Alexandria Volkening

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Interests: Applied dynamical systems (collective behavior, pattern formation, complex systems), agent-based and data-driven modeling, PDEs, stochastic processes, math in biology and social science

Professional Appointments:

2019 Jul. –	NSF-Simons Fellow • NSF-Simons Center for Quantitative Biology	Northwestern University
2017 Jun. – 2019 Jul.	Postdoctoral Fellow • Mathematical Biosciences Institute	Ohio State University

Education:

2017 May	Ph.D., Applied Mathematics • Advisor: Björn Sandstede • Thesis: Modeling pattern formation on zebrafish	Brown University
2012 May	M.S., Applied Mathematics	Brown University
2011 May	B.S., Mathematics • Summa cum laude, Honors in math, Meyerhoff Scholar Affiliate	UMBC

Publications:

[4] Y Chen, J Gemmer, M Silber, A Volkening. *Noise-induced tipping under periodic forcing: Preferred tipping phase in a non-adiabatic forcing regime.* Chaos, 29 (4), 2019.

[3] A Volkening, B Sandstede. *Iridophores as a source of robustness in zebrafish stripes and variability in Danio patterns.* Nature Communications, 9 (3231), 2018.

[2] A Volkening, B Sandstede. *Modelling stripe formation in zebrafish: an agent-based approach*. Journal of the Royal Society Interface, 12 (112), 2015.

[1] JL Gevertz, Z Aminzare, KA Norton, J Pérez-Velázquez, A Volkening, KA Rejniak. *Emergence of anti-cancer drug resistance: exploring the importance of the microenvironmental niche via a spatial model*, in "Applications of Dynamical Systems in Biology and Medicine", Springer, 2015: 1–34.

Preprints*:

- A Volkening, DF Linder, MA Porter, GA Rempala. *Forecasting elections using compartmental models of infection.* arXiv:1811.01831. In review.
- J Abrams†, A Schwartz†, V Ciocanel, A Volkening, B Sandstede. *Influenza spread on context-specific social networks*. In revision.

In preparation:

- A Volkening, M Abbott†, D Catey† , N Chandra† , B Dubois† , F Lim† , B Sandstede. *Reconciling stripe formation on the body and fins of zebrafish.* Draft available upon request.
- M McGuirl, B Sandstede, A Volkening. *Quantifying fish patterns: a TDA study of variability & robustness.*

* Preprints posted at: `alexandriavolkening.com` † denotes undergraduate students

Public Science Articles:

2018	A Volkening. "How the zebrafish got its stripes" in The Conversation (September 17, 2018)

Press:

2018	Publication [3] in Ohio State News (reproduced in sources including Science Daily and Phys.org)
2015	Publication [2] in Brown News, Fusion News, Science Daily, and Futurity and selected as cover image for Interface, Volume 12 (113)

Selected Awards:

2019	2nd Place Flash Talk, Statewide User Group Conference, Ohio Supercomputer Center
2017	Stella Dafermos Award, Division of Applied Mathematics, Brown University
2017	Graduate Speaker, Doctoral Commencement Ceremony, Brown University
2011 – 2015	National Science Foundation Graduate Research Fellowship
2011	Valedictorian, University of Maryland Baltimore County (UMBC)
2011	Phi Beta Kappa Honors Society
2011	UMBC Outstanding Senior in Mathematics
2010	UMBC Outstanding Teaching Assistant in Mathematics

Recent Travel & Collaboration Grants (> 20 received):

- *Collaborate@ICERM Award*
  - Collaborative proposal "Mathematical models of pedestrian movement in large lecture halls" 2020 Jun.
- *AWM-NSF Travel Grant*
  - \$2300 to participate in the SIAM Conf. on Applications of Dynamical Systems 2019 May
- *Institut Mittag-Leffler Fellowship*
  - \$1526 to participate in the Mathematical Biology emphasis semester 2018 Oct.
- *US Junior Oberwolfach Fellowship*
  - \$1000 to participate in the Workshop on Diff. Eqns. arising from Organizing Principles in Bio 2018 Sep.
- *SIAM Early Career Travel Award*
  - \$650 to participate in the SIAM Conf. on Applications of Dynamical Systems 2019 May
  - \$650 to participate in the SIAM Conf. on the Life Sciences 2018 Aug.
- *European Society for Mathematical Biology Travel Grant*
  - 300€ to participate in the European Conf. on Mathematical and Theoretical Biology 2018 Jul.

