Nimesh Chahare

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EDUCATION

Ph.D. School of Mathematics and Statistics, Universitat Politècnica de Catalunya, Barcelona, 2021

M.E. Mechanical Engineering, Indian Institute of Science, Bengaluru, 2016

B.Tech. Mechanical Engineering, Visvesvaraya National Institute of Technology, Nagpur, 2014

RESEARCH AREAS

Bioengineering: Cell mechanobiology, Tissue engineering, and Lab-on-the-chip

Mechanics: Continuum mechanics, Material testing, and Soft matter physics

RESEARCH EXPERIENCE

PhD student, Institute for Bioengineering of Catalonia, and UPC

Adviser: **Prof. Xavier Trepat** and **Prof. Marino Arroyo** Aug 2017–Present

Thesis: **Mechanics of epithelial layers subjected to controlled pressure and tension**
Designing a device to simulate physiological environment of morphogenesis and epithelial folding, which involves stretching and buckling of epithelia.

Working on a project in collaboration with Prof. Pere Roca-Cusachs for analysing atomic force microscopy data to understand role of force loading rates in cell mechanosensing.

Constructing a numerical framework to elucidate protein transport with Fluorescence recovery after photobleaching (FRAP) and Fluorescence Loss in Photobleaching (FLIP) with Ion Andreu.

Project Associate, Biomechanics Lab, Indian Institute of Science

Adviser: **Prof. Namrata Gundiah** July 2016–March 2017

Developing constitutive model of Fiber Reinforced Elastomers (FRE)
Computed stresses and strains from uniaxial and biaxial stretching experiments of Polydimethylsiloxane Fibre Reinforced Elastomer. Also, modeled experimental results using constrained optimization techniques.
Computed stresses and strains from uniaxial and biaxial stretching experiments of Polydimethylsiloxane Fibre Reinforced Elastomer. Also, modeled experimental results using constrained optimization techniques.

Masters, Mechanical Engineering, Indian Institute of Science

Adviser: **Prof. Namrata Gundiah** August 2014–June 2016

Thesis: **Design and fabrication of miniature shear device for cell mechanics**
Designed a cost effective system capable of applying uniform shear on culture cells along with real time visualization using fluorescence microscopy (microscope mountable).
Calibrated the device using fluorescence microscopy and traction force microscopy to test for uniform shear flow conditions. Implemented trajectory generation filter based control system in the shear device electronics using MATLAB and Arduino programming.

PUBLICATIONS

Patents

2018 Pullarkat, P., Vishwakarma, R., Gundiah, N., and **Chahare, N. R.** "A microscope mountable fluid shear device". Indian patent, IN201641029893A, Published 2018-03-09.

Articles in Peer-Reviewed Journals

2021 Andreu, I.*, Falcones, B.*, Hurst, S., **Chahare, N. R.**, Quiroga, X., Leroux, A., Kechagia, Z., Beedle, A.E., Elosegui-Artola, A., Trepat, X., Farre, R., Betz, T., ALmendros, I., and Roca–Cusachs, P. "The force loading rate drives cell mechanosensing." *Nature Communications*, available at *Biorxiv*. doi:10.1101/2021.03.08.434428

2020 Chatterjee, A., **Chahare, N. R.**, Kondaiah, P., Gundiah, N. "Role of Fiber Orientations in the Mechanics of Bioinspired Fiber-Reinforced Elastomers" *Soft Robotics*. doi:10.1089/soro.2019.0191

2020 Kundanati, L., **Chahare, N. R.**, Jaddivada, S., Karkisaval, A. G., Sridhar, R., Pugno, N. M., Gundiah, N. "Cutting mechanics of wood by beetle larval mandibles." *Journal of the Mechanical Behavior of Biomedical Materials*. doi:10.1016/j.jmbbm.2020.104027

Journal Article Manuscripts Under Review

2021 Andreu, I.*, Granero-Moya, I.*, **Chahare, N. R.**, Clein, K., Jordàn, M. M., Beedle, A. E., ... and Roca-Cusachs, P. "Mechanosensitivity of nucleocytoplasmic transport." , available at *Biorxiv*. doi.org/10.1101/2021.07.23.453478

Conference Presentations

2017 Chatterjee, A., **Chahare. N. R.**, Kulkarni. A., Kondaiah, P., and Gundiah, N. "Design of a dynamic cell stretcher to quantify responses of fibroblasts to cyclic stretching and TGF-β." 5th International Conference on Computational and Mathematical Biomedical Engineering, Pittsburgh, Pennsylvania, USA. April 10–12.

2016 Satone, V., **Chahare, N. R.**, and Padole, P. "Design of pedal operated behda cracking machine using flywheel motor." Association for Machines and Mechanisms' Industrial Problems on Machines and Mechanisms (IPRoMM), Nagpur, India. Dec 22–23.

2016 Abhijith, K. G., **Chahare, N. R.**, Kundanati, L., and Gundiah, N. "Mechanics of the Cuticle of Wood Boring Insects." Structural Integrity Conference and Exhibition (SICE), Bengaluru, India. July 4–6.

ACADEMIC ACHIEVEMENTS

Awards and Honors

2014 All India Rank 362 (99.8 percentile) out of 185, 578 in Graduate Aptitude Test in Engineering in Mechanical engineering.

2016 Second prize for Best paper presentation in Association for Machines and Mechanisms Industrial Problems on Machines and Mechanisms (IPRoMM), Nagpur, India.

2013 22nd position in national level presentation competition for future transportation solution, TATA MOTORS' MIND ROVER.

Grants

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

2014 Awarded scholarship by Indian Ministry of Human resource and development for Masters in Engineering at Indian Institute of Science, Bengaluru 2014-16.

APPOINTMENTS

2016–17 Project Associate, Biomechanics Lab
Department of Mechanical Engineering, Indian Institute of Science, Bengaluru

TEACHING EXPERIENCE

Institute for Bioengineering of Catalonia

2021 Alexandre Garcia-Duran's UB Summer Intership project
Characterization of stiffness of PDMS and development of Microfluidic device for stretching cells/tissues

2017 Treball de Recerca
Mentored two high school students in a project related to 3D epithelia

TECHNICAL SKILLS

Cell Biology and Microscopy

Spinning disk confocal microscopy, Airy Scan Confocal microscopy, light and fluorescence microscopy.

Photobleaching techniques in Fluorescence recovery after Photobleaching (FRAP) and Fluorescence Loss in Photobleaching (FLIP).

Cell culture, Protein Micropatterning techniques, and Elastomer preparation, Hydrogel preparation.

Programming

MATLAB, C, C++, Python, FIJI macro, Maple, Wolfram Mathematica, HTML, LaTeX and Arduino IDE.

Design and Analysis

SolidWorks, Inkscape, Adobe Illustrator, SolidEdge, Cinema4D and Keyshot.
ImageJ, AMIRA, ABAQUS, Hypermesh, and COMSOL.

ACTIVITIES

Responsibilities

Managed data servers (synology and magnetic tape drive system) in the Prof. Trepat's lab.
Member of PhD committee at IBEC.

Outreach

Active member of Science day events, planning committee for communicating popular science 2018–.
Volunteered at Structural Integrity Conference and Exhibition (SICE) 2016.
Cultural committee member, organizing cultural programmes in Marathi mandal IISc 2015.
Active member of Social Welfare Society at VNIT 2014.

LANGUAGES

Native: Marathi, Hindi
Fluent: English
Beginner's proficiency: Catalan, Spanish

Updated March 2022