Zhuolin Qu

Curriculum Vitae

Tulane University
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Research Interests

Mathematical and Computational Epidemiology, Infectious Diseases Modeling, Population Dynamics, Numerical Methods for Nonlinear PDEs, Scientific Computing, Uncertainty Quantification

Education

2011–2016 **Doctor of Philosophy, Applied Mathematics**, *Tulane University*.
Advisor: Alexander Kurganov
Thesis: Fast Operator Splitting Methods for Nonlinear PDEs

2012–2016 **Master of Science, Statistics**, *Tulane University*.
Advisor: Michelle Lacey

2007–2011 **Bachelor of Science, Mathematics and Computational Science**, *University of Science and Technology of China*.
Advisor: Mengping Zhang

Academic Experience

2016–present **Postdoctoral Fellow**, *Tulane University*, Mentor: James (Mac) Hyman.

2017–2019 (Summer) **Visiting Scholar**, *Los Alamos National Laboratory*.
Theoretical Biology and Biophysics (T-6), Host: Benjamin McMahon

2015 **Summer Intern**, *Los Alamos National Laboratory*.
Computational Earth Science (EES-16), Mentor: Carl Gable, Nataliia Makedonska

2012, 2013 (Summer) **Visiting Fellow**, *Shanghai Jiao Tong University, China*.
Institute of Natural Sciences

2010 **Summer Intern**, *Pohang University of Science and Technology, Korea*.
Combinatorial and Computational Mathematics Centre, Mentor: Kwang Ik Kim.

Publications and Preprints (*authors in alphabetical order)

Published

- **Qu, Zhuolin** and Hyman, J. M. Generating a Hierarchy of Reduced Models for a System of Differential Equations Modeling the Spread of *Wolbachia* in Mosquitoes. *SIAM Journal on Applied Mathematics*, 2019, 79(5):1675-1699.
- **Qu, Zhuolin**, Xue, L., and Hyman, J. M. Modeling the Transmission of *Wolbachia* in Mosquitoes for Controlling Mosquito-Borne Diseases. *SIAM Journal on Applied Mathematics*, 2018, 78(2):826–852.
- Thongsripong, P., **Qu, Zhuolin**, Hyman, J. M., and Wesson, D. Quantification of Mosquito Biting Rates Using Surveys and their Implication in Determining Dengue Viral Transmission Risk in the Greater New Orleans Region. In *The American Journal of Tropical Medicine and Hygiene*, 2018, 99(4)
- Cheng, Y. Z., Kurganov, A., **Qu, Zhuolin***, and Tang, T. Fast and Stable Explicit Operator Splitting Methods for Phase-field Models. *Journal of Computational Physics*, 2015, 303:45-65.

- Kao, C. Y., Kurganov, A., **Qu, Zhuolin***, and Wang, Y. A Fast Explicit Operator Splitting Method for Modified Buckley-Leverett Equations. *Journal of Scientific Computing*, 2015, 64(3):837-857.
- Chertock, A., Kurganov, A., **Qu, Zhuolin***, and Wu, T. Three-Layer Approximation of Two-Layer Shallow Water Equations. *Mathematical Modelling and Analysis*, 2013, 18(5):675-693.

Under Review

- Thongsripong, P., **Qu, Zhuolin**, Yukich, J., Hyman J. M., and Wesson, D. Quantification of Human-mosquito Contact Rate Using Surveys and its Application in Determining Dengue Viral Transmission Risk.
  Submitted to PLOS Neglected Tropical Diseases
- Azizi, A., **Qu, Zhuolin**, Lewis, B., and Hyman, J. M. Generating a Heterosexual Bipartite Network Embedded in Social Network.
  Submitted to Computational Social Networks
- Azizi, A., Dewar, J., **Qu, Zhuolin**, and Hyman, J. M. Using an Agent-based Sexual-network Model to Guide Mitigation Efforts for Controlling Chlamydia.
  Submitted to Sexually Transmitted Infections
- Kurganov, A., Rozanova, O. S., **Qu, Zhuolin***, and Wu, T. Adaptive Moving Mesh Central-Upwind Schemes for Hyperbolic System of PDEs. Applications to Compressible Euler Equations and Granular Hydrodynamics.
  Submitted to Communications on Applied Mathematics and Computation

Papers in Preparation (drafts available on request)

- **Qu, Zhuolin**, Azizi, A., Schmidt, N., Craig-Kuh, M. C., Stoecker, C., Hyman, J. M., and Kissinger, P. Network Modeling the Impact of Community-based Male-screening on the Chlamydia Trachomatis Prevalence in Women.
  To be submitted to The Lancet Infectious Disease by November 2019
- **Qu, Zhuolin**, Gulbudak, H., Hyman, J. M., and Milner, F. Sensitivity Analysis in a Vector-Host Immuno-Epidemiological Model with Application to Rift Valley Fever
- **Qu, Zhuolin**, McMahon, B. H., and Hyman, J. M. Modeling the Comorbidities Impacting the Spread of Invasive Non-typhi Salmonella
- Kurganov, A., **Qu, Zhuolin***, and Wu, T. Well-Balanced Adaptive Moving Mesh Central-Upwind Schemes for the Saint-Venant Systems of Shallow Water Equations

