Purba Biswas

PhD Student, Applied Mathematics
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RESEARCH INTERESTS

Stochastic processes in biology · Mathematical biology · Mathematical neuroscience · Computational cell biology · Dynamical systems · Graph theory and biological networks · Epidemic modeling

EDUCATION

Ph.D., Applied Mathematics — Aug 2025 – present
Case Western Reserve University — *Cleveland, OH*

- Expected graduation: May 2030

M.S., Applied Mathematics — Jul 2023 – May 2025
University of Delaware — *Newark, DE*

- Passed Ph.D. preliminary exams in Real Analysis, Linear Algebra and Numerical Analysis
- Research advisor: Prof. John R. Jungck, Department of Mathematical and Biological Sciences

M.S., Mathematics — Apr 2021 – Oct 2022
Jahangirnagar University — *Savar, Dhaka, Bangladesh*

- Thesis: *A Study on Poiseuille Flow of Incompressible Fluid: Analytical and Finite Difference Approaches*; supervisor: Dr. Md. Tauhedul Azam

B.S. (Honors), Mathematics — 2016 – 2021
Jahangirnagar University — *Savar, Dhaka, Bangladesh*

- Project: *Analysis and Prediction of Solar Energy Consumption Patterns using Machine Learning*; supervisor: Md. Abdur Rahman

PUBLICATIONS

Journal articles

1. J. R. Jungck and **P. Biswas**. Graph theoretic analyses of tessellations of five aperiodic polykite unitiles. *Mathematics* 13(18):2982, 2025. doi:10.3390/math13182982
2. M. A. Rahman, T. M. M. Al Masud, and **P. Biswas**. Prediction of electric energy consumption using recurrent neural networks. *International Journal of Smartcare Home* 1(1):23–34, 2021. doi:10.21742/26531941.1.1.03

Conference abstracts

3. J. R. Jungck (presenter), D. Plante, **P. Biswas**, and S. Brittain. Self-assembly and self-folding models of viral capsids. *Symposium on Biomathematics and Ecology Education and Research (BEER)*, George Mason University, VA, 2025.

RESEARCH EXPERIENCE

GBD Collaborator Nov 2025 – present
Institute for Health Metrics and Evaluation (IHME), University of Washington *Remote*

- Collaborator peer review of Global Burden of Disease Study 2023 manuscripts, with feedback submitted on:
  - *Global, regional, and national burden of brain and central nervous system cancer from 1990 to 2023 and forecasts to 2050*
  - *Substance use disorders, mental disorders and self-harm among adolescents and young adults in the 21st century*
  - *Global, regional, and national burden of respiratory infections, 1990–2023*
  - *Developmental disabilities in children and adolescents, 1990–2023*

GEMS Fellow and Research Assistant Jun 2024 – May 2025
Mathematical Sciences and Delaware Biotechnology Institute, Univ. of Delaware *Newark, DE*

- Advisor: Prof. John R. Jungck · Collaborator: Prof. Donald Plante (University of New Hampshire)
- Modeled quasicrystalline viral capsids with aperiodic polykite unitiles
- Graph-theoretic analysis of tessellations: Hamiltonian cycles, Heesch numbers, Delaunay triangulations
- Junction analysis for magnet placement on 3D-printed capsomere models

INMAS Trainee Oct 2024 – May 2025
NSF Internship Network in the Mathematical Sciences *Johns Hopkins University hub*

- Mentors: Prof. Fadil Santosa and Dr. Martin-Daniel Lacasse
- Applied team projects in Python, statistical modeling and machine learning
- Attended in-person workshops at Johns Hopkins University with program-funded travel

Research Assistant 2022 – 2023
Biomedical Physics Lab, Department of Physics, Jahangirnagar University *Savar, Dhaka, Bangladesh*

- Advisor: Prof. Md. Kabir Uddin Sikder
- Mathematical models of cancer growth and proliferation, including genetic and eco-evolutionary dynamics

COMPUTATIONAL SKILLS

Programming: MATLAB, Python, R, C++ **Typesetting:** LaTeX, Beamer

PRESENTATIONS

Posters

- *Graph theoretic analyses of tessellations of aperiodic polykite unitiles.* 2025
  NSF-Simons NITMB MathBio Convergence Conference, Chicago, IL
- *Graph-theoretic analysis of tessellations of aperiodic polykite unitiles.* 2025
  Synthetic Biology Symposium, University of Delaware
- *Modeling quasicrystal viral capsids towards self-assembly of unitile polykites.* 2025
  Winter Research Symposium, Dept. of Mathematical Sciences, University of Delaware
- *Modeling quasicrystal viral capsids: self-assembly of hats and turtles.* URCA 2024
- *Representing quasicrystal viral capsids with Einstein tiles.* URCA 2024
- *Self-folded tetrahedra as a model of protein folding.* URCA 2024