Invited Talks:

- *Quantifying zebrafish pattern variability and model robustness*
  - University of Notre Dame Applied Math Seminar, Notre Dame, IN (upcoming) 2019 Sep.
  - BIRS Workshop: Bridging Cell. & Tissue Dyn. from Normal Dev. to Cancer, Banff, Alberta* 2019 Jun.
- *Forecasting U.S. elections with compartmental models*
  - Minisymposium, SIAM Conf. on Applications of Dyn. Systems, Snowbird, UT 2019 May
  - Case Western Reserve University Applied Math Seminar, Cleveland, OH 2019 Mar.
  - MBI Workshop on Modeling & Analysis of Dynamic Social Networks, Columbus, OH 2018 Oct.
- *Modeling stripe and mutated pattern formation on the skin of zebrafish*
  - UC Irvine Special Math Colloquium/Biophysics & Systems Biology Seminar, Irvine, CA 2019 Feb.
  - 1010 Workshop on Mathematical Biology, Institut Mittag-Leffler, Djursholm, Sweden 2018 Oct.
- *Modeling pattern formation on the skin of zebrafish*
  - University of North Carolina at Chapel Hill Special Seminar, Chapel Hill, NC 2019 Feb.

* Presentation recording at: www.birs.ca/events/2019/5-day-workshops/19w5080/videos/watch/201906190901-Volkening.html

- New Frontiers in Pattern Formation Workshop, Cardiff, UK (online) 2018 Dec.
- Seminar, Max Planck Institute for Developmental Biology, Tübingen, Germany 2018 Oct.
- University of Bath Centre for Mathematical Biology Seminar, Bath, UK 2018 Feb.
- Group Meeting, University of Oxford Wolfson Centre for Math Biology, Oxford, UK 2018 Feb.

• *Modeling pattern formation and complex systems in biology and social science*
- Boston University Dynamical Systems Seminar, Boston, MA 2019 Jan.

• *Modeling and analysis of agent-based dynamics: an overview*
- Joint Mathematics Meetings, Baltimore, MD 2019 Jan.

• *Linking pigment cell interactions to fish skin patterns*
- Seminar, NSF-Simons Center for Quantitative Biology, Evanston, IL 2019 Jan.

• *Robustness and variability in zebrafish patterns*
- Leiden University Informal Analysis Seminar, Leiden, Netherlands 2018 Oct.

• *Modeling political opinions to forecast U.S. elections*
- Seminar, Ohio Wesleyan University, Delaware, OH 2018 Sep.

• *Modeling agent interactions: zebrafish, neurons, and political elections*
- Ohio Wesleyan University Science Lecture Series, Delaware, OH 2018 Sep.

• *Agent-based models of cellular self-organization*
- BIRS Workshop: Mathematics of the Cell, Banff, Alberta* 2018 Aug.

• *Linking altered cell interactions to mutated skin patterns on zebrafish*
- Minisymposium, SIAM Conf. on the Life Sciences, Minneapolis, MN 2018 Aug.

• *Agent-based models of pattern formation on the skin of zebrafish*
- Minisymposium, European Conf. on Math. & Theor. Biology, Lisbon, Portugal 2018 Jul.

• *Modeling and analysis of agent-based dynamics in biological applications*
- Minisymposium, AMS Spring Central Sectional Meeting, Columbus, OH 2018 Mar.

• *Agent-based models of pattern formation on zebrafish*
- University of Surrey Mathematics of Life & Social Sciences Seminar, Surrey, UK 2018 Feb.
- MIT Numerical Methods for PDEs Seminar, Cambridge, MA 2017 Mar.
- Seminar, Harvard School of Engineering & Applied Sciences, Cambridge, MA 2017 Jan.
- Penn State Theoretical Biology Seminar, State College, PA 2016 Nov.

• *Agent-based and continuum models for stripe formation on the fins of zebrafish*
- Minisymposium, SIAM Conf. on Analysis of PDEs, Baltimore, MD 2017 Dec.

• *How the zebrafish got its stripes*
- College of Wooster Bio/Physics Colloquium, Wooster, OH 2017 Oct.

• *Stripe formation on zebrafish fins*
- Minisymposium, SIAM Conf. on Applications of Dynamical Systems, Snowbird, UT 2017 May
  - Described in the SIAM News Blog on May 26, 2017

• *Modeling stripe formation on zebrafish/Agent-based models of stripe formation on zebrafish*
- Minisymposium, SIAM Conf. on Nonlin. Waves & Coherent Structures, Philadelphia, PA 2016 Aug.
- Minisymposium, SIAM Conf. on Applications of Dynamical Systems, Snowbird, UT 2016 May
- Minisymposium, SIAM Conf. on the Life Sciences, Boston, MA 2016 Jul.
- Seminar, Max Plank Institute for Developmental Biology, Tübingen, Germany 2015 Apr.

