect population model for Honors thesis.

- Thesis topic: "Semelparous periodical insects"
- Advisor: Jim Cushing

*Undergraduate Research Assistant*

**August 2006 - May 2007**

Researched representations of the symmetric group  $S_n$  and how they relate to the irreducible partitions of  $n$ .

- Research topic: “Partitions and the symmetric group”
- Advisor: James Cossey

**NASA / University of Arizona**, Tucson, Arizona USA

*Space Grant Intern*

**August 2005 - May 2006**

Learned how to run molecules through a microwave spectrometer and analyze the results in the lab of the Kukolich group, as well as built a new microwave spectrometer.

- Research topic: “Microwave spectroscopy”
- Advisor: Stephen Kukolich

TEACHING  
EXPERIENCE

**University of Arizona**, Tucson, Arizona USA

*Graduate Teaching Assistant*

**January - May 2012**

Independently taught Calculus I with Applications (MATH 124), gave all lectures, graded, and wrote all homework assignments and exams.

*Graduate Teaching Assistant*

**August - December 2009**

Independently taught College Algebra (MATH 112), gave all lectures, graded, and wrote all homework assignments and exams.

*Undergraduate Teaching Assistant*

**January - May 2008**

Assisted Dr. David Savitt in teaching, giving demonstrations, and helping students in a senior-level cryptography course.

*Undergraduate Teaching Assistant*

**January - May 2007**

Assisted Dr. Ryan Vinroot in teaching and helping students in second semester undergraduate abstract algebra course.

LEADERSHIP

Creator and Organizer, SIAM Journal Club in Mathematical Biology, 2011-present

Volunteer Coordinator, MC, and Protest Judge, MathCounts Southern Arizona, 2011-present

Organizer, Arizona Days Applied Math Conference, 2011

Mentor, Undergraduate Math Modeling Class, 2011

Organizer, Applied Math Brown Bag Seminar, 2010-2011

Vice President, MathCats Undergraduate Math Club, 2006-2008

College of Science Ambassador, 2006-2008

American Cancer Society Relay for Life Co-Chair, 2006-2007

PROFESSIONAL  
EXPERIENCE

**Lockheed Martin Corporation**, Goodyear, Arizona USA

*Applied Mathematics Engineer*

**June 2008 - August 2008**

Designed algorithms for radar image processing and developed techniques to try to resolve focusing problem for high resolution images. In addition, was in charge of mathematical problem on a team of engineers.

**National Security Agency**, Fort Meade, Maryland USA

*Applied Research Mathematician*

**June 2007 - August 2007**

Worked in cryptanalysis and in diagnosing an unknown cryptological system, and used probability and statistics to program tests in C and in Python. Also worked with regular expressions to parse through data for desired information.

FUNDED  
CONFERENCES  
ATTENDED

2013 Joint Mathematics Meetings. San Diego, California. January 9-12, 2013. Presenter.  
(Upcoming)

Society for Mathematical Biology Annual Meeting. Knoxville, Tennessee. July 25-28, 2012.  
Presenter.

Joint Meeting of the British Microcirculation Society and The Microcirculatory Society. Keble  
College, Oxford, United Kingdom. July 4-6, 2012. Presenter.

Experimental Biology 2012. San Diego, California. April 21-25, 2012. Presenter.

Mathematical Biosciences Institute (MBI) Workshop for Young Researchers in Mathematical  
Biology. Ohio State University, Columbus, Ohio. August 29-September 1, 2011. Presenter.

National Institute for Mathematical and Biological Synthesis (NIMBioS) Investigative Workshop on  
Modeling Renal Hemodynamics. University of Tennessee, Knoxville, Tennessee. August 1-3, 2011.  
Presenter.

Experimental Biology 2011. Washington, DC. April 9-13, 2011. Presenter.

Society for Industrial and Applied Mathematics (SIAM) Annual Meeting and Conference on the Life  
Sciences. Pittsburgh, Pennsylvania. July 12-16, 2010.

Mathematical Association of America (MAA) MathFest. Madison, Wisconsin. July 31 - August 2,  
2008.

Statistical and Applied Mathematical Sciences Institute (SAMSI) Undergraduate Workshop.  
SAMSI, Research Triangle Park, North Carolina. February 29 - March 1, 2008 and March 2-3,  
2007.

Southwestern Undergraduate Mathematics Research Conference. Arizona State University, Tempe,  
Arizona. February 22-24, 2008. Presenter.

Arizona Mathematics Undergraduate Research Conference. Western New Mexico University, Silver  
City, New Mexico. April 27-29, 2007. Presenter.

PRESENTATIONS

Fry BC and Secomb TW. Theoretical model for metabolic blood flow regulation in a heterogeneous  
microvascular network. 2013 Joint Mathematics Meetings, San Diego, California. January 9, 2013.  
Oral presentation and poster. (Upcoming)

Fry BC and Secomb TW. Simulation of metabolic blood flow regulation by wall-derived and red-  
blood-cell-derived mechanisms: Responses to hemodilution. American Mathematical Society West-  
ern Sectional Meeting, Tucson, Arizona. October 28, 2012. Oral presentation. (Invited)

Fry BC and Secomb TW. Simulation of metabolic blood flow regulation by wall-derived and red-  
blood-cell-derived mechanisms: Responses to hemodilution. Society for Mathematical Biology An-  
nual Meeting, Knoxville, Tennessee. July 28, 2012. Oral presentation.

