ABDUL NASEER MALMI-KAKKADA

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CURRENT POSITION

Assistant Professor of Physics (Tenure-Track) 08.2020 - Present
Dept. of Chemistry and Physics, Augusta University,
1201 Goss Ln, GE-3036, Augusta, Georgia 30912, USA.

EDUCATION AND RESEARCH EXPERIENCE

Postdoctoral Research Fellow, 01.2016-07.2020
Supervised by D. Thirumalai,
Dept. of Chemistry, The University of Texas at Austin.
University of Maryland, College Park (Lab Moved to UT Austin). 09.2015-12.2015

PhD Theoretical Physics 09.2009-08.2015
University of Minnesota (Minneapolis)
Dissertation: Role of Disorder in Quantum Crystals (Advisor: Oriol T. Valls)

Bachelor of Science till 12.2008
University of St. Thomas, St Paul, Minnesota.
Hanover College, Hanover, Indiana.

AWARDS

High Five My Faculty Award, Center for Undergraduate Research and Scholarship, Augusta University

Research Mentor Excellence Award Nominee, Augusta University

Aneesur Rahman Award, Dept. of Physics, University of Minnesota (Twin Cities)

Research Travel Grant, India-US Science and Technology Forum (IUSSTF)

Summer Research Fellowship, University of Minnesota (Twin Cities)

Doctoral Dissertation Fellowship Nominee, Dept. of Physics, University of Minnesota (Twin Cities)

Gold Medal, Academic Talent Award, Ahmadiyya Muslim Community

Dean's List (Hanover College, Univ. of St. Thomas and Univ. of Minnesota)

President's Award for Academic Excellence, Republic of The Gambia

PUBLICATIONS

Published Journal Articles

1) G. Zills#, T. Datta+, **A.N. Malmi-Kakkada+.** Enhanced mechanical heterogeneity of cell collectives due to temporal fluctuations in cell elasticity. Physical Review E 107, 0144401 (2023). https://journals.aps.org/pre/abstract/10.1103/PhysRevE.107.014401 #undergraduate student **+**Corresponding author

2) C.L. Marchant*, **A.N. Malmi-Kakkada***, J.A. Espina*, E.H. Barriga. Cell clusters softening triggers collective cell migration in vivo. Nature Materials 21, 1314-1323 (2022). (*Equal contribution with experimental collaborators). https://www.nature.com/articles/s41563-022-01323-0
   Featured in: Cover article of Nature Materials (Nov 2022 issue), Feature article - Augusta University news portal (jagwire)
3) **A.N. Malmi-Kakkada+**, S. Sinha, X. Li, D. Thirumalai**+**. Adhesion strength between cells regulate non-monotonic growth by a biomechanical feedback mechanism. Biophysical Journal 121, 19, 3719-3729 (2022). https://www.cell.com/biophysj/fulltext/S0006-3495(22)00360-5
+Corresponding authors

4) R. Huebner*, **A.N. Malmi-Kakkada***, S. Serakaya, S. Weng, D. Thirumalai, J.B. Wallingford. Mechanical heterogeneity along single cell-cell junctions is driven by lateral clustering of cadherins during vertebrate axis elongation. (*Equal Contribution with experimental collaborator). eLife 10:e65390 (2021)

5) S. Sinha, **A.N. Malmi-Kakkada+.** Inter-particle adhesion regulates the surface roughness of growing dense three-dimensional active particle aggregates. J. Phys. Chem. B 125, 37, 10445−10451 (2021) (+corresponding author).

6) S. Sinha#, **A.N. Malmi-Kakkada**, X. Li, H. Samanta, D. Thirumalai. Spatially Heterogeneous Dynamics of Cells in a Growing Tumor Spheroid: Comparison Between Theory and Experiments. Soft Matter, 16, 5294-5304 (2020) #Graduate student mentee

7) **A.N. Malmi-Kakkada***, X. Li*, H. Samanta, S. Sinha# and D. Thirumalai. Cell Growth Rate Dictates the Onset of Glass to Fluid-like Transition and Long Time Superdiffusion in an Evolving Cell Colony. Physical Review X, 8, 021025 (2018). #Graduate student mentee.
   Featured In: News (College of Natural Sciences, UT Austin); National Science Foundation (NSF) Social Media; Scientific Visualization and Data Analytics Showcase Video (Supercomputing Conference 2017 and Texas Advanced Computing Center); Node Blog (Development Journal); Coalition of Academic Scientific Computation Brochure; UT Austin Department of Physics Highlight

8) **A.N. Malmi-Kakkada**, O.T. Valls, C. Dasgupta. Superfluid Response to Edge Dislocation Motion. Physical Review B, 95, 134512 (2017).