• *Modeling stripe formation in zebrafish: an agent-based approach*
- Minisymposium, SIAM Annual Meeting, Boston, MA 2016 Jul.

• *Agent-based and continuum models for the formation of stripes in zebrafish*
- Minisymposium, SIAM Conf. on Analysis of PDEs, Scottsdale, AZ 2015 Dec.
- Minisymposium, SIAM Conf. on Nonlin. Waves & Coherent Structures, Cambridge, UK 2014 Aug.

* Presentation recording at: www.birs.ca/events/2018/5-day-workshops/18w5126/videos/watch/201808141933-Volkening.html

Local Seminar Talks:

15 talks at Ohio State or Brown, including the MBI Data Analytics Seminar, the OSU TDAI Computational Social Science Brown Bag Series, the OSC Statewide User Group Meeting, and the Brown-BU PDE Seminar

Contributed Talks:

2019 Jul.	Society for Mathematical Biology Annual Meeting, Montreal, Canada
2019 Jan.	Joint Mathematics Meetings, Baltimore, MD
2017 Jul.	SIAM Annual Meeting, Pittsburgh
2017 Mar.	WINRS New England Meeting, Providence, RI
2017 Jan.	Dynamics Days, Silver Spring, MD
2016 Apr.	RPI Applied Math Days, Troy, NY
2015 Jul.	Pattern Formation Workshop, Halifax, Canada

Posters:

2019 Jun.	MBI Summit on the Rules of Life, Columbus, OH
2019 Jun.	BIRS Workshop on Bridging Cell. & Tissue Dyn. from Normal Dev. to Cancer, Banff, Alberta
2019 Apr.	Rising Stars Workshop for Women in Computational & Data Sciences. Austin, TX
2019 Jan.	Dynamics Days, Evanston, IL
2018 Aug.	BIRS Mathematics of the Cell Workshop, Alberta, Canada
2018 Jul.	European Conference on Mathematical & Theoretical Biology, Lisbon, Portugal
2018 Apr.	MBI Emphasis Workshop on Multiscale Dynamics of Infection, Columbus, OH
2018 Apr.	OSU College of Public Health Research Showcase, Columbus, OH
2018 Mar.	MBI Emphasis Workshop on Socioepidemiology, Columbus, OH
2017 Dec.	SIAM Conference on Analysis of PDEs, Baltimore, MD
2017 Aug.	ICERM Workshop on Pedestrian Dynamics, Providence, RI
2017 Jan.	Dynamics Days, Silver Spring, MD
2016 Jun.	Conference on Analysis of PDEs using Dynamical Systems Techniques, Boston, MA
2016 Jan.	Opening Workshop: Isaac Newton Institute Programme on Stoch. Dyn. Systems, Cambridge, UK
2014 May	Stability of Solitary Waves, Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy
2010 Apr.	1st Chesapeake SIAM Student Conference, Baltimore, MD

Public Science & University Talks:

2018 Mar.	*Self-rule on the skin: how the zebrafish gets its stripes*, STEAM Factory, Columbus, OH
2017 May	*Amplified*, Doctoral Address, Brown University, Providence, RI
2011 May	*Valedictorian Address*, UMBC, Baltimore, MD

Interactive Math Engagement Talks:

- *How the zebrafish gets its stripes*
  - Pheasant Run Boys & Girls Club, Reynoldsburg, OH — 2018 Dec.
  - Gables Elementary School (Boys & Girls Club summer program), Columbus, OH — 2018 Jul.
  - Oakmont Elementary School, Columbus, OH — 2018 Jul.
  - Livingston Elementary School, Columbus, OH — 2018 Jul.
- *Simulating random walks within the cell*
  - Young Women's Summer Institute, Ohio Supercomputer Center, Columbus, OH — 2018 Jul.
- *When do small changes matter?*
  - JHU Center for Talented Youth program, Providence, RI — 2016 Dec.
  - STEAM Week, Jewish Community Day School (5th grade), Providence, RI — 2016 Feb.