Grants and Awards

Grant Submitted

2019 **NSF/MPS/DMS/Mathematical Biology**, *"Spatial Models for Enhancing the Effectiveness of Wolbachia to Control the Spread of Mosquito-borne Diseases"*.
Role: PI, collaboration with Co-PI James (Mac) Hyman at Tulane, in review

Honors and Awards

2017–2019 **Postdoctoral Fellow Travel Fund**, *Tulane University*.

2017 **Health Sciences Research Days Award for Excellence in Research and Presentation by a Postdoctoral Fellow**, *Tulane University*.
Evaluated by a panel of judges in health science among nearly 200 presentations

2015–2019 **Travel Awards**, *Awarded 15 competitive grants for travel to conferences and workshops.*

2012–2015 **Summer Research Fellowship**, *Tulane University.*

Conference and Talks

Invited Talks

- **SIAM Texas-Louisiana Sectional Meeting**, Mini-symposium talk, Southern Methodist University, 11/2019
- **Mathematics and Statistics Colloquium**, Georgia State University, 10/2019
- **Population Health Science Seminar**, School of Public Health, Georgia State University, 10/2019
- **Seventh International Conference on Mathematical Modeling and Analysis of Populations in Biological Systems (ICMA VII)**, Mini-symposium talk, Arizona State University, 10/2019
- **Biostatistics Colloquium**, Louisiana State University Health Sciences Center, New Orleans, 10/2019
- **Epidemiology Seminar**, School of Public Health and Tropical Medicine, Tulane University, 09/2019
- **Fifth International Conference on Computational and Mathematical Population Dynamics (CMPD5)**, Mini-symposium talk, Fort Lauderdale, 05/2019
- **Mathematics Colloquium**, University of Louisiana at Lafayette, 10/2018
- **Los Alamos National Laboratory**, Brown bag meeting on disease transmission modeling and surveillance, Seminar talk, 07/2018
- **42nd SIAM SEAS Sectional Conference**, Mini-symposium talk, UNC Chapel Hill, 03/2018
- **Mathematical Biology Center**, Guangzhou University, Seminar talk, 11/2017
- **Mathematics and Science College**, Shanghai Normal University, Seminar talk, 11/2017
- **Tropical Medicine Seminar**, School of Public Health and Tropical Medicine, Tulane, 09/2017
- **Los Alamos National Laboratory**, Center for Nonlinear Studies, Seminar talk, 08/2017
- **Georgia State University**, Guest lecture, "How Mathematical Models are helping Guide Mitigation Efforts to Control Epidemics", 05/2017
- **Graduate Student Colloquium**, Tulane Mathematics Department, 09/2015
- **Los Alamos National Laboratory**, SFT Brown Bag Seminar, 08/2015
- **The Ninth IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena**, Mini-symposium talk, 04/2015
- **Applied Mathematics Seminar**, Tulane Mathematics Department, 04/2014

Contributed Talks

- **Scientific Computing around Louisiana**, Tulane University, 02/2019
- **Biomathematics and Ecology: Education and Research**, Arizona State University, 10/2018

- **SIAM Annual Meeting 2018**, Portland, OR, 07/2018
- **Scientific Computing around Louisiana**, Louisiana State University, 02/2018
- **SIAM Annual Meeting 2017**, Pittsburgh, PA, 07/2017
- **Scientific Computing around Louisiana**, Tulane University, 03/2017

Posters

- **SAMSI workshop on Model Uncertainty: Mathematical and Statistical**, Duke University, 08/2018
- **MBI Emphasis Workshop on Multiscale Dynamics of Infections**, Ohio State University, 04/2018
- **NIH-MIDAS Network Meeting**, 04/2018
- **29th Annual Health Sciences Research Days**, Tulane University, 02/2018
- **SMB Annual Meeting 2017**, 07/2017
- **NIH-MIDAS Network Meeting**, 05/2017
- **SIAM Conference on Computational Science and Engineering**, 03/2017
- **28th Annual Health Sciences Research Days**, Tulane University, 02/2017
- **KI-Net: Collective Dynamics in Biological and Social Systems**, 11/2015
- **Los Alamos National Laboratory**, Student Symposium: "Championing Scientific Careers", 08/2015
- **Scientific Computing Around Louisiana**, Tulane University, 03/2015

