

# Ryan T. Botts, Ph.D.

## Associate Professor of Mathematics

Point Loma Nazarene University  
3900 Lomaland Drive  
San Diego, CA 92107  
Cell Phone: 619.849.2968

Email: [ryanbotts@pointloma.edu](mailto:ryanbotts@pointloma.edu)  
Website:  
[pointloma.edu/MICS/botts.html](http://pointloma.edu/MICS/botts.html)

---

### **Education**

- Ph.D. Mathematics: Ohio University, Athens, OH. 2003- 2010  
Advisor: Martin J. Mohlenkamp  
Title: The Learning and Analysis of Regulatory Networks Using Sums of Separable Functions
- M.S. Mathematics: Cal Poly State University, San Luis Obispo, CA. 2003.
- B.S. Mathematics: Cal Poly State University, San Luis Obispo, CA. 2001.

### **Employment and Teaching Experience**

- |              |                                                                                                                                                                  |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2015-Current | Associate Professor of Mathematics, Point Loma Nazarene University                                                                                               |
| 2010-2015    | Assistant Professor of Mathematics: Point Loma Nazarene University                                                                                               |
| 2007-2010    | Teaching Assistant: Ohio University-Athens                                                                                                                       |
| 2007-2010    | Research Assistant: Ohio University-Athens<br>Adv. Dr. Martin J. Mohlenkamp. <i>Toward a Direct Numerical Solution of the Multiparticle Schrodinger Equation</i> |
| 2009-2010    | Part-Time Instructor: Ohio University- Lancaster                                                                                                                 |
| 2006-2007    | Secondary School Teacher: Templeton High School                                                                                                                  |
| 2003-2006    | Teaching Assistant: Ohio University-Athens                                                                                                                       |
| 2001-2003    | Teaching Assistant: Cal Poly State University-SLO                                                                                                                |

### **Research Interests**

Statistical learning, bioinformatics, data and applications are all areas I am interested in. Some days I am working as a bioinformatician interested in using the genomic sequences of antibiotic resistant bacteria to better understand the sources, acquisition and distribution of clinically relevant samples found in contaminated urban wetlands. Other days I am an applied mathematician working in numerical analysis, more specifically in machine learning in high-dimensions with tensor products, trying to build learning algorithms for novel applications. Working on a wide variety of interdisciplinary problems has led me into research on how to train the next generation of interdisciplinary scientists.

## **Publications**

R. Botts, B. Apffel, C. J. Walters, K. Davidson, R. Echols, M. Geiger, V. Guzman, V. Haase, M. Montana, C. La Chat, J. Mielke, K. Mullen, C. Virtue, C. Brown, E. Top, and D. Cummings. *The genomic and functional analysis of four multidrug resistance plasmids captured from the sediment of an urban wetland*. Submitted.

R. Botts, L. Carter and C. Crockett. *Hybrid courses across the curriculum: what works and what doesn't*. ACMS 21<sup>st</sup> Biennial Conference Proceedings. (2017).

R. Botts, L. Carter and C. Crockett. *Blended Learning in a Quantitative Literacy Course*. Primus. *In Press*.

T.R. Borgogna, J.-L. Borgogna, J. A. Mielke, C. J. Brown, E. M. Top, R. T. Botts, D. E. Cummings. High Diversity of CTX-M Extended-Spectrum  $\beta$ -Lactamases in Municipal Wastewater and Urban Wetlands. *Microbial Drug Resistance* ahead of print. doi:10.1089/mdr.2015.0197 (2015).

L. Carter, R. Botts and C. Crockett. *Computational Science Programs: the Background Research*. Proceedings of FIE 2013. *Frontiers in Education* (2013).

R. Botts, Ale Jan Homburg, and Todd R. Young. *The Hopf Bifurcation with Bounded Noise*. *Discrete Cont. Dynam. Systems - A*. 32: 2997-3007 (2012).

M d'Avezac, R. Botts, M. J. Mohlenkamp, and A. Zunger. *Learning to Predict Physical Properties using Sums of Separable Functions*. *SIAM Journal on Scientific Computing* Vol. 33(6): 3381-3401 (2011).

