Nimesh R. Chahare, Ph.D.

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EDUCATION

Ph.D.	Applied Mathematics, Universitat Politècnica de Catalunya, Barcelona, Spain	2023
M.E.	Mechanical Engineering, Indian Institute of Science, Bengaluru, India	2016
B.Tech.	Mechanical Engineering, National Institute of Technology, Nagpur, India	2014

RESEARCH AREAS

Biophysics | Developmental Biology | Mechanobiology | Microfluidics

RESEARCH EXPERIENCE

Postdoctoral Reseach Scientist, at Columbia University

Adviser: **Prof. Nandan Nerurkar** May 2024–Present

Project: **Mechanics of morphogenesis of embryonic brain development**

Doctoral Researcher, at Institute for Bioengineering of Catalonia

Adviser: **Prof. Xavier Trepat** and **Prof. Marino Arroyo** August 2017–April 2024

Thesis: **Mechanics of epithelial layers subjected to controlled pressure**, Grade: *cum laude*

Developed a microfluidic chip to control epithelial tissue shapes and lumen pressure.

Implemented an innovative approach to pattern epithelial folds through controlled buckling.

Acquired expertise in cell culture, protein micropatterning, microfluidic device design and fabrication, advanced microscopy, along with proficiency in image processing and cell segmentation.

Collaboration: **Modeling nuclear to cytoplasmic transport of proteins**

Worked with Prof. Pere Roca-Cusachs and Dr. Ion Andreu.

Developed a computational tool to track protein diffusion and import/export rates across nuclear membrane using photobleaching techniques (FRAP and FLIP). *Published in Nat. Cell Biol. 2022*

Collaboration: **Analyzing force loading rates associated with cell mechanosensing**

Worked with Prof. Pere Roca-Cusachs and Víctor González-Tarragó

Analyzed rate-dependent mechanosensitivity of cells using large datasets from Atomic Force Microscopy and Optical Tweezers experiments. *Published in Nat. Commun. 2021*

Graduate Researcher, at Indian Institute of Science

Adviser: **Prof. Namrata Gundiah** August 2014–June 2017

Master's thesis: **Design and fabrication of miniature shear device for cell mechanics**

Developed a bioreactor with a cone plate rheometer-like design to apply uniform shear stress on cells, while gaining expertise in computer-aided design, 3D printing, and assembling/programming electrical components. *Patented in India*

Side project: **Finite element analysis of coffee white stem borer (CWSB) mandible**

Discovered mechanical advantages of mandible for wood cutting through 3D tomography, CAD modeling, and finite element analysis. *Published in JMBBM 2020*

Side project: **Developing constitutive model of Fiber Reinforced Elastomers (FRE)**

Performed uniaxial/biaxial stretching of fiber-reinforced elastomer and modeled the data using a hyperelastic constitutive equation. *Published in Soft Robotics 2020*

PUBLICATIONS

Patents

Pullarkat, P., Vishwakarma, R., Gundiah, N., and Chahare, N. R. (2018) A microscope mountable fluid shear device. Indian patent, IN201641029893A.

Journal Articles

Chahare, N. R., Ouzeri, A., Golde, T., Wilson, T., Roca-Cusachs, P., Arroyo, M., and Trepat, X. Harnessing active viscoelasticity for synthetic epithelial morphogenesis. (*in preparation*)

Andreu, I.*, Granero-Moya, I.*, Chahare, N. R., ... & Roca-Cusachs, P. (2022). Mechanical force application to the nucleus regulates nucleocytoplasmic transport. **Nature cell biology**, 24(6), 896.

Andreu, I.*, Falcones, B.*, Hurst, S., Chahare, N. R., ... & Roca-Cusachs, P. (2021). The force loading rate drives cell mechanosensing through both reinforcement and cytoskeletal softening. **Nature communications**, 12(1), 4229.

Chatterjee, A., Chahare, N. R., ... & Gundiah, N. (2021). Role of fiber orientations in the mechanics of bioinspired fiber-reinforced elastomers. **Soft Robotics**, 8(6), 640-650.

Kundanati, L., Chahare, N. R., ... & Gundiah, N. (2020). Cutting mechanics of wood by beetle larval mandibles. **Journal of the Mechanical Behavior of Biomedical Materials**, 112, 104027.

Oral Presentations

Deutsche Physikalische Gesellschaft, Spring Meeting, Dresden, Germany.	March 2023
World Congress of Biomechanics, Taipei, Taiwan. (*Virtual*)	July 2022
EMBL-IBEC Conference, Engineering multicellular systems, Barcelona, Spain.	June 2022
EMBL Symposium, Mechanobiology in development and disease, Heidelberg, Germany.	May 2022

KEY PROFICIENCIES

Biology

Mammalian cell culture, immunofluorescence stainings, protein micropatterning (microcontact printing and photopatterning), hydrogel preparation, pharmacological treatments.
Handling epithelial cell lines in the context of in vitro 2D/3D experiments.

Microscopy

Advanced microscopy techniques, including light/fluorescence microscopy,
spinning disk/laser scanning confocal microscopy, and SPIM lightsheet microscopy.
Utilized photobleaching techniques (FRAP, FLIP), along with local photoactivation for optogenetics.

Microfluidics

Experienced in working within microfabrication facilities, involving designing photomasks, photolithography, plasma bonding, 3D printing with a DLP projector, elastomer (PDMS) preparation, and fabrication of frugal microfluidic devices using a desktop cutting machine.

Design and Analysis

Programming: MATLAB, R, Python, FIJI macro, Markdown, LaTeX.
3D modeling: FreeCAD, SolidWorks, Inkscape, Blender, and Keyshot.

Soft skills

Strong collaboration and teamwork abilities, hard-working, confident in public speaking, self-motivated quick learner, adept at trouble-shooting, and adaptable to dynamic challenges.

ENGAGEMENTS AND SERVICE ACTIVITIES

Founder and convenor of the International Epithelial Mechanics Fan Club. . 2023-Present

Active in organizing committee at Columbia Postdoctoral Workers, UAW Local 4100. 2024-Present

Managed data servers (synology and magnetic tape drive system) at Prof. Trepat's lab. 2018–2024

Featured my work at Antoni Tàpies Foundation Museum . 2023-2024

Showcased my origami artworks at Barcelona's contemporary art museum, CCCB. 2023

Invited to be a panelist in a discussion on the topic of 'Why Scientists Should Care About Art?' organized by the Barcelona City Government. 2023

Active participation in organizing March for Science events in Barcelona. 2018, 2023

Interviewed by the European Commission-funded project "Mechanocontrol". 2022

Mentored two high school students, an undergraduate, and a master's student for summer projects on separate occasions at IBEC. 2018, 2021

Member of PhD committee at IBEC. 2017–2019

ACADEMIC ACHIEVEMENTS

Won the best poster prize at 15th IBEC symposium on Bioengineering for Active Ageing. 2022

International travel grant for attending winter school on Quantitative Systems Biology at International Centre for Theoretical Sciences (ICTS), Bengaluru, India. 2019

Awarded scholarship by Indian Ministry of Human Resource and Development for attending Indian Institute of Science, Bengaluru, India. 2014

Ranked in the top 0.2% (362nd out of 185,578 candidates) in national level entrance examination, Graduate Aptitude Test in Engineering (GATE) for Mechanical Engineering. 2014

LANGUAGES

Fluent: English, Marathi, Hindi

Conversational: Catalan, Spanish

REFERENCES

Available on request

Updated October 2024