Fry BC and Secomb TW. Simulation of metabolic blood flow regulation by wall-derived and  
erythrocyte-derived mechanisms: Responses to hemodilution. Joint Meeting of the British Mi-  
crocirculation Society and The Microcirculatory Society, Keble College, Oxford, United Kingdom.  
July 4, 2012. Poster.

Fry BC and Secomb TW. Simulation of metabolic blood flow regulation in heterogeneous microvas-

cular networks: Effects of hematocrit variations. Experimental Biology 2012, San Diego, California. April 21, 2012. Oral presentation and poster.

Fry BC. Simulation of metabolic blood flow regulation in heterogeneous microvascular networks. Modeling and Computation Seminar, University of Arizona, Tucson, Arizona. April 5, 2012. Oral presentation.

Fry BC and Secomb TW. Mathematical model for metabolic blood flow regulation in microvascular networks. Graduate Interdisciplinary Programs (GIDP) Community Event, University of Arizona, Tucson, Arizona. November 17, 2011. Poster.

Fry BC and Secomb TW. Mathematical model for metabolic blood flow regulation in microvascular networks. Graduate and Professional Student Council (GPSC) Student Showcase, University of Arizona, Tucson, Arizona. November 4, 2011. Poster.

Alexander MJ and Fry BC. Models for conducted responses. Quantitative Biology Colloquium, University of Arizona, Tucson, Arizona. October 25, 2011. Oral presentation.

Fry BC and Secomb TW. Mathematical model for metabolic blood flow regulation in microvascular networks. National Alliance Mathematical Field of Dreams Conference, Tempe, Arizona. October 14, 2011. Poster.

Alexander MJ and Fry BC. Introduction to the microcirculation and vascular communication. Quantitative Biology Colloquium, University of Arizona, Tucson, Arizona. October 4, 2011. Oral presentation.

Fry BC. Modeling metabolic blood flow regulation in microvascular networks. Applied Math Brown Bag Seminar, University of Arizona, Tucson, Arizona. September 2, 2011. Oral presentation.

Fry BC and Secomb TW. Mathematical model for metabolic blood flow regulation in microvascular networks. MBI Workshop for Young Researchers in Mathematical Biology, Columbus, Ohio. August 29, 2011. Poster.

Fry BC and Secomb TW. Mathematical model for metabolic blood flow regulation in microvascular networks. NIMBioS Investigative Workshop on Modeling Renal Hemodynamics, Knoxville, Tennessee. August 1, 2011. Poster.

Fry B. Modeling oxygen transport in the microcirculation. Applied Math Brown Bag Seminar, University of Arizona, Tucson, Arizona. April 15, 2011. Oral presentation.

Fry B, Lee J, Smith NP, and Secomb TW. Estimation of blood flow rates in large microvascular networks based on incomplete boundary conditions. Experimental Biology 2011, Washington, DC. April 11, 2011. Poster.

Fry B. Effects of blood flow distribution on oxygen delivery in a heterogeneous microvascular network. Mathematics Graduate Student Colloquium, University of Arizona, Tucson, Arizona. February 2, 2011. Oral presentation.

Fry B and Shelton D. Stem Cells: Introduction and Ethics. Quantitative Biology Colloquium, University of Arizona, Tucson, Arizona. November 16, 2010. Oral presentation.

Fry B. The effect of blood flow distribution on oxygen delivery in a heterogeneous network. Applied Math Brown Bag Seminar, University of Arizona, Tucson, Arizona. April 30, 2010. Oral presentation.

Fry B. Time-dependent myogenic response of arterioles. Applied Math Second-Year Graduate Research Conference, University of Arizona, Tucson, Arizona. December 18, 2009. Oral presentation.

Fry B. An introduction to modeling tumor growth with viral therapy. Applied Math First-Year Mini-Conference, University of Arizona, Tucson, Arizona. May 15, 2009. Oral presentation.

Fry B, McGuire L, and Shah A. An experimental study of frequency regimes of honey coiling. Applied Math Laboratory Mini-Conference, University of Arizona, Tucson, Arizona. December 3, 2008. Oral presentation.

Fry B. Semelparous Periodical Insects. Southwestern Undergraduate Mathematics Research Conference, Arizona State University, Tempe, Arizona. February 22-24, 2008. Oral presentation.

Fry B. Partitions and the symmetric group. Arizona Mathematics Undergraduate Conference, Western New Mexico University, Silver City, New Mexico. April 27-29, 2007. Oral presentation.

#### COMPUTER SKILLS

- Languages: MATLAB, C, Perl, Java, Python
- Applications:  $\text{\LaTeX}$ , Maple, and common Windows database, spreadsheet, and presentation software
- Operating Systems: Unix/Linux, Windows

#### MEMBERSHIPS

Society for Industrial and Applied Mathematics (SIAM), American Mathematical Society (AMS), Society for Mathematical Biology (SMB), The Microcirculatory Society (MCS)