Bhaskar Kumawat Ph.D. Candidate

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Education

University of Michigan — Ann Arbor, MI, USA
Ph.D. in Ecology and Evolutionary Biology — 2021 -
U-M Graduate Teacher Certificate
Complex Systems Graduate Certificate

- Advisor: Dr. Luis Zaman
- PhD Defense Date (expected): **November 1, 2026**

Indian Institute of Science — Bangalore, KA, India
BS & MS in Biology — 2016 - 2021

- BS Thesis: Evolution across scales
- MS Thesis: Architecture of the genotype-phenotype map and the coevolution of complexity in host-parasite systems

Awards & Fellowships

- **Rackham Predoctoral Fellowship Award**, Rackham Graduate School, University of Michigan — 2026
- **Graduate Student Instructor Award**, Department of Ecology and Evolutionary Biology, University of Michigan — 2025
- **Rackham Outstanding Graduate Student Instructor Award**, Rackham Graduate School, University of Michigan — 2025
- **Best Poster Award**, iSEB 2019 annual conference, JNCASR, Bangalore — 2019
- **Gold Medal** and Best Software Tool Nomination (as Team Leader), International Genetically Engineered Machine Competition (iGEM) — 2018
- **Gold Medal** and Best Hardware Nomination, International Genetically Engineered Machine Competition (iGEM) — 2017
- **KVPY Fellowship**, Dept. of Science and Technology, Govt. of India — 2014
- **NTSE Scholarship**, Natl. Council. of Edu. Research & Training, Govt. of India — 2012

Grants

- **Block Grant**, Dept. of Ecology and Evolutionary Biology, University of Michigan — 2022-2026
- **Rackham Research Grant**, University of Michigan — 2023
- **Indian Biological Engineering Competition Grant**, Dept. of Biotechnology, Govt. of India — 2018

Teaching Experience

CMPLXSYS 445: Entropy and Information — Fall 2025
Lead Instructor, University of Michigan

EEB Abe Scholars Undergraduate Mentor — Summer 2025
Mentored Undergraduate student for synthetic biology project

EEB 429: Introduction to Statistical Model Building in R — Winter 2024
Graduate Student Instructor, University of Michigan

EEB 485: Population and Community Ecology — Fall 2022, 2023
Graduate Student Instructor, University of Michigan

CMPLXSYS 391: Modeling Political Processes Winter 2022
Graduate Student Instructor, University of Michigan

BIO 173: Introduction to Biology Lab Fall 2021
Graduate Student Instructor, University of Michigan

Research Experience

Experimental evolution of bacteriophage evolvability 2023-ongoing
Dissertation chapter with Dr. Luis Zaman, University of Michigan

Dynamic localization on phenotypic boundaries 2022-ongoing
Dissertation chapter with Dr. Jordan Horowitz and Dr. Luis Zaman, UM

Evolution of evolvability in digital organisms 2021-2023
Dissertation chapter with Dr. Luis Zaman, University of Michigan

Evolution across scales 2019-2020
Undergraduate thesis project with Dr. Ramray Bhat, IISc, Bangalore

Utility functions promote co-operative behaviour in evolving agents 2019-2020
Independent project with Preetham Venkatesh, IISc, Bangalore

PhageShift : Improving treatment of bacterial infections through novel modifications to conventional phage therapeutics 2018
iGEM 2018 as Team lead with Dr. Sandeep Eswarappa and Prof. Umesh Varshney