9) **A.N. Malmi-Kakkada**, O.T. Valls, C. Dasgupta. Dislocation Mobility and Anomalous Shear Modulus Effect in ^{4}He Crystal. Journal of Low Temperature Physics,186 (3-4), 259-274 (2017).

10) **A.N. Malmi-Kakkada**, O.T. Valls, C. Dasgupta. Hydrodynamics of Compressible Superfluids in Confined Geometries. Journal of Physics B: Atomic, Mol. and Opt. Phys., 47, 055301 (2014).

11) A. Jara, C. Safranski, I. Krivorotov, C-T. Wu, **A.N. Malmi-Kakkada**, O.T. Valls and K. Halterman. Angular Dependence of Superconductivity in Superconductor/Spin Valve Heterostructures. Physical Review B, 89, 184502 (2014).

12) **A.N. Malmi-Kakkada**, O.T. Valls, C. Dasgupta. Ising Model on a Random Network With Annealed or Quenched Disorder. Physical Review B, 90, 024202 (2014).

Articles in Review

13) **A.N. Malmi-Kakkada**, D. Thirumalai. Generalized Rayleigh-Plesset Theory for Cell Size Maintenance in Bacteria and Viruses. In Revision. (https://www.biorxiv.org/content/10.1101/552778v2)

Other Peer Reviewed Publications

14) J. D. Dawson, **A.N. Malmi-Kakkada.** Biophysical and biochemical foundations of cell migration. Textbook chapter in *Cell Migration in Development, Health and Disease*. In Press. (2022).

15) A. Bowen, **A.N. Malmi-Kakkada.** Physical Signatures of Cancer Metastasis. Proceedings of the Practice and Experience in Advanced Research Computing (2017). (https://dl.acm.org/citation.cfm?id=3093338.3104176)

16) **A.N. Malmi-Kakkada.** Readers' Thoughts on Science and Religion. Physics Today 71, 6 (2018) (https://doi.org/10.1063/PT.3.3935)

TEACHING

Mathematical Methods of Physics (Differential Eq., Partial Diff Eq., Fourier series etc) Fall 2021-2023

Introductory Physics I and Introductory Physics I Lab. Fall 2020, Spring 2021-23

Teaching Preparation Certificate, Faculty Innovation Center, University of Texas at Austin Spring 2019

Fellow, Teaching Discovery Day and Inclusive Teaching Workshop, UT Austin Fall 2019

Teaching Assistant, Dept. of Physics, Univ of Minnesota (Twin Cities) 2009-2015

ADVISING AND MENTORSHIP

Postdoc: Dr. Jonathan Dawson, (PhD Max Planck Institute for Complex Systems), joined in Jan 2022

Undergraduate research students: [1] Garrett Zills, Physics Major, Augusta University and

[2] Tommy Rusch, Computer science major, Augusta University

Garrett won the outstanding student research award (2022) and was nominated for the prestigious Barry Goldwater Scholarship.

Graduate Thesis Committee for Master's in Biomolecular Science - Amber Ajamu Johson

Honor's Thesis Advisor, Department of Physics and Chemistry - 2 students

[3] Dominic Broglio, Chemistry Honors Student, Augusta University

PhD Student mentoring: Sumit Sinha, Thirumalai Lab, UT Austin (now postdoc at Harvard University)

TALKS AND POSTER PRESENTATIONS

Session co-organizer, Mechanics of Cells and Tissues, American Physical Society, (March 2023).

Poster, Biophysical Society Annual Meeting, (February 2023).

Research Seminar, Biophysics and Soft Matter Group, King's College London, UK (June 2022).

Invited Seminar, Instituto Gulbenkian Ciencia (ICG), Lisbon, Portugal (May, 2022).

Seminar, Modelling Cell Development and Regeneration Seminars, University of Toronto (April, 2022).

Invited talk, Materials Science and Biophysics Seminar Series, Dept. of Chemistry and Physics, Augusta University (April, 2022)

Selected Talk, American Physical Society (APS) March Meeting (March, 2022).

Invited Talk, Fall seminar series, Physical Sciences Oncology Center, Univ of Pennsylvania. (October 2021).

Selected Talk, American Physical Society (APS) March Meeting, Session on Morphogenesis organized by the Division of Biological Physics. (March, 2021).

Invited Talk (Virtual), Physics Department Seminar (Northeastern University, Boston), Center for Interdisciplinary Research on Complex Systems. (October, 2020).