R. Botts and L. Carter. *Lessons Learned: A Journey in Computational Science*. ACMS 18<sup>th</sup> Biennial Conference Proceedings. (2011).

R. Botts. *The Learning and Analysis of Regulatory Networks Using Sums of Separable Functions*. Ohio University Libraries (2010).

## **Presentations:**

L. Ustick, R. Botts, Z. Lindsey, K. Petersen, E. Top, C. Brown, D. Cummings. *Characterizing the need for standardized nomenclature of plasmid backbone genes*. ASM Microbe Conference, New Orleans, LA June 2017.

R. Botts, L. Ustick, C. Catileja, V. Guzman, S. Hall, J. Henderson, Z. Lindsey, C. Walters, R. Platz, S. Pyle, C. Brown, E. Top, D. Cummings. *Four new CTX-M plasmids captured from urban wetlands along the US-Mexico border*. ASM Microbe Conference, New Orleans, LA June 2017.

R. Botts, L. Carter, C. Crockett, G. Crow, J. Jimenez, and M. Zack. *Hybrid Classes in Mathematics and Computer Science*. ACMS 19<sup>th</sup> Biennial Conference, Ancaster, ON, Canada June 2015.

R. Botts. *Adventures in Machine Learning with Sums of Separable Functions*. Machine Learning Seminar Series. SPAWAR, San Diego, CA December 2014.

R. Botts. *Antibiotic Resistance in Urban Wetlands and the Bioinformatics Challenges it Presents*. IBEST Seminar Series. Moscow, ID, July 2014.

R. Botts and D. Cummings. *Antibiotic Resistance in Urban Wetlands*. Faculty Scholarship Day Point Loma Nazarene University, San Diego, CA, August 2013.

R. Botts, D. Cummings, J. Fregoso, and T. Borgogna. *Antibiotic Resistance in Urban Wetlands*. University of Idaho, Moscow, ID July 2013.

Botts, R. and Carter, L. *Lessons learned: A Journey in Computational Science*. ACMS Eighteenth Biennial Conference, Santa Barbara, CA, June 2011.

R. Botts, *Regulatory Network Analysis and Approximation Using Tensor Products*. SIAM Regional Conference Pittsburgh, PA, July 2010.

### **Funding**

PLNU Alumni Association. *Sequencing and Genomic Analysis of Novel Colistin Resistance Plasmids Found in Urban Wetlands*. \$2000. R. Botts. Spring 2017.

PLNU RASP Award. Sequencing of Multi-Drug Resistance Plasmids. \$2000. R. Botts. Fall 2016.

PLNU Sabbatical Award. The Analysis and Characterization of Plasmids Carrying Antibiotic Resistance Genes Captured in Urban Wetlands. R. Botts. Fall 2016.

National Institutes of Health (NIH). *Capture and Characterization of Self-Transmissible Plasmids from Urban Wetlands Encoding Clinically Relevant Antibiotic Resistance Genes*. \$237,790. D. E. Cummings, R. T. Botts, and E. M. Top. May 2013 – April 2016.

PLNU Wesleyan Center for 21<sup>st</sup> Century Studies. *Training Undergraduates to Perform Sequence Analysis on Self-Transmissible Plasmids Captured in Urban Wetlands*. \$2000. R. Botts. May 2013.

PLNU Alumni Association. *The Analysis and Characterization of CTX-M Antibiotic Resistance Genes in Urban Wetlands*. \$2000. R. Botts and D. Cummings. May 2013

### **Research Students**

Lindsey, Zac.

Platz, Rachel. *How frequently are ISCR elements recombining to produce novel antibiotic resistant bacteria? 2015-2017.* Poster presented at PLNU honor's conference.

Ustick, Lucas. *Plasmid annotation and visualization pipeline.* 2015-2017. Oral presentation at PLNU honor's conference.

Collins, Brooke. Undergraduate research project. *The identification and annotation of novel plasmids carrying drug resistance genes from urban wetlands.* 2012-2014. Poster presented at PLNU honor's conference.