Publications

1. **Kumawat, B.**, Horowitz, J.M., Zaman L., 2025. Anomalous localization of evolving populations on dynamic fitness landscapes *(In preparation)*
2. **Kumawat, B.**, Lalejini, A., Acosta, M.M. and Zaman, L., 2025. Evolution Takes Multiple Paths to Evolvability when Facing Environmental Change. *Proceedings of the National Academy of Sciences, 122* (1), p.e2413930121. https://doi.org/10.1073/pnas.2413930121
3. **Kumawat, B.** and Zaman, L., 2021, July. Architecture of the Genotype-Phenotype Map and the Coevolution of Complexity. *Artificial Life Conference Proceedings 33* (Vol. 2021, No. 1, p. 66). MIT Press. https://doi.org/10.1162/isal_a_00386
4. **Kumawat, B.** and Bhat, R., 2021. An interplay of resource availability, population size and mutation rate potentiates the evolution of metabolic signaling. *BMC Ecology and Evolution, 21*, pp.1-15. https://doi.org/10.1186/s12862-021-01782-0
5. D'Costa, J., Pujar, A., **Kumawat, B.**, Venkatesh, P., Ranjith, G., Sinha, V., Dubey, A.K., Narayan, H. *Resistance: Tales from a Post-Antibiotic World*. IISc Press, 2019. ISBN-10: 8192570789. *(book chapter)*

Presentations

Invited

- Talk on "Directed evolution of evolvability for enhanced phage therapy" for MAC-EPID Symposium on climate change and health: Microbial threats and microbial solutions, University of Michigan, Ann Arbor, USA, November 2024.
- Talk on "Evolution of evolvability in a computational system" for Complex Systems Advanced Academic Workshop, Center for the Study of Complex Systems, University of Michigan, Ann Arbor, USA, November 2022.
- Talk on "PhageShift: Better phage therapeutics using synthetic biology" at Centre For BioSystems Science And Engineering Symposium, Indian Institute of Science, Bangalore, India, 2019.

Contributed

- Poster on "Leveraging environmental change for directed evolution of an evolvable bacteriophage" at GRC Microbial population biology, Andover, USA, July 2025.
- Poster on "Localization on phenotypic boundaries enhances population evolvability" at EMBO Workshop on predicting evolution, Heidelberg, Germany, July 2023.
- Poster on "Localization on phenotypic boundaries enhances population evolvability" at GRC/S Molecular mechanisms in evolution, Easton, USA, June 2023.
- Talk on "Selective capture at phenotypic boundaries enhances population evolvability" at EMBL Symposium on the organism and its environment, Heidelberg, Germany, May 2023.
- Talk on the paper "Architecture of the Genotype-Phenotype Map and the Coevolution of Complexity" at ALife Conference, Prague, Czech Republic, July 2021.
- Poster on "Relatively disparate evolutionary dynamics of genomic and developmental features in unicellular and multicellular contexts" at the Indo-Swiss Meeting on evolutionary biology, CHG, Bangalore, India, December 2019.
- Poster on "Utility functions with compounding returns lead to evolution of cooperativity in Multi-Armed Bandit networks" at the Indo-Swiss Meeting on evolutionary biology, CHG, Bangalore, India, December 2019.
- Poster on "Investigating the evolution of developmental mechanisms in digital multicellular organisms" at the Indian Society of Evolutionary Biologists Conference, JNCASR, Bangalore, India, October 2019. *(best poster award)*
- International Genetically Engineered Machine Competition (iGEM) Giant Jamboree Presentation on "PhageShift" project, Boston, USA, October 2018.

Summer Schools & Workshops

- Preparing Future Faculty Seminar (4 weeks), Center for Research in Learning & Teaching, University of Michigan, Ann Arbor, USA, May 2025.
- Complex Systems Summer School (4 weeks) at the Santa Fe Institute, Santa Fe, USA, June 2024.
- ALife Conference. Attended without contribution. Montreal, Canada, 2020.

Professional Societies

- Build-A-Cell Community Workshops 2025-26
- Complex Systems Summer School at the Santa Fe Institute, Santa Fe, New Mexico 2024
- American Physical Society (APS), Graduate Student Member 2023-24

Service & Outreach

- Peer-reviewer for *Genetics* (2026), *npj Complexity* (2025), and *Proceedings of the Royal Society B* (2024) 2024-2026
- Early Career Scientists Symposium Committee, EEB, Univ. of Michigan 2024
- Feria de Ciencias Volunteer, Ann Arbor High School and SACNAS 2022
- Undergraduate synthetic biology workshop leader, Indian Institute of Science 2018