Bhaskar Kumawat

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EDUCATION

B.S. (Research) + M.S. (Research)
> Indian Institute of Science (2016 - Present), GPA: 8.7 / 10

AWARDS AND HONORS

Academic

2019	Best Poster Award, iSEB 2019 annual conference, JNCASR, Bangalore
2018	Gold Medal and Best Software Tool Nomination (Team Leader), iGEM 2018, Boston, MA
2017	Gold Medal and Best Hardware Nomination, iGEM 2017, Boston, MA

Fellowships/Funding

2017 iBEC Grant
> Indian Biological Engineering Competition. Awarded $\sim$14,000\$ by the Department of Biotechnology, Govt. of India for iGEM 2017.

2014 KVPY Fellowship
> National level competitive scholarship with stipend upto pre-PhD level by DST, Govt. of India (<1% selection rate)

2012 NTSE Scholarship
> National level competitive scholarship by NCERT, Govt. of India (<0.1% selection rate)

RESEARCH

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

+ Showed that a population of single-celled or multi-cellular organisms under different environmental contexts develop a range of emergent dynamics and characteristics as a result of the multi-scale nature of the system.

+ Specifically for single-celled asexual populations, we found that increased mutation rates, population sizes and resource abundances promote the evolution of information sharing. (See Kumawat & Bhat 2020)

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

+ Developed a program to simulate agents that perform tasks and evolve in the presence of other agents in a 2D network (Python + Rust)

+ Showed that certain forms of utility functions in these agent networks lead to evolution of high levels of co-operativity

+ Determined the conditions under which specialisation and differentiation emerges in this system

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

+ Carried out administrative duties and budget planning for a team consisting of 26 members
+ Designed and cloned mouse CCL2 chemokine and its fusion derivatives into bacterial vectors
+ Expressed, optimized the expression and purified mouse CCL2 for characterization in human monocyte chemoattraction studies
+ Executed protocols for phage isolation, amplification and modification
+ Mentored the 2018 IISER-Kolkata iGEM Team with their project to develop a arsenic sequestering bacteria – BacMan

iFloat : A multifaceted approach to cluster bioengineered gas vesicles in vitro to improve flotation
iGEM 2017 Modelling and Biophysics with Prof. Dipshikha Chakravortty And Prof. Rajan Dighe, IISc, Bangalore (2017)

+ Demonstrated that clustering is important to ensure successful flotation of free floating gas vesicles using a mathematical model
+ Used Dynamic Light Scattering (DLS) to measure cluster sizes and TE Microscopy to image isolated gas vesicles
+ Designed a spectrophotometric assay to quantify gas vesicle flotation

Design of dry active brownian particles without long range interactions
Summer internship with Dr. Shashi Thutupalli, NCBS, Bangalore (2017)

+ Studied active brownian motion and its role in giving rise to order and phase transition-like phenomena (Motility Induced Phase Separation)
+ Designed active brownian particles that can transduce energy from a vertically vibrating surface into horizontal active motion

WORK

Manuscripts in submission

2020   **Kumawat, B.**, & Bhat, R. (2020). Distinct evolutionary trajectories in asexual populations through an interplay of their size, resource availability and mutation rates. *bioRxiv* doi.org/10.1101/2020.08.27.269829

Book Chapters

2019   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.

Conference & Talks

2020   ALife 2020, Montreal (switched to online mode due to COVID-19) organised by the International Society for Artificial Life. Received scholarship to attend the meeting as a new member to the community.

2019	Indo-Swiss Meeting on Evolutionary Biology, CHG, Bangalore. Poster on "Relatively disparate evolutionary dynamics of genomic and developmental features in unicellular and multicellular contexts"
2019	Indo-Swiss Meeting on Evolutionary Biology, CHG, Bangalore (Jointly with Preetham Venkatesh). Poster on "Utility functions with compounding returns lead to evolution of cooperativity in Multi-Armed Bandit networks"
2019	Indian Society of Evolutionary Biologists (ISEB) Annual Conference, JNCASR, Bangalore. Poster on "Investigating the evolution of developmental mechanisms in digital multicellular organisms"
2019	PhageShift talk at the Center For BioSystems Science And Engineering symposium, Indian Institute of Science, Bangalore.
2018	PhageShift talk (and poster) at the International Genetic Engineering Machine Competition (iGEM) Giant Jamboree, Boston, MA. Winner of a Gold Medal and Best Software Tool Nomination.

COURSEWORK

Graduate Level

Biology	Molecular Basis of Ageing and Regeneration, Elements of Structural Biology, Molecular Systems Biology, Principles of Genetic Engineering, Bioinformatics, Spatial and Stochastic Dynamics in Biology, Quantitative Ecology
Physics	Condensed Matter Physics - I, Statistical Mechanics, Computational Physics
Other	Game Theory, Numerical Solutions of Differential Equations, Dynamical Systems Theory

Undergraduate

Biology	Molecular Biology, Developmental Biology, Physiology, Biochemistry
Physics	Intermediate Thermal Physics and Physics of Materials, Materials Thermodynamics
Other	Algorithms and Programming, Intro. to Electrical and Electronics Engineering, Probability and Statistics

TECHNICAL SKILLS

Programming	C, C++, Python, Rust, MATLAB, Mathematica, Bash
Design	Inkscape, GIMP, R & ggplot, basic OpenSCAD, Digital Electronics
Lab	Microbiology, Molecular Biology, Bacteriophage work, Basic Biochemistry, and Design of synthetic gene circuits (Model Systems: *Escherichia coli*, T4 Bacteriophage, *Dictyostelium discoideum*)

Updated September 2020