Borgogna, Joanna. *Diversity, abundance and persistence of antibiotic resistance genes within urban wetlands in San Diego County.* 2013-2014. Poster presented at WCBSURC 2014.

Peterson, Kristen. *Analysis of plasmid survival strategies using machine learning.* 2013-2014. Poster presented at MAA regional meeting.

Booth, Caylor. Undergraduate research project: *Automated image quantification software to assess tumor vascularization.* Interdisciplinary project with Mike Dorrell (Biology), 2011-2013. Poster presented at MAA regional meeting.

McClatchey, Nate. Undergraduate research project: *Image Compression Using Tensor Decomposition.* Co-advised with Jesus Jimenez. 2011-2012. Poster presented at MAA regional meeting.

Levasseur, Tyler. Undergraduate research project: *The Calculus of Variations.* Co-advised with Jesus Jimenez. 2011-2012. Poster presented at MAA regional meeting.

### **Academic Awards**

2009: Ohio University Graduate Assistant Outstanding Teaching Award.

2005-2006: Ohio University Foundation Doctoral Fellowship for a graduate student with an outstanding undergraduate record and other characteristics of distinction.

2005: College of Arts and Sciences Outstanding Teaching Assistant.

2004: Charles A. Denbow Memorial Scholarship for an outstanding first year graduate student.

2003: Charles J. Hanks Award for excellence in mathematics for a Master's student.

### **Other Activities**

August 2017: Zeroing in on Algebra II/Integrated III A Problem Solving Symposium co-presenter. “The Next Class: What Skills are Universities Hoping College Students will Learn. San Diego Math Network Workshop, San Diego, CA.

August 2013: Faculty Scholarship Day Presentation “Antibiotic Resistance in Urban Wetlands.” PLNU, San Diego, CA.

September 2011: The National Academies Pacific Northwest Regional Summer Institute on Undergraduate Education in Biology, Olympia, WA.

July 2011: Technology Integrated Learning Environments Workshop: Fiveweek workshop offered at PLNU, San Diego, CA.

June 2011: Lessons Learned: A Journey in Computational Science. Session talk at ACMS meeting, Santa Barbara, CA.

July 2010: Mini-symposium on Multilinear Computation and Application at SIAM regional conference, Pittsburgh, PA.

April 2008: Research presentation for the Ohio University Board of Trustees followed by Q and A session regarding obstacles in research with the OU Board of Trustees.

April 2008: Member of graduate student panel discussion for undergraduate students considering graduate work at an MAA regional conference in Marietta, OH.

April 2007: Cal State Early Assessment Project: Promote student success on college math entrance exams and effectively place them in courses.

2006-2007: Participant in California Beginning Teacher Support and Assessment Program (BTSA)

2004-2006: Graduate Student Senate Grant Committee Chair: Oversaw the distribution of \$24,000 of grant money annually.

2003-2006: Graduate Student Senate department representative.

### **PLNU Student Presentations**

Samantha Hall, Victoria Guzman\*, Jacob Henderson, Lucas Ustick, Sarah Pyle, and Claudia Castilleja, Celeste Brown, Eva Top, Ryan Botts, and David Cummings. 2017. *Genomic and phenotypic analysis of four novel plasmids encoding CTX-M type extended spectrum Beta-lactamases*. West Coast Biological Sciences Undergraduate Research Conference, Point Loma Nazarene University, Santa Clara, CA. (poster presentation)

L. Ustick, R. Botts, Z. Lindsey, K. Petersen, E. Top, C. Brown, D. Cummings. 2017. *Characterizing the need for standardized nomenclature of plasmid backbone genes*. American Society for Microbiology Microbe Conference, New Orleans, LA. (poster presentation)

presentation)

Conrad, J., J. Paul, and A. Thwing. 2016. *Assessing methods for analyzing MacTel*. Mathematical Association of America Sectional Meeting, Loyola Marymount University, Los Angeles, CA. (poster presentation)