Teaching Experience:

2019 Spring	Instructor, Linear Algebra & Diff. Eqns. for Engineers, Ohio State University (**Eval.: 4.46/5**)
2015 Summ.	Instructor, Multivariable Calculus, Catalyst Summer Bridge Program, Brown University
2014 Spring	Co-Instructor, Business Math, RI Correctional Facility (Community College of RI Program)
2013 Fall	Co-Instructor, Basic College Math, RI Correctional Facility (Community College of RI Program)
2013 Fall	Teaching Assistant, Methods of Applied Mathematics I, Brown University
2013 Spring	Teaching Assistant, Methods of Applied Mathematics I, Brown University
2011 Spring	Grader, Real Analysis II, UMBC
2010 Fall	Teaching Assistant, Honors Calculus I, UMBC
2009 Fall	Teaching Assistant, Honors Calculus I, UMBC

Academic & Research Advising (24 students):

2019 Summ.	Undergraduate Research Mentor (**5** students), Brown University (remotely)
2016 Summ.	Undergraduate Research Mentor (**8** students), Summer@ICERM Program
2016 – 2017	Mentor (**4** students), Applied Math Grad-Undergrad Mentoring Program, Brown University
2014 – 2016	Primary Faculty Academic Advisor (**4** freshmen & sophomore students), Brown University
2015 Fall	Undergraduate Research Mentor (**1** student), Brown University
2015 Summ.	Undergraduate Research Mentor (**2** students), Brown University REU Program

Education & Diversity Training:

2018	Diversity and Implicit Bias Awareness Certificate, Ohio State University
2018	Multicultural Center Safe Zone Training, Ohio State University
2015 – 2017	LGBTQ Safe Zone Participation, Brown University
2014 – 2016	Sheridan Center Certificate V: Academic Advising Track, Brown University
2014 – 2015	TEAM Collective (advice for advisors of underrepresented students), Brown University

Service (Field):

- *Conference/Workshop Co-organizer*
  - AMS Math Research Community: Agent-Based Modeling in Biological and Social Systems — 2018 Jun.
  - LCDS Workshop on Agent-Based Modeling, Brown University — 2015 Mar.
- *Minisymposium Organizer/Co-organizer*
  - "Dynamics of democracy", SIAM Conf. on Applications of Dynamical Systems — 2019 May
  - "Student & postdoc icebreaker", SIAM Conf. on Applications of Dynamical Systems — 2019 May
  - "Agent-based modeling in the life sciences", SIAM Conf. on the Life Sciences — 2018 Aug.
  - "Analytical and computational advances in mathematical biology across scales", AMS Spring Central Sectional Meeting — 2018 Mar.
  - "PDEs arising from the self-organization of agents", SIAM Conf. on the Analysis of PDEs — 2017 Dec.
  - "Stripe formation on zebrafish: a collection of biological and mathematical perspectives", SIAM Conf. on the Life Sciences — 2016 Jul.
  - "Differential Equations, Probability, & Sea Ice", Joint Math Meetings — 2016 Jan.
  - "The behavior of autonomous agents in diverse applications", SIAM Conf. on Applications of Dynamical Systems — 2015 May
- *Referee* — 2018 –
  - Discrete & Continuous Dyn. Systems B
  - Journal of Mathematical Biology
  - SIAM Journal on Applied Dynamical Systems
  - SIAM Journal on Applied Mathematics
  - IMA Journal of Applied Mathematics
  - PLOS One
  - Royal Society Open Science
  - Zebrafish

- *Volunteer*
  - American Mathematical Society Math Research Community Booth, Joint Math Meetings 2019 Jan.
- *Judge*
  - Poster Session, SIAM Conference on Applications of Dynamical Systems 2019 May
  - MAA Undergraduate Student Poster Session, Joint Math Meetings 2019 Jan.
  - AWM National Essay Contest: Biographies of Contemporary Women in Math 2016 – 2018
- *Mentor*
  - European Conference on Math. & Theor. Biology Mentoring Program (2 students) 2018 Jul.

Service (University):

- *Judge/Reviewer*
  - Hayes Graduate Research Forum (abstracts), Ohio State University 2018 Dec.
  - PDA Travel Award Applications, Ohio State University 2018 Dec.
  - Denman Undergraduate Research Forum (posters), Ohio State University 2018 Apr.
  - Natural & Math. Sciences Undergraduate Research Forum (posters), Ohio State University 2018 Mar.
  - Hack Ohi/o Hackathon (team projects), Ohio State University 2017 Oct.
  - Undergraduate Research Fall Forum (posters), Ohio State University 2017 Sep.
- *Committee Member*
  - Honorary Degree Committee, Brown University 2015 – 2017
  - Department of Public Safety Oversight Committee, Brown University 2015 – 2017
  - Graduate Student Council Finance Board, Brown University 2015 – 2016
  - Graduate Student Council (Representative for Applied Mathematics), Brown University 2014 – 2016
  - Promotion and Tenure Committee (Undergraduate Student Representative), UMBC 2008, 2010

