

# PUNIT GANDHI

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Department of Mathematics and Applied Mathematics  
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## ACADEMIC APPOINTMENTS

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**Virginia Commonwealth University** (VCU), Richmond VA.

Department of Mathematics and Applied Mathematics  
Assistant Professor

2019 - present

## EDUCATION AND POSTDOCTORAL TRAINING

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**Postdoctoral Fellow** 2016 - 2019

Mathematical Biosciences Institute, The Ohio State University.

**Ph.D.** University of California, Berkeley. Physics. May 2016

**B.S.** Cornell University. Applied and Engineering Physics. May 2004

## SCIENTIFIC JOURNAL ARTICLES

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P. Gandhi, Y. Wang. A conceptual framework for modeling a latching mechanism for cell cycle regulation. *Math. Biosci.*, **382** 109396 (2025).

M. V. Ciocanel, P. Gandhi, K. Niklas, A. T. Dawes. Quantifying symmetry transitions in dynamic morphological systems. *Math. Biosci.*, **384**, 109431 (2025).

P. Gandhi, L. Liu, M. Silber. A Pulsed-Precipitation Model of Dryland Vegetation Pattern Formation. *SIAM J. Appl. Dyn. Sys.*, **22**(2), 657–693 (2023).  
-Featured in SIAM News **57**(6), July 2024.

P. Gandhi, M. A. Robert, J. Palacios, D. Chan. Effects of contact tracing and self-reporting in a network disease model. *Lett. Biomath.*, **9**(1), 23–39 (2022).

P. Gandhi, M. V. Ciocanel, K. Niklas, A. T. Dawes. Identification of approximate symmetries in biological development. *Phil. Trans. R. Soc. A*, **379**(2213), 20200273 (2021).  
-Featured in SIAM News **55**(3), April 2022.

P. Gandhi, S. Bonetti, S. Iams, A. Porporato M. Silber. A fast-slow model for banded vegetation pattern formation in drylands. *Physica D*, 132534 (2020).  
-Featured in SIAM News Blog Entry on January 9, 2020.

P. Gandhi, M. Golubitsky, C. Postlethwaite, I. Stewart, Y. Wang. Bifurcations on fully inhomogeneous networks. *SIAM J. Appl. Dyn. Sys.* **19**(1), 366–411 (2020).

P. Gandhi, Y. Zelnik, E. Knobloch. Spatially localized structures in the Gray–Scott model. *Phil. Trans. R. Soc. A* **376**, 20170375 (2018).

P. Gandhi, L. Werner, K. Gowda, S. Iams, M. Silber. A topographic mechanism for arcing

of dryland vegetation bands. *J. R. Soc. Interface* **15**(147), 20180508 (2018).

Y. Zelnik, P. Gandhi, E. Knobloch, E. Meron. Implications of tristability on pattern forming ecosystems. *Chaos* **28**, 033609 (2018).

B. Pradenas, I. Araya, M. G. Clerc, C. Falcón, P. Gandhi, E. Knobloch. Slanted snaking of localized Faraday waves. *Phys. Rev. Fluids* **2**, 064401 (2017).

P. Gandhi, C. Beaume, E. Knobloch. Dynamics of phase slips in systems with time-periodic modulation. *Phys. Rev. E* **92**, 062914 (2015).

P. Gandhi, C. Beaume, E. Knobloch. A new resonance mechanism in the Swift–Hohenberg equation with time-periodic forcing. *SIAM J. Appl. Dyn. Sys.* **14**(2), 860–892 (2015).

-Featured Media Gallery Entry in SIAM DS Web Magazine, July 2015.

P. Gandhi, C. Beaume, E. Knobloch. Localized states in periodically forced systems. *Phys. Rev. Lett.* **114**, 034102 (2015).

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## CONFERENCE PROCEEDINGS AND OTHER SCIENTIFIC PUBLICATIONS

P. Gandhi, S. Iams, S. Bonetti, M. Silber. Vegetation Pattern Formation in Drylands. *Dryland Ecohydrology*. Springer. 2nd Edition (2019).

P. Gandhi, C. Beaume, E. Knobloch. Time-periodic forcing of spatially localized structures. Nonlinear Dynamics: Materials, Theory and Experiments. *Springer Proc. Phys.* **173**, 303–316 (2016).

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## RESEARCH GRANTS

Collaboration Grant for Mathematicians (PI), Simons Foundation, \$42k, 2022–2027.

*Modeling dryland vegetation patterns across timescales.*

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## INVITED PRESENTATIONS

*The impact of rainfall variability on pattern formation in a flow-kick model for dryland vegetation bands* Nov. 11, 2024

Mathematical Biology Seminar, U. Penn., Philadelphia, PA.