Workshops Conferences

- **Workshop on Modeling the Spread of Infectious Diseases**, Tulane University, 02/2019
- **NIMBioS Tutorial: Network Modeling**, University of Tennessee, 02/2019
- **Joint Research Conference on Statistics in Quality, Industry, and Technology**, Santa Fe, 06/2018
- **9th Annual Summer Institute in Statistics and Modeling in Infectious Diseases**, University of Washington, 07/2017
- **NIMBioS Tutorial: Uncertainty Quantification for Biological Models**, 06/2017
- **SAMSI Summer School on Optimization**, 08/2016
- **KI-Net Conference** on Modern Perspectives in Applied Mathematics: Theory and Numerics of PDEs, 04/2014

Service

Journal Referee: Journal of Biological Dynamics, PLoS ONE, Journal of Theoretical Biology, Mathematical Biosciences, Letters in Biomathematics, Journal of Biological Systems

Organizer: New Orleans workshop on Modeling the Spread of Infectious Diseases, Tulane University, Spring 2019

Co-organizer: Clifford Lectures, Tulane University, 2017

Committee

- Graduate Oral exam and Dissertation Defense comittee, Li Guan, Department of Mathematics, Tulane University, Spring 2018
- Prospectus Defense comittee, Christian Geneus, Department of Biostatistics, Tulane University, Spring 2019

- Undergraduate Honors Thesis Prospectus, Rhea Kataria, Department of Mathematics, Tulane University, Fall 2019

Media Coverage
- **Math Horizons**, Evelyn J. Lamb, "Fighting an Epidemic with an Epidemic", *Math Horizons*, 2019, 26:4, 22-23, DOI: 10.1080/10724117.2019.1574148
- **Forbes Magazine**, Innovation-Science, "Math-Based Mosquito Control To Prevent Human Diseases", January 14th, 2019
- **Los Alamos Monitor**, "Solving epidemics with math", October 10th, 2018
- **The Times-Picayune**, "Tulane researchers use math to contain the spread of mosquito-borne illnesses", August 30th, 2018
- **SIAM News**, Research Nugget on "Sustained bacterial outbreak in mosquitoes limits spread of life-threatening diseases", March 20th, 2018

Poster Judge: School of Science and Engineering Research Day, Tulane University, 2018, 2019

Newcomb Fellow: Newcomb College Institute, 2016–present, voluntary association of faculty from all undergraduate colleges to support women's leadership/gender equity and foster faculty-student interaction and research

Teaching Experience

Instructor of Record
- MATH 758: Scientific Computation III (graduate), Spring 2018, Spring 2019
- MATH 221: Calculus III, Fall 2016
- MATH 122: Calculus II, Fall 2013
- MATH 116: Long Calculus II, Spring 2014

Teaching Assistant
- MATH 309/609: Linear Algebra, Fall 2012, Spring 2013
- MATH 224: Introduction to Applied Mathematics, Spring – Fall 2012, Spring 2015
- MATH 131: Consolidated Calculus, Fall 2014
- MATH 221: Calculus III, Spring 2012
- MATH 122: Calculus II, Spring 2016
- MATH 121: Calculus I, Fall 2011, Fall 2015

Guest Teaching Lectures
- MATH 732: Applied Mathematics II (graduate), Spring 2017
- MATH 635: Optimization (graduate), Fall 2018
- MATH 424/624: Ordinary Differential Equation, Fall 2016

Workshop: "Ready, Prep, Teach!", The Center for Engaged Learning and Teaching (CELT), Tulane University, Spring 2019

Mentoring Experience

Doctoral Dissertation
- Assist in mentoring doctoral dissertation, Mathematics student, on modeling epidemics with distribution parameters, committee member for Dissertation defense (Tulane, 2017-2019)
- Assist in mentoring doctoral dissertation, Biostatistics student, on characterizing the spread of epidemics over networks (Tulane, 2018-2019)
- Assist in mentoring doctoral dissertation, Public Health student, on quantifying human-mosquito contact rate, manuscript submitted. (Tulane, 2017-2018)

Master Thesis
- Assist in mentoring master thesis project, Computational Science student, on modeling chikungunya disease and quantifying model uncertainty (Tulane, 2018-2019)

Honor Thesis
- Assist in mentoring undergraduate honor thesis, Neuroscience student, on modeling Tuberculosis progression with treatment, Senior Scholar Award for undergraduate (Tulane, 2018-2019)
- Assist in mentoring undergraduate honor thesis, Mathematics student, on characterizing the stochastic spread of epidemics over networks (Tulane, 2018-2019)
- Assist in mentoring undergraduate project, Mathematics student, on modeling the Chagas disease in the New Orleans area and estimating human risk. (Tulane, 2018-2019)

Committee Mentoring committee member for Society of Mathematical Biology mentoring program at the annual meeting 2017

Computer Skills

Script Matlab, Octave, Fortran, Mathematica, C, R, Python, Maple, MySQL, NetLogo

Software Latex, Git, Vim, Inkscape, Gephi, ParaView, Adobe Illustrator, Origin

Other MPI, PETSc, LaGriT, PFLOTRAN