Hall, S. V. Guzman, L. Ustick, C. Virtue, K. Davidson, C. La Chat, C. Brown, E. Top, R. Botts and D. Cummings. 2016. *Novel antibiotic resistance plasmids from the coastal environment*. West Coast Biological Sciences Undergraduate Research Conference, Point Loma Nazarene University, San Diego, CA. (poster presentation)

La Chat, Chip, C. Virtue, J. Walters, K. Davidson, R. Echols, M. Hoenecke, V. Haas, J. Mielke, M. Geiger, E. Top, C. Brown, R. Botts, and D. Cummings. 2015. *Genotypes and conferred phenotypes of four multi-drug resistant plasmids isolated from the natural environment*. West Coast Biological Sciences Undergraduate Research Conference, Point Loma Nazarene University, San Diego, CA. (poster presentation)

Borgogna, T. R. J.-L. Borgogna, J. A. Mielke, C. J. Brown, E. M. Top, R. T. Botts, D. E. Cummings. 2014. *Abundance and Diversity of CTX-M extended-spectrum – lactamases in urban wetlands associated with wastewater treatment plants*. General Meeting of the American Society for Microbiology, Boston, MA. (poster presentation)

Petersen, K., L. Carter, D. Cummings, and R. Botts. 2014. *Plasmid Identification Using Gene Clusters*. Mathematical Association of America Sectional Meeting, Concordia University, Irvine, CA. (poster presentation, won outstanding undergraduate poster)

Borgogna, J.-L., T. Borgogna, L. Carter, R. Botts, and D. Cummings. 2014. *Diversity, abundance, and persistence of antibiotic resistance genes in urban wetlands in San Diego County*. West Coast Biological Sciences Undergraduate Research Conference, Azusa Pacific University, Azusa, CA. (poster presentation)

Collins, B., L. Carter, R. Botts, and D. Cummings. 2014. *The identification and annotation of novel plasmids carrying drug resistance from urban wetlands*. Point Loma Nazarene University Honors Conference, San Diego, CA. (poster presentation)

Frye, W., R. Botts, and D. Cummings. 2014. *Aminoglycoside resistance plasmids in Pseudomonas species isolated from the Tijuana River Estuary*. West Coast Biological Sciences Undergraduate Research Conference, Azusa Pacific University, Azusa, CA. (oral presentation)

Borgogna, T., J.-L. Borgogna, M. Rouffet, R. Botts, and D. Cummings. 2014. *Detection and Quantification of CTX-M Extended-Spectrum  $\beta$ -lactamases in Urban Wetlands and Associated Waste Water Treatment Plants*. West Coast Biological Sciences Undergraduate Research Conference, Azusa Pacific University, Azusa, CA. (oral presentation, won outstanding undergraduate presentation)

Booth, C., L. Carter, M. Dorrell, and R. Botts. 2013. *Applications of Image Processing to Automate Tumor Image Quantification*. Mathematical Association of America Sectional Meeting, University of San Diego, San Diego, CA. (poster presentation)

Levasseur, T., J. Jimenez, R. Botts. 2012. *The Calculus of Variations*. Point Loma Nazarene University Honors Conference, San Diego, CA. (poster)

McClatchey, N., J. Jimenez, R. Botts. 2012. *Image Compression Using Tensor Decomposition*. Point Loma Nazarene University Honors Conference, San Diego, CA. (poster)

### **Research Student Mentoring:**

2017: Zac Lindsey, Mariele Lensink, TJ Wiegman  
2016: Zac Lindsey, Rachel Platz, Lucas Ustick  
2015: Carly Boyd, Rachel Platz, Katie Kittridge, Katelyn Ortiz  
2014: J. J. Paul, Carly Boyd (part time)  
2013: Brooke Appfel, Kristen Petersen  
2012: Caylor Booth  
2011: Caylor Booth

### **Honors Scholars:**

2017-2018: Zac Lindsey, Jeremy Martinez, Jordan Silva (Co-advisor), Taylor Steele (Co-advisor)  
2016-2017: Rachel Platz, Lucas Ustick  
2015-2016: Carly Boyd, Joey Conrad (Co-advisor), JJ Paul (Co-advisor), Annie Thwing (Co-advisor)  
2013-2014: Brooke Appfel, Joanna Fregoso, Kristen Petersen  
2012-2013: Caylor Booth  
2011-2012: Tyler Levasseur (Co-advisor), Nate McClatchey (Co-advisor)