*The impact of rainfall variability on pattern formation in a flow-kick model for dryland vegetation bands* Nov. 7, 2024

Research Colloquium, Dept of Math and Econ, VSU, Petersburg, VA.

*Resilience to Environmental Variability in a Flow-kick Model of Dryland Vegetation Pattern Formation* Jun. 24, 2024

SIAM Conference on Coherent Structures and Nonlinear Waves, Baltimore, MD.

*Characterizing morphology transitions in biological systems with approximate symmetry.* Jun. 18, 2024

(virtual) Summer Seminar Series, Society for Mathematical Biology.

*Mathematics of Pattern Formation.* Jun. 7, 2024

(virtual) REU Seminar, VCU, Richmond, VA.

- Conceptual modeling of dryland vegetation patterns across timescales.* Apr. 3, 2024  
Colloquium, Center for Ecological Sciences, Indian Institute of Science, Bangalore, India.
- Conceptual modeling of dryland vegetation patterns across timescales.* Mar. 27, 2024  
MPS Division Research Seminar, Ahmedabad University, Ahmedabad, India.
- Pattern Formation in Biology and Ecology.* Feb. 28, 2024  
Biology Student Seminar, Ahmedabad University, Ahmedabad, India.
- Conceptual modeling of dryland vegetation patterns across timescales.* Nov. 10, 2023  
Biomath Seminar, Duke University, Durham, NC.
- Conceptual modeling of dryland vegetation patterns across timescales.* Jul. 13, 2023  
Dynamical Systems in the Life Sciences Conference, Columbus, OH.
- Conceptual modeling of dryland vegetation patterns across timescales.* Jul. 20, 2023  
Minsymposium, SMB Annual Meeting, Columbus, OH.
- Vegetation Pattern Formation in Drylands: Impacts of Changing Storm Characteristics.* May 17, 2023  
Minsymposium, SIAM Conference on Applied Dynamical Systems, Portland, OR.
- Quantifying asymmetry in biological systems.* Sept. 30, 2022  
Biomath Seminar, VCU, Richmond, VA.
- An entropy-based method for quantifying asymmetry in biological systems.* Jul. 12, 2022  
Minisymposium, SIAM Conference on the Life Sciences, Pittsburgh, PA.
- Response of dryland vegetation bands to stochastic rain pulses.* Apr. 8, 2022  
(virtual) Minisymposium, Joint Mathematics Meetings.
- A Pulsed-Precipitation Model of Banded Vegetation Pattern Formation in Drylands.* Mar. 10, 2022  
(virtual) Dynamical Systems Seminar, Ohio State University, Columbus, OH.
- Quantifying asymmetry in biological systems.* Feb. 18, 2022  
(virtual) Scientific Session, AAAS Annual Meeting.
- Dynamics of dryland vegetation bands on heterogeneous terrain.* May 23, 2021  
(virtual) Minisymposium, SIAM Conference on Applications of Dynamical Systems.
- A fast-slow model of banded pattern formation in drylands.* Apr. 21, 2021  
(virtual) Mathematical Biology Seminar, Virginia Tech., Blacksburg, VA.
- A fast-slow switching model for banded pattern formation in drylands.* Dec. 7, 2020  
(virtual) Mathematical Biology Seminar, University of Iowa, Iowa City, IA.
- Using pattern formation in the presence of spatial heterogeneity to learn about dryland ecosystems.* Dec. 3, 2020  
(virtual) SIAM Student Chapter Lecture, Florida Atlantic University, Boca Raton, FL.
- A fast-slow switching model for banded pattern formation in drylands.* Aug. 10, 2020  
(virtual) SIAM Conference on Mathematics of Planet Earth.
- A fast-slow switching model for banded pattern formation in drylands.* Nov. 1, 2019

Math Department Colloquium, College of William and Mary, Williamsburg, VA.  
*Water transport in models of dryland vegetation patterns.* May 20, 2019  
 Minisymposium, SIAM Conference on Applied Dynamical Systems, Snowbird, UT, USA.  
*Water transport in models of dryland vegetation patterns.* Jan. 18, 2019  
 Minisymposium, Joint Math Meeting, Baltimore, MD.  
*Water transport in models of dryland vegetation patterns.* Sep. 17, 2018  
 Dynamical Systems Seminar, University of Minnesota, MN.  
*Water Transport in Dryland Ecosystems: Shaping Banded Vegetation Patterns.* Jun. 14, 2018  
 Minisymposium, SIAM Conference on Nonlinear Waves and Coherent Structures,  
 Anaheim, CA.  
*Time-periodic forcing of spatially localized structures.* Dec. 1, 2016  
 Science Lecture Series, Ohio Wesleyan University, Delaware, OH.  
*Time-periodic forcing of localized structures.* Dec. 4, 2015  
 Nonlinear Physics Seminar, University of Chile, Santiago, Chile.