Invited Seminar, Department of Cell Biology, Medical College of Georgia (October, 2020).

Invited Talk (Virtual), International Physics of Living Systems Annual Meeting (IPOLS), Georgia Tech. June 2020. In person conference cancelled due to COVID19.

Invited Talk (Virtual), Mechanics in Developmental Biology Conference, Institut Curie, Paris, France. June 2020.

Invited Talk (Virtual), Developmental Cell Biology Conference, Stowers Institute for Medical Research, April 2020. In person conference cancelled due to COVID19.

Invited Talk, Religion and Science Seminar, Outreach activity to motivate high school and undergraduate students to pursue research careers (March 2020).

Invited Seminar, Dept. of Cell and Developmental Biology, University College London (UCL) "From super-resolution imaging to theory: cadherin clustering drives asymmetric glassy dynamics during vertebrate embryo elongation" (Dec 2019).

Presentation, Dept. of Molecular Biosciences, University of Texas (Austin).

Talk, Physics of Living Systems Meeting, University of Texas (Austin).

Presentation & Poster, Basic and Translational Research Retreat, Livestrong Cancer Institue, Dell Medical School, University of Texas (Austin).

Invited Talk, Medical Image Analysis and Visualization, Supercomputing Conference 17 (Denver, Colorado).

Poster, 62nd Annual Meeting, Biophysical Society (San Francisco, California).

Invited Talk, Theoretical Biophysics Group, Mayo Clinic (Rochester, Minnesota).

Talk, Condensed Matter Seminar, Dept. of Physics, University of Minnesota (Twin Cities).

SERVICE

Physics outreach to elementary school kids in partnership with APS Physicists to Go.

Co-organizer, Materials Science and Biophysics Seminar Series, Augusta University.

Organizer, Materials Science and Biophysics Journal Club, Dept. of Chemistry and Physics, Augusta University.

Faculty search committee member for Physics tenure track position (Fall 2021).

Organized Department Outreach Program for Undergraduate Chemistry/Physics Majors (Fall 2021).

Panelist for Intro to Graduate School (Spring 2022).

Reviewer for Physical Review Letters, Physical Review X, Physical Review E, Soft Matter.

Presenter, Undergraduate Research Mixer, Texas Institute for Discovery and Education in Sciences.

Scientific Judge, Undergraduate Research Conference, UT Austin.

GRANTS

PI, NIH - Maximizing Investigators' Research Award (MIRA) $1,499,345 (pending).

PI, National Science Foundation (NSF) - Biophysical Principles of Synthetic Cell-Cell Signaling *In Vivo.* $450,000 (in revision).

PI, US Air Force Office of Scientific Research - Characterization and Multiscale Modeling of Electrotaxis Induced Bone Regeneration. $450,000 (applied).

Significant contributor - (NIH R21) Developing a platform for engineering customizable cell-cell signaling *in vivo* (with PI: Paul Langridge, Dept. of Biology, Augusta University). $407,000 (Funded)

PI, National Science Foundation (NSF) - Computational studies to determine mechano-molecular basis of early neural development. $250,000 (in revision). Grant application was rated Excellent/very good/ very good and evaluated as competitive by 3 reviewers/panel.

Summer Scholars Program grant for 2 students (2021 and 2022). Center for Undergraduate Research and Scholarship (CURS), Augusta University. $20,800 (Funded).

PI, Burroughs Wellcome Foundation, Durotaxis of Neural Crest Collective Cell Migration *in vivo* (2020). Collaborative Research Travel Grant. UK Host: Prof. Roberto Mayor (UCL). $8,600 (Funded).

Translation Research Program Student Grant to support undergraduate research. Medical College of Georgia, Augusta University. $2,000 (Funded).

REFERENCES

Dr. Devarajan(Dave) Thirumalai,
Collie-Welch Regents Professor in Chemistry,
Department of Chemistry, University of Texas (Austin), 105 E. 24th St, Austin, TX 78705.
Email: dave.thirumalai@gmail.com Phone: 301-938-2386.

Dr. John Wallingford,
William and Gwyn Shive Endowed Professorship,
Department of Molecular Biosciences, University of Texas at Austin, 2415 Speedway, Austin, TX 78712. Email: wallingford@austin.utexas.edu Phone: 512-232-2784.

Dr. Oriol T Valls,
Professor of Physics,
Department of Physics, University of Minnesota, 116 Church St SE, Minneapolis, MN 55455.
Email: otvalls@umn.edu Phone: 612-624-0516.