Talks

- *From Patterns to Viral Shells.* Three Minute Thesis (3MT), CWRU (my-thesis.org) 2026
- *Predicting energy efficiency of buildings using machine learning.* INMAS workshop 2024 – 25
- *Effects of age and smoking on insurance charges.* INMAS workshop 2024 – 25

FELLOWSHIPS, AWARDS AND TRAVEL SUPPORT

- **Travel Award**, NSF-Simons NITMB MathBio Convergence Conference, Chicago 2025
- **Travel Support**, Kansas Math Symposium, Wichita State University 2025
- **INMAS Fellowship**, NSF Internship Network in the Mathematical Sciences 2024 – 2025
- **GEMS Summer Research Fellowship** (Graduate Education in Mathematical Sciences), University of Delaware 2024
- **University Merit Scholarship** (undergraduate results), Jahangirnagar University 2020 – 2022
- **Finalist, Silver Honor**, International Astronomy and Astrophysics Competition (IAAC) 2020
- **Finalist, Bronze Honor**, International Youth Math Challenge (IYMC) 2020
- **Ambassador Award for Excellent Encouragement**, IAAC and IYMC 2020
- **First Runner-up**, E-Mentor Mathematics, National Digital Learning Competition, Bangladesh 2020
- **Merit Scholarship**, Secondary School Certificate, Ministry of Education, Bangladesh

TEACHING

Graduate Teaching Assistant Aug 2025 – present
Case Western Reserve University *Cleveland, OH*

- MATH 201 and MATH 223 (Multivariable Calculus); Fall 2025, Spring 2026, Fall 2026
- Lead weekly problem sessions and exam review, tutoring, grading and proctoring
- Instructor: Dr. Long Tran and Dr. Hayden Julius;

Graduate Teaching Assistant Aug 2023 – May 2025
Department of Mathematical Sciences, University of Delaware *Newark, DE*

- Calculus and Analytic Geometry A (Fall 2023, Spring 2024, Fall 2024); Calculus II, Pre-Calculus and Intermediate Algebra (Spring 25), Lead discussion sections, grading, proctoring and holding office hours

Teaching Assistant 2020 – 2022
Physics and Science Education Lab, Jahangirnagar University *Savar, Dhaka, Bangladesh*

- Taught high-school mathematics in a community school under the lab's research project; wrote and graded quizzes and exams

MENTORING AND OUTREACH

Jungck Lab, Delaware Biotechnology Institute, University of Delaware

- **Mentored two undergraduate research students** working in the lab for course credit: Ibukun Fagbohun and Leara Cellitti 2024 – 2025
- **Mentored three undergraduate researchers from underrepresented groups**: Solana Tabor and Papa Boateng, funded by the SIAM–Simons Undergraduate Summer Research Program, and Mahogany Collins, funded by the Delaware IDeA Network of Biomedical Research Excellence (DE-INBRE) Summer 2024
- **Co-led a seven-week outreach workshop** (one day per week) for high-school students from underrepresented groups and a teacher from each of three schools; topics included knot theory and DNA, fractal geometry, Voronoi diagrams and Delaunay triangulations, phase portraits and epidemic models Summer 2024

SERVICE AND LEADERSHIP

- **Treasurer**, SIAM Student Chapter, Case Western Reserve University — 2026 – present
- **Organized** a High-Performance Computing seminar, SIAM Student Chapter, CWRU — Nov 4, 2026
- **Joint Secretary and Board of Directors**, E-Business & Entrepreneurship Club, Jahangirnagar University; organized the club's annual symposium — 2019 – 2020
- **Co-founder**, Jahangirnagar University Mathematics Platform — 2019
- Organized a seminar on presentation skills, Jahangirnagar University
- **Class President** (six years), Department of Mathematics, Jahangirnagar University — 2016 – 2022
- Ambassador, International Youth Math Challenge — 2020 – present
- Ambassador, International Astronomy and Astrophysics Competition — 2020 – 2022

PROFESSIONAL MEMBERSHIPS

- Society for Industrial and Applied Mathematics (SIAM) — 2024 – present
- American Mathematical Society (AMS) — 2023 – present
- Association for Women in Mathematics, University of Delaware chapter — 2023 – 2025
- South Asian Women in Power Sector Professional Network (WePOWER) — 2022 – present

WORKSHOPS AND TRAINING

- Introduction to GBD Online Course, Institute for Health Metrics and Evaluation, University of Washington — Nov 2025
- Responsible Conduct of Research (RCR), CITI Program, University of Delaware — Feb 2025
- Innovative Teaching Strategies, University of Delaware — Winter 2025
- CHARM FORGES Summer Program, Center for Hybrid, Active, and Responsive Materials, University of Delaware — Aug 2024
- 1st and 2nd Lecture Series on Mathematical Modeling in Biology, Bangladesh Society for Mathematical Biology — 2020, 2022
- Shoktikonna (Power Women in STEM) Leadership Program, World Bank Bangladesh; one of 35 selected for a three-month cohort — 2022