### **Service to the University**

AY2016-2017:

- Honor's project advisor: Rachel Platz, Lucas Ustick
- Honor's committee member: Ellen Asselin
- New faculty mentor
- IAC committee. Member
- Faculty honor guard

AY2015-2016:

- Honor's project advisor: Carly Boyd, Joey Conrad, JJ Paul, Annie Thwing
- Honor's committee member: Kathryn Carlton

- Men's club volleyball advisor
- Department Preview Days representative
- Department website coordinator
- IAC committee. Member
- MAT Thesis Panel member: Lauren Brashears 1/21/2016
- Faculty honor guard

AY2014-2015:

- Honor's committee member: Nicholas McMahon, Hannah Quinn, Dylan Poorboy, Melody Axtell
- Men's club volleyball advisor
- Student Mentor through spiritual development
- Department Preview Days representative
- Department website coordinator
- Pre-health interviews
- Faculty honor guard
- Science Honor's Weekend planning and implementation
- Campus Air Conditioning working group
- IAC committee member

AY2013-2014:

- Honor's project advisor: Brooke Appfel, Joanna Fregoso, Kristen Petersen
- Honor's committee member: Eduardo Alvarez, Will Frye, Taylor Davis, Timothy Borgogna
- Men's club volleyball advisor
- Northrop Grumman 2 day Excel course for PLNU, with Carl Hammond.
- Faculty to Faculty Canvas Training workshop volunteer for faculty at PLNU
- FYE Small group facilitator
- Department Preview Days representative
- Department website coordinator
- Pre-health interviews
- Faculty honor guard
- Science Honor's Weekend planning and implementation

AY2012-2013:

- Honor's project advisor: Caylor Booth
- Honor's committee member: Doug Zuill
- Master's thesis committee member PLNU, statistics consulting: Patricia Evans
- Faculty Development Committee Member
- Learning Management System Working Group, member
- Men's club volleyball advisor
- Department Preview Days representative
- Department website coordinator



- Volunteer Lecturer for College Bound at PLNU
- Pre-health interviews
- Faculty honor guard
- Science Honor's Weekend planning and implementation AY 2011-2012.
- Department Preview Days representative
- Department website coordinator
- Enrollment Management Committee member
- Dorm Discussion Group Leader on "The Immortal Life of Henrietta Lacks."
- Faculty honor guard
- Science Honor's Weekend planning and implementation
- Participation in Facelift, a one day community service project, PLNU involvement coordinated by Kevin Modesto.

AY 2010-2011:

- Honor's project advisor: Tyler Levasseur, Nate McClatchey
- Master's thesis committee member PLNU, statistics consulting: Danielle Dwyer
- Planning and leadership of PLNU/SPAWAR joint program "Girls Day Out" in October 2010
- Faculty honor guard
- Science Honor's Weekend planning and implementation
- Participation in Facelift, a one day community service project, PLNU involvement coordinated by Kevin Modesto

### **Teaching Development**

- SoCAL PKAL regional network meeting participation "Broadening Participation and Persistence in College STEM: Equity, Diversity and Inclusion" UCSD, San Diego, CA March 2017.
- *Rohr Science Faculty Learning Community*. PLNU, San Diego, CA 2011-Current.
- *Raise Your Students' Grades Luncheon: Sandra McGuire*. PLNU, San Diego, CA Oct. 2014.
- *Sloan-C Student Satisfaction: Flipped Learning Online*. Online. Oct. 4-11, 2013.
- *Sloan-C New to Online: The Quality Matters Rubric*. Online. June 21-28, 2013.
- *Sloan-C Blended Learning Mastery Series*. Online. Aug. 16- Oct 25, 2013.
- *The Art of Changing the Brain*. CTL PLNU, San Diego, CA Aug. 2013.
- *Team Based Learning*. PLNU, San Diego, CA Aug. 2012.
- *I Want to Be Just Whelmed*. CTL PLNU, San Diego, CA Aug 2011
- *The National Academies Summer Institute on Undergraduate Education in Biology in Olympia, WA* Sep. 7-11, 2011.
- *Technology Integrated Learning Environment (TILE)*. PLNU, San Diego, CA Aug. 2011.
- *Student Engagement Techniques*. CTL PLNU, San Diego, CA Aug. 2011.