## VISITING APPOINTMENTS, WORKING GROUPS, WORKSHOP PROJECTS, SUMMER SCHOOLS AND CONFERENCE MINISYMPOSIA

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IMSI Interdisciplinary Research Cluster, Chicago, IL. August 5-14, 2024  
Project: “Exploring shifts in biogeochemical cycles and mass extinction events through slow-fast dynamical systems”  
 Visiting Researcher, Ahmedabad University, Ahmedabad, India. Feb.-Apr. 2024  
Host: Dr. Jitesh Jhavar, Ecology Cluster, School of Arts and Sciences.  
 IMSI Interdisciplinary Research Cluster, Chicago, IL. June 20-30, 2023  
Project: “Climate Tipping Phenomena in Non-autonomous Paleoecosystems”  
 Mathematics and Climate Research Network Meeting, Portland, OR. May 19-20, 2023  
 Working group participant  
 Joint Mathematics Meetings, Boston, MA. Jan. 4-7, 2023  
 Session organizer: “Kicks, Shocks, Recovery and Resilience: Impulsive Models in Ecology and Socio-Economic Systems”  
 VCU Institute for Sustainable Energy and Environment, Charles City, VA. Nov. 17, 2022  
 Rice Rivers Center Meeting  
 NSF MODULUS Conference, Fairfax, VA. Aug. 8-11, 2022  
 Working group participant  
 SIAM Conference on the Life Sciences, Pittsburgh, PA. Jul. 11-14, 2022  
 Session organizer: “Symmetry, Robustness and Entropy in Living Systems”  
 Joint Mathematics Meetings, virtual. Jan. 6-9, 2021  
 Session organizer: “Recent Advances in Ecological Modeling”  
 Dynamics and data in the COVID-19 pandemic, American Institute of Mathematics, San

Jose, CA. June 22 - July 31, 2020  
Mentor for virtual summer school

SIAM Conference on Applied Dynamical Systems, Snowbird, UT. May 19-23, 2019  
Session organizer: “The influence of network structure and symmetry on dynamics”

Focused Research Group: Frontiers in Nonlinear and Stochastic Modeling of Mass Extinction, Columbus, OH. Mar. 28-29, 2019

Current Topics Workshop: Collective Behavior and Emergent Phenomena in Biology, Columbus, OH. Sep. 10-12, 2018  
Project: “Risk Aversion and Collective Decision Making in Ants”

AMS Mathematics Research Community: Agent Based Modeling in Biological and Social Systems, West Greenwich, RI. Jun. 17-23, 2018  
Project: “Analysis of the Twitter Response to Recent Mass Shootings”

SIAM Conference on Nonlinear Waves and Coherent Structures, Anaheim, CA. Jun. 11-14, 2018  
Session organizer: “Vegetation Patterns: Modeling, Analysis, and Data”

SIAM Conference on Applied Dynamical Systems, Snowbird, UT. May 21-25, 2017  
Session organizer: “Topographic influences on vegetation patterns in semi-arid regions”

## SCHOLARSHIP OF TEACHING AND LEARNING

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J. Reid, M. Ahmadian, D. Jennings, A. A. Pepperl, 2020-2023 Institute on Inclusive Teaching cohorts\*, S. E. Golding, A. A. Johnson. Saying It Aloud: Inclusive Teaching Statements Impact on Student Success and Engagement. *J. College Science Teaching*, 1–14 (2025)

\*I am a listed co-author as a member of the 2022-2023 IIT cohort, for data acquisition.

C. Bergren, P. Gandhi, J. A. Livezey, R. Olf. A tale of two slinkies: Learning about model building in a student-driven classroom. *Phys. Teach.* **56**(3), 134–137 (2018).

P. Gandhi, J. Livezey, A. M. Zaniewski, D. L. Reinholz, D. R. Dounas-Frazer. Attending to experimental physics practices and lifelong learning skills in an introductory laboratory course. *Am. J. Phys.* **84**(9), 696–703 (2016).

D. R. Dounas-Frazer, G. Z. Iwata, P. Gandhi. Uncertainty analysis for a simple thermal expansion experiment. *Am. J. Phys.* **81**, 338 (2013).

## EDUCATION GRANTS, AWARDS, FELLOWSHIPS AND TRAINING

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Affordable Course Content Award (Co-PI), VCU, \$2k 2024–2025

*Creation of Ancillary Open Access Materials for Undergraduate Numerical Methods in the Department of Mathematics and Applied Mathematics.*

First-Generation Student Success Research Grant (Co-PI), VCU, \$5k 2022–2023

*Awareness and Usage of Math Resources for First-Generation Students.*

Leaders for Inclusive Learning, College of Humanities and Sciences, VCU. 2021  
 -Featured in VCU News, July 13, 2022.