Service (Department):

- *Judge*
  - Mathematical Contest for Modeling, Ohio State University 2017, 2018
  - Brown Mathematical Contest for Modeling, Brown University 2015, 2016
- *Mentor/Group Leader*
  - LaTeXTutorial, MBI Mathematical Biosciences Bootcamp, Ohio State University 2019 Jun.
  - Student Projects, Calculus for the Life Sciences, Ohio State University 2017, 2018
  - Math Biology Group, Applied Math Graduate Student Retreat, Brown University 2016 Sep.
- *President & Lead Founder*
  - SIAM Student Chapter, Brown University 2015 – 2016
    - Co-organized 10 events & grew chapter to over 100 members spanning 8 disciplines
- *Secretary*
  - SIAM Student Chapter, Brown University 2016 – 2017
  - AWM Student Chapter, Brown University 2013 – 2014
- *Panelist*
  - Career Path Panel, MBI Mathematical Biosciences Bootcamp, Ohio State University 2019 Jul.
  - MBI Panel for Sampling Advanced Math for Minority Students, Ohio State University 2017 Jul.
  - Panel on REUs, AWM, Brown University 2016 Oct.
  - Graduate School Panel, AWM & Rose Whelan Society, Brown University 2016 Mar.
- *Organizer/Co-organizer*
  - PostDoc Panel, Brown University 2015 May
  - Alumni Panel: Jobs in Academia & Industry, Brown University 2015 Sep.
  - Bi-annual final exam prep sessions for applied math courses, Brown University 2013 – 2016

Outreach Activities:

2019 Apr.	Judge, Ohio Supercomputer Center SUG Conference (posters), Columbus, OH
2019 Mar.	Judge, High School I/O Hackathon (projects), Columbus, OH
2018 Sep.	Mentor, Metro High School Coding Club, Columbus, OH
2018 Jul.	Panelist, Young Women's Summer Institute Career Night, Ohio Supercomputer Center
2018 –	Member, STEAM Factory, Ohio State University
2014 – 2017	Founding Member, Math CoOp Outreach Program, Brown University
2014	Tutor, Math Resource Center, Brown University
2014 – 2017	Listserv Manager, Rose Whelan Society for Women in Math, Brown University
2013 – 2017	Event Organizer, Rose Whelan Society for Women in Math, Brown University
2011 –	Experienced Resource Person, NSF Graduate Research Fellowship Program
2008 – 2009	Math Support Volunteer, Johnnycake Elementary School, Baltimore, MD

Workshop Participation:

2019 Aug.	ICERM Workshop on Applied Math. Modeling with Topological Techniques, Providence, RI
2019 Jun.	BIRS Workshop on Bridging Cell. & Tissue Dyn. from Normal Dev. to Cancer, Banff, Alberta
2019 May	NIMBioS/DySoC Investigative Workshop: Mathematics of Gun Violence. Knoxville, TN
2019 Apr.	Rising Stars Workshop for Women in Computational & Data Sciences. Austin, TX
2018 Oct.	Program on Mathematical Biology, Institut Mittag-Leffler, Djursholm, Sweden
2018 Sept.	Workshop on Diff. Eqns. arising from Organizing Principles in Biology, Oberwolfach, Germany
2018 Aug.	BIRS Workshop on Math of the Cell: Mech. & Chem. Signaling across Scales, Banff, Alberta
2017 Aug.	ICERM Workshop on Pedestrian Dynamics, Providence, RI
2017 Jul.	SIAM Workshop on Network Science, Pittsburgh, PA
2016 Jan.	Opening Workshop: Isaac Newton Programme on Stoch. Dyn. Systems in Bio, Cambridge, UK
2015 Jun.	AMS Math Research Community on Sea Ice, Diff. Equations, & Probability, Snowbird, UT
2014 Sep.	BU/Keio Workshop on Dynamical Systems, Boston, MA
2014 May	Stability of Solitary Waves, Centro di Ricerca Matematica Ennio De Giorgi, Italy
2013 Sep.	Research Collaboration for Women in Applied Math & Dynamical Systems, Minneapolis, MN

Tech. Skills: AUTO (numerical continuation), HuffPost Pollster API, MATLAB

Memberships:

- American Physical Society (APS)
- American Mathematical Society (AMS)
- Association for Women in Mathematics (AWM)
- Society for Industrial & Applied Mathematics (SIAM)
- Society for Mathematical Biology (SMB)