Abhishek Raghunathan

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Education

- **PhD in Biology; GPA: 3.99** — Seattle, Washington
  Department of Biology, University of Washington — *2022 - Present*
- **BS-MS in Biology with Data Science minor; CGPA: 9.30** — Thiruvananthapuram, India
  Indian Institute of Science Education and Research (IISER TVM) — *2017 - 2022*
- **Senior Secondary (Class 12) - 94.2%** — Chennai, India
  Chettinad Vidyashram — *2017*

Publications

1. Allipra S, Anirudhan K, Shivanandan S, **Raghunathan A**, Maruthachalam R. The kinetochore protein NNF1 has a moonlighting role in the vegetative development of *Arabidopsis thaliana*. Plant J. 2022

Research Experience

- **Dissertation Research** — University of Washington
  Guide - Prof. Matthew Akamatsu — *July 2023 - Present*
  - My project seeks to characterize how self-aeembling branched actin networks autonomously adapt to conditions of increasing load at sites of mammalian clathrin-mediated endocytosis (CME), and to uncover molecular mechanisms underlying this adaptation.
  - Previous work employing agent-based models of endocytic actin networks predicted an increase in the number of actin filaments at CME sites under elevated tension. To test this prediction, we are currently performing experimental manipulations of membrane tension and quantitative live-cell imaging in gene-edited hiPSCs. Preliminary results support the hypothesis of increased actin assembly in response to increased tension.
  - Future work will explore whether geometric features of CME sites and load-dependent properties of actin filaments/actin-binding proteins are drivers of emergent load-adaptation, which we believe could be general mechanisms governing load-adaptation in various systems.

- **PhD Rotation Projects** — University of Washington
  Department of Biology — *September 2022 - June 2023*
  - **Guide - Prof. Hannele Ruohola-Baker (Mar-Jun 2023)**:
    - Used computationally designed minibinder proteins to dissect cellular signaling downstream of HER2 and EGFR receptors.
    - Preliminary signaling assays supported the hypothesis that HER2 is required for pAkt activation downstream of EGFR.
  - **Guide - Prof. Matthew Akamatsu (Jan-Mar 2023)**:
    - Employed agent-based models of CME to study the origin of non-uniform branched actin networks at sites of CME.
    - Demonstrated that simulated actin network non-uniformity was robust to changes in initial ARP2/3 complex distribution, from a symmetric ring around the base of the endocytic bud to increasingly asymmetric distributions.
  - **Guide - Prof. Julie Theriot (Sept-Dec 2022)**:
    - Developed methods to analyze the shapes of human neutrophils migrating in 3D.
    - Combining signed distance functions with spherical harmonics led to superior accuracy in shape reconstruction compared to previous approachs.

- **Master's Thesis Research** — IISER TVM
  Guide - Prof. Murty Srinivasula — *August 2021 - July 2022*
  - Investigated the interplay between palmitoylation and phosphatidylinositol phosphate interactions in determining the localization of E3 ubiquitin ligase CARP2.
  - Demonstrated that the intracellular localization of CARP2 is cell line dependent in HEK293T, A549, and N2A cells.

- Showed that depalmitoylation of CARP2 in cells with hydroxylamine significantly altered its spatial distribution, from punctate structures to predominantly diffuse in the cytosol.

- **Data Science Minor Project** IISER TVM
  Guide - Prof. Ravi Maruthachalam *April - July 2021*
  - Conducted bioinformatic characterization of a putative kinetochore protein in *Arabidopsis thaliana* (AtNNF1, potential homologue of *S. cerevisiae* NNF1).
  - Found conserved amino acid blocks as well as rapidly evolving regions in the sequences of NNF1 homologues from several species.
  - This work led to authorship on a publication from the lab.

Conferences and Workshops

1. Emergent Mechanisms of Load Adaptation in Endocytic Actin Networks from Force-Attenuated Capping. Cell Bio - San Diego, 2024
   Abhishek Raghunathan, Matthew Akamatsu
2. CytoSim Workshop + Hackathon NC State - Raleigh, North Carolina , 2025

Fellowships and Awards

- Molecular Biophysics Training Grant - University of Washington 2023-2025
- Margo and Tom Wyckoff Award - Department of Biology, Univeristy of Washington 2025
- DAAD-WISE fellowship for research internships in Germany (WISE Virtuell Academy) 2021
- INSPIRE fellowship - Government of India 2017
- Attended Vijyoshi national science camp - Indian Institute of Science, Bangalore 2017

Technical Skills

- **Programming Languages:** C, R, MATLAB, Python, Bash
- **Computational Biology:** Agent-based modeling, 4D microscopy data analysis, COBRA toolbox in MATLAB for metabolic modeling
- **Laboratory Techniques:** Plasmid Cloning, Mammalian cell culture, Working with hiPS cells, Western Blotting, Immunoprecipitation, Live cell imaging with lattice lightsheet and confocal microscopes

Teaching and Mentorship

- **TA for the following courses:**
  Department of Biology, University of Washington
  - BIOL 200 - Introductory Biology WIN Quarter 2023
  - BIOL 350 - Foundations in Physiology SPR Quarter 2023

- **Undergraduate Mentees:**
  Akamatsu Lab
  - **Emma Koves** - Exploring the effects of ARP2/3 complex asymmetry on emergent network organization and force production by simulated endocytic actin networks. 2024 - Present
  - **Benjamin Brown** - Characterizing load-adaptation by simulated endocytic actin networks and exploring underlying mechanisms. 2024 - Present

Positions of Responsibility

- Co-team leader of silver medal winning iGEM team from IISER TVM 2021
- Founding member of the Biology club at IISER TVM 2020
- Editor, IISER TVM literary magazine 2017-2019