Project NExT Fellow, Mathematical Association of America.	2019
Berkeley Connect Mentoring Fellowship, Physics, University of California, Berkeley.	2014
Award for Improving Undergraduate Education, American Physical Society.	2012
-To the Berkeley Compass Project in which I held leadership and teaching positions.	

## TEACHING EXPERIENCE

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### Virginia Commonwealth University, Richmond VA.

Department of Mathematics and Applied Mathematics

Math 632: <i>Ordinary Differential Equations I</i>	SP21, SP23
Math 585: <i>Biomathematics Seminar: Patterns!</i>	FA21
Math 535: <i>Introduction to Dynamical Systems</i>	FA23, FA24
Math 415: <i>Numerical Methods</i>	SP20, FA20, SP22, SP23
Math 310: <i>Linear Algebra</i>	FA21, FA22, FA23
Math 301: <i>Differential Equations</i>	FA19, SP20
Math 201: <i>Calculus with Analytic Geometry II</i>	SP25, FA24
Math 200: <i>Calculus with Analytic Geometry I</i>	FA20, SP21, FA22, SP23, FA23

### The Ohio State University, Columbus OH.

Department of Mathematics

Math 2174: <i>Linear Algebra and Differential Equations for Engineers</i>	FA17
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### University of California, Berkeley CA.

Department of Physics

Physics 98: <i>Introduction to Measurement Uncertainty</i>	SP13
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### MS 101, Bronx NY.

7th Grade Life Science	2005 - 2006
7th Grade Mathematics	2005 - 2006
8th Grade Earth Science	2004 - 2005

## SERVICE

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Department of Mathematics and Applied Mathematics, Virginia Commonwealth University

<i>VCU Testing Site Manager</i> , American Mathematics Competition	2023-Present
<i>Member</i> , Organizing Committee for BAMM! conference	2019-Present
<i>Member</i> , Outreach Committee	2024-Present
<i>Member</i> , Organizing Committee for Bridges 2024 conference	2023-2024
<i>Member</i> , Undergraduate Curriculum Committee	2023-2024
<i>Team Coach</i> , COMAP International Mathematical Contest in Modeling	2020-2023
<i>Member</i> , Classroom Visitation Committee	2023-2024
<i>Organizer</i> , Biomath Seminar	2022-2023
<i>Member</i> , Diversity, Equity and Inclusion Committee	2022-2023

<i>Member</i> , Undergraduate Affairs Committee	2021-2022
<i>Faculty Mentor</i> , for students in PhD program	2020-2022
<i>Member</i> , Graduate Affairs Committee	2020-2021
<i>Organizer</i> , VCU Mathematical Contest in Modeling	Fall 2019

College of Humanities and Sciences, Virginia Commonwealth University

<i>Member</i> , COVID-response working group on enrollment	Summer 2020
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Mathematical Biosciences Institute, Ohio State University

<i>Volunteer</i> , Florence Nightingale Day	Fall 2018
<i>Organizer</i> , Postdoctoral professional development seminar	2017 - 2018
<i>Presenter</i> , Introduction to mathematical biology for Sampling Advanced Mathematics for Minority Students (SAMMS) Program	Summer 2017, 2018, 2019
<i>Judge</i> , Ohio State University Mathematical Contest in Modeling	Fall 2017, 2018
<i>Organizer</i> , Cell motility journal club	Spring 2017
<i>Project Mentor</i> , Calculus for the biological sciences	Fall 2016, 2018

Referee for Funding Agencies: *Israel Science Foundation, Food from Thought (U. Geulph).*

Mathematical Modeling Contest Judging: SCUDEM 2022-2023.

Scientific Advisory Committees: MathSEE Symposium 2023.

Referee for Journals: *Journal of Nonlinear Science, Journal of Mathematical Biology, Mathematical Methods in the Applied Sciences, Communications Biology, Mathematical Medicine and Biology, Royal Society Proceedings A, Nonlinearity, Journal of Theoretical Biology, Bulletin of Mathematical Biology, Nonlinear Dynamics, Catena, Oikos, Environmental Research Letters, Discrete & Continuous Dynamical Systems - S, Systems, SIAM Journal on Applied Mathematics, SIAM Journal on Applied Dynamical Systems, Physical Review Letters, Physica D, Chaos, Ecological Complexity, American Naturalist, PLOS One, Mathematical Biosciences, Mathematical Biosciences and Engineering, Forest Ecology and Management Journal of Vibrations and Acoustics, Nonlinear Processes in Geophysics, The Physics Teacher.*