- *New Faculty Seminar on Student Engagement.* CTL PLNU San Diego, CA Nov. 2010.
- *Classroom Assessment Techniques.* CTL PLNU, San Diego, CA Oct. 2010.
- *Creating a Community in Your Classroom.* CTL PLNU San Diego, CA Aug. 2010.

**Courses Taught**

MTH123	Pre-Calculus Mathematics
MTH133	Pre-Calculus for the Sciences
MTH164/121	Calculus I/Modeling Lab
MTH203	Introduction to Statistics
MTH213	Fundamentals of Elementary Mathematics I
MTH223	Fundamentals of Elementary Mathematics II
MTH233	Linear Algebra
MTH242	Number Theory
MTH303	Problem Solving
MTH333	Differential Equations
MTH362	Calculus Based Statistics
MTH363	Calculus Based Statistics with R
MTH373	Mathematical Modeling
MTH424	Real Analysis
MTH491	Independent Study in Mathematics/Statistics
MTH492	Special Topics in Mathematics
CSC311	MATLAB
CSC311	R
CSC/ISS/MTH496	Service Learning I
CSC/ISS/MTH497	Service Learning II

**Service To Community**

West Coast Biological Sciences Undergraduate Research Conference oral presentation co-chair and poster session judging coordinator. San Diego, CA April 2016.

Mathematical Association of America Sectional Meeting poster presentation judge. Los Angeles, CA April 2016.

Mathematical Association of America Sectional Meeting poster presentation judge. San Diego, CA April 2015.

Mathematical Association of America Sectional Meeting poster presentation judge. Irvine, CA January 2014.

California Basic Educational Skills Test Reading and Mathematics Item Review Conference. Development and analysis of CBEST test items. Evaluations Systems (Pearson) Sacramento, CA September 2013.

Project Kaleidoscope (PKAL) conference planning committee for “Transforming STEM Education: Inquiry, Innovation, Inclusion, and Evidence” San Diego, CA 2012.

Mathematical Association of America Sectional Meeting poster presentation judge.  
San Diego, CA January 2013.

Textbook review of *The Basic Practice of Statistics*, D. Moore. Fall 2013.

Textbook review of *Precalculus: A Prelude to Calculus*, S. Axler. Fall 2012.

### **Conferences**

- First Annual SSC Pacific Workshop on Naval Applications of Machine Learning 2017
- SIAM/AMS/MAA Joint Mathematics Meeting in Seattle, WA January 2016.
- ACMS (Association of Christians in the Mathematical Sciences) meeting Ancaster, ON Canada June 2015.
- SIAM/AMS/MAA Joint Mathematics Meeting in Houston, TX January 2015.
- SIAM/AMS/MAA Joint Mathematics Meeting in Baltimore, MD January 2014.
- ACMS (Association of Christians in the Mathematical Sciences) meeting Santa Barbara, CA June 2011.
- GLBIO (Great Lakes Bioinformatics Conference) with sessions on bioinformatics education at Athens, OH May 2-4, 2011.
- OCCBIO (Ohio Collaborative Conference on Bioinformatics), with sessions on bioinformatics curriculum and education at Cleveland, OH, July 2009.
- SIAM/AMS/MAA Joint Mathematics Meeting in San Francisco, CA January 2010.
- SIAM (Society for Industrial and Applied Mathematics) Annual Conference in Pittsburgh, PA, July 2010.

### **Professional Memberships**

Society for Industrial and Applied Mathematics (SIAM) since 2009.

International Society for Computational Biology (ISCB) since 2010.

Association of Christians in the Mathematical Sciences (ACMS) since 2010.