

Sumitabha Brahmachari, Ph.D

Department of Biochemistry and Molecular Biology
University of Texas Medical Branch, Galveston, Texas, US

Email: subrahma@utmb.edu
Homepage: brahmachari-lab.github.io/

PROFESSIONAL EXPERIENCE

Assistant Professor

Jun 2026 –

Department of Biochemistry and Molecular Biology
University of Texas Medical Branch, Galveston, Texas, US

Research Scientist

Sep 2025 – May 2026

Center for Theoretical Biological Physics
Rice University, Houston, Texas, US

Postdoctoral Fellow

Sep 2018 – Aug 2025

Center for Theoretical Biological Physics
Rice University, Houston, Texas, US

EDUCATION

Ph. D., Department of Physics and Astronomy, Northwestern University

Sep 2013 – Aug 2018

M. Sc. Physics, Department of Physics, Indian Institute of Technology Bombay Jul 2011 – May 2013

B. Sc. Physics, Hindu College, University of Delhi

Jul 2008 – May 2011

RESEARCH KEYWORDS

Molecular Dynamics Simulations, Machine Learning, Statistical Mechanics, Computational Biology, Hi-C data, Epigenetics, Genome Architecture, Transcription regulation, Single-molecule DNA Biophysics.

PUBLICATIONS (* = shared authorship)

Link to all publications: <https://scholar.google.com/citations?user=uIbiYcIAAAAJ&hl=en&authuser=1>

- [1] S Brahmachari, AB Oliveira, MF Mello, VG Contessoto, and JN Onuchic. [Exploring the energy landscape of bacterial chromosome segregation](#). *Proc. Natl. Acad. Sci. USA*. 123 (12), e2535321123 (2026).
- [2] AB Oliveira Junior, MF Mello, RJ Oliveira, E Dodero-Rojas, S, Brahmachari, VG Contessoto, and JN Onuchic. [A data-driven chromatin model reveals spatial and dynamic features of genome organization](#). *Proc. Natl. Acad. Sci. USA*. 123 (4), e2530583123 (2026).
- [3] J Hwang, C Lee, S Brahmachari, et al. [DNA supercoiling-mediated G4/R-loop formation tunes transcription by controlling the access of RNA polymerase](#). *Nat. Commun.* (2025).
- [4] VG Contessoto, AB Oliveira Jr, S Brahmachari, PG Wolynes, MDi Pierro and JN Onuchic. [Energy landscape analysis of the development of the chromosome structure across the cell cycle](#). *Proc. Natl. Acad. Sci. USA*. 122 (12) (2025).
- [5] S Brahmachari, S Tripathi, JN Onuchic, and H Levine. [Nucleosomes play a dual role in regulating transcription dynamics](#). *Proc. Natl. Acad. Sci. USA*. 121 (28) (2024).

- [6] S Brahmachari, T Markovich, FC MacKintosh, and JN Onuchic. [Temporally Correlated Active Forces Drive Segregation and Enhanced Dynamics in Chromosome Polymers](#). **PRXLife** 2 (2024).
- [7] E Doderro-Rojas, MF Mello, S Brahmachari, et al. [PyMEGABASE: Predicting cell-type-specific structural annotations of chromosomes using the epigenome](#). **J. Mol. Biol.** 435 (15), p168180 (2023).
- [8] BS Ruben, S Brahmachari, VG Contessoto, et al. [Structural reorganization and relaxation dynamics of axially stressed chromosomes](#). **Biophys. J.** 122 (9) p1633-1645 (2023).
- [9] S Brahmachari, VG Contessoto, M Di Pierro, and JN Onuchic. [Shaping the genome via lengthwise compaction, phase separation, and lamina adhesion](#). **Nucl. Acids Res.** 50, p4258-4271 (2022).
- [10] S Tripathi, S Brahmachari, JN Onuchic, and H Levine. [DNA supercoiling-mediated collective behavior of co-transcribing RNA polymerases](#). **Nucl. Acids Res.** 50 (3), p1269-1279 (2022).
- [11] C Hoencamp*, O Dudchenko*, AMO Elbatsh*, S Brahmachari* et al. [3D genomics across the tree of life reveals condensin II as a determinant of architecture type](#). **Science** 372, p984-989 (2021).
- [12] PR Desai, S Brahmachari, JF Marko, et al. [Coarse-grained modelling of DNA plectoneme pinning in the presence of base-pair mismatches](#). **Nucl. Acids Res.** 48 (19), p10713-10725 (2020).
- [13] S Brahmachari and JF Marko. [Chromosome disentanglement driven via optimal compaction of loop-extruded brush structures](#). **Proc. Natl. Acad. Sci. USA.** 116, p24956-24965 (2019).
- [14] S Brahmachari, A Dittmore, Y Takagi, et al. [Defect-facilitated buckling in supercoiled double-helix DNA](#). **Phys. Rev. E** 97 (2), p022416 (2018).
- [15] A Dittmore, S Brahmachari, Y. Takagi, J. F. Marko, and K. C. Neuman. [Supercoiling locates mismatches](#). **Phys. Rev. Lett.** 119, 147801 (2017).
- [16] S Brahmachari*, KH Gunn*, RD Giuntoli, et al. [Nucleation of multiple buckled structures in intertwined DNA double helices](#). **Phys. Rev. Lett.** 119, 188103 (2017).
- [17] S Brahmachari and JF Marko. [Torque and buckling in stretched intertwined double-helix DNAs](#). **Phys. Rev. E** 95 (5), p052401 (2017).
- [18] [Book chapter] S Brahmachari and JF Marko. [DNA mechanics and topology](#). **Biomechanics in Oncology**, Advances in Experimental Medicine and Biology, vol 1092. Springer, Cham. (2018).

AWARDS AND FELLOWSHIPS

- | | |
|---|-------------|
| • Robert A. Welch Postdoctoral Fellow, Rice University | 2018 – 2022 |
| • Shirley Chan student travel grant sponsored by DBIO, APS | 2017 |
| • Molecular Biophysics Training Program Fellow, Northwestern University | 2014 – 2016 |
| • Innovation in Science Pursuit for Inspired Research (INSPIRE) scholarship, sponsored by the Department of Science and Technology, Government of India | 2008 – 2013 |

PROFESSIONAL SERVICE

- Member of the American Physical Society (2017 to present).
- Peer-reviewed for PRL, PRX Life, PLOS One, iScience, Journal of Royal Society Interface, Clinical and Translational Medicine, and eLife.

MENTORING AND OUTREACH

- Mentored multiple undergraduate (Benjamin Ruben) and graduate students (Leren Wang, Shubham Tripathi, Esteban Doderro-Rojas, Matheus F. Mello) leading to multiple publications

- Mentor for the NSF sponsored Frontiers in Science (FIS) program at Rice University. FIS provides summer research opportunities in biophysics for undergraduate students from underserved colleges.
- Organized an