BIOGRAPHICAL SKETCH
NOTE: Follow the format and instructions provided by the NIH.

NAME: Saraswathibhatla, Aashrith

eRA COMMONS USER NAME (credential, e.g., agency login): aashrith.saraswathibhatla

POSITION TITLE: Postdoctoral Researcher

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
Indian Institute of Technology Gandhinagar	B. Tech	05/2015	Mechanical Engineering
University of Wisconsin-Madison	PhD	05/2021	Collective Cell Migration in epithelial monolayers PI: Prof. Jacob Notbohm

POST-DOCTORAL MENTORED RESEARCH TRAINING

Training Experience	Start/End Dates (MM/YY)
Role of extracellular matrix mechanics in mediating collective cell migration in 3D PI: Prof. Ovijit Chaudhuri, Stanford University	07/2021 - Current

A. Personal Statement

My research investigates the role of mechanical properties of extracellular matrix (ECM) in mediating carcinoma cell migration and invasion using 2D and 3D in vitro models.

In my PhD at the UW-Madison, I investigated the mechanics of collective cell migration in epithelial monolayers using 2D in vitro models, and computational tools. Specifically, I demonstrated the physical mechanisms involved in cell shape, cell rearrangements, and coherent motion in an epithelial monolayer. My research resulted in 4 first-authored publications in biophysics-focused journals such as *Physical Review X, Physical Review E, and Extreme Mechanics Letters*. In addition to the research, being the first graduate student of my PhD lab, I have had an opportunity to mentor the successive graduate students, and various undergraduate students.

To extend my training in biophysics and mechanotransduction using 3D in vitro models, I joined the Chaudhuri lab at Stanford University to investigate the role of ECM properties in mediating collective invasion in invasive ductal carcinoma. For the past 1.5 years as a postdoc, I have investigated on how mammary epithelial cells breach their endogenous basement membrane (*Chang, Saraswathibhatla et al., BioRxiv, 2022*). I also co-authored a review paper on cell-extracellular matrix mechanotransduction in 3D which was published in Nature Review Molecular Cell Biology (*Saraswathibhatla, Indana et al., Nat. Rev. Mol. Cell Bio., 2023*). Currently I am investigating the role of mechanical stiffness and plasticity of stromal ECM in mediating carcinoma cell invasion. Simultaneously, I have had a great opportunity to mentor graduate students and undergraduates.

Overall, I would like to focus my professional career on two important aspects: 1) to investigate fundamental biophysical and mechanotransduction mechanisms in various biological processes corresponding

to public health and disease progression, and 2) to mentor and train researchers at the interface of biology and mechanical engineering.

B. Positions, Scientific Appointments and Honors

Positions and Employment

July 2021 - Current	Postdoctoral Research Fellow, Stanford University.
Fall 2015 – Spring 2021	Research Assistant, Notbohm Lab, University of Wisconsin-Madison.
Fall 2016 – Summer 2017	Teaching Assistant, Mechanics of Materials, University of Wisconsin-Madison.
Fall 2018	Grader, Linear Elasticity, University of Wisconsin-Madison.

Honors

2022	Society of Mathematical Biology Travel award.
2022	European Society for Mathematical and Theoretical Biology Travel award.
2022	Bio-X Travel award.
2019	Department of Engineering Physics Travel Award, UW Madison.
2014	Summer Undergraduate Research Fellowship, Caltech.

C. Contributions to Science

1. Biophysics and mechanotransduction of cell-extracellular matrix interactions in 3D. Cells live in 3D microenvironments, emphasizing the role of 3D space in controlling various cell behaviors such as cell spreading, migration, division, and differentiation. In *Saraswathibhatla, Indana et al., 2023*, we reviewed the current understanding of how cells perceive 3D space, 3D cell-ECM interactions, and mechanotransduction mechanisms in various cell behaviors with potential impact in health and disease. In *Chang, Saraswathibhatla et al., 2022*, we investigated the biophysical mechanism of how mammary epithelial cells breach basement membrane in ductal carcinoma using mammary acini as a 3D in vitro system. Interestingly, we discovered that cells collectively increase their volume and generate contractile forces to breach the basement membrane, leading to invasion of the cells into the stromal ECM.

1. Saraswathibhatla, A.*, Indana, D.* & Chaudhuri, O. Cell–extracellular matrix mechanotransduction in 3D. *Nat Rev Mol Cell Biol* (2023). https://doi.org/10.1038/s41580-023-00583-1

2. Chang, J.*, Saraswathibhatla, A*., Song, Z., Verma, S., Sanchez, C., Srivastava, S., Liu, K., Bassik., Marinkovich, P., Hodgson, L., Shenoy, V., West, RB., Chaudhuri, O. (2022). Collective invasion of the basement membrane in breast cancer driven by forces from cell volume expansion and local contractility. BioRxiv 2022 (In review). https://doi.org/10.1101/2022.07.28.501930

Invited Lectures

1. Cell volume expansion and cell contractility mediate basement membrane breaching in ductal carcinoma. *GRC Physical Sciences of Cancer* 2023, Galveston, Texas, US. January 2023.

2. Mechanical plasticity of ECM in mediating collective invasion in ductal carcinoma. *GRS Signal Transduction of Engineered Extracellular Matrices* 2022, Manchester, New Hampshire, US. July 2022.

2. Physics of collective cell migration in epithelial monolayers. In numerous cases in human health and disease, epithelial cells transition from a static, motionless state to an active, migratory state. Fundamentally, such motion is resultant of various modes of cell migration such as cell rearrangements, coherent motion, and cell volume deformations. In *Saraswathibhatla & Notbohm 2020*, I demonstrated that cell shape and cell rearrangements are controlled by cell-substrate tractions and stress fibers, in contrast to the current understanding that the shape and rearrangements are controlled by forces at cell-cell interface. My work has been highlighted by the UW Madison Engineering News. In *Saraswathibhatla et al., 2021, and Saraswathibhatla et al., 2022*, I demonstrated that cells coordinate their forces giving rise to coherent motion and collective area deformations in an epithelial monolayer. In these works, I developed novel experimental methods to measure forces at a single cell resolution and augmented an existing theoretical model using the experimental measurements.

1. Saraswathibhatla, A., Zhang, J., Notbohm, J. Coordination of contractile tension and cell area changes in an epithelial cell monolayer. *Physical Review E* 105, 024404 (2022). https://doi.org/10.1103/PhysRevE.105.024404

2. Vazquez, K., Saraswathibhatla, A. & Notbohm, J. Effect of substrate stiffness on friction in collective cell migration. *Scientific Reports* 12, 2474 (2022). https://doi.org/10.1038/s41598-022-06504-0.

3. Saraswathibhatla, A., Henkes, S., Galles, E.E., Sknepnek, R., Notbohm, J. Coordinated tractions increase the pack size of collectively moving pack in a cell monolayer. *Extreme Mechanics Letters*, 101438 (2021). https://doi.org/10.1016/j.eml.2021.101438.

4. Saraswathibhatla, A., Notbohm, J. Tractions and stress fibers control cell shape and rearrangements during collective cell migration. *Physical Review X* 10, 011016 (2020). https://doi.org/10.1103/PhysRevX.10.011016. *Highlighted in UW-Madison Engineering News*.

5. Notbohm, J., Napiwocki, B.N., deLange, W.J., Stempien, A., Saraswathibhatla, A., Craven, R.J., Salick, M.R., Ralphe, J.C., Crone, W.C. (2019). Two-dimensional culture systems to enable mechanics-based assays for stem cell-derived cardiomyocytes. *Experimental Mechanics* 59, 1235-1248. https://doi.org/10.1007/s11340-019-00473-8.

Invited Lectures

1. Role of active cell forces in mediating coherent motion in an epithelial monolayer*. European Council for Mathematical and Theoretical Biology, Heidelberg, Germany*. September, 2022.

2. Coordination of contractile tension and cell area deformations in an epithelial monolayer. *Cell Migration Seminar (Virtual)*, October 2022.

3. Publicly accessible experimental data and computational tools for scientific researchers around the world. With increasing amounts of theoretical models in investigating biophysical mechanisms of fundamental biological process, there is still lack of validation of the theoretical models because of the lack of open-source raw experimental data. In *Saraswathibhatla et al., 2020*, I described all my experimental methods and computational tools, and shared my experimental data and computational tools on a publicly accessible platform, expecting the data to be useful to theoretical researchers interested in force and motion in collective cell migration.

1. Saraswathibhatla, A., Galles, E.E., Notbohm, J. Spatiotemporal force and motion in collective cell migration. *Scientific Data* 7, 197. https://doi.org/10.1038/s41597-020-0540-5

2. Saraswathibhatla, A., Galles, E.E., Notbohm, J. *Scientific Data Curation* (2020): Metadata record for: Spatiotemporal force and motion in collective cell migration. *Figshare.* https://doi.org/10.6084/m9.figshare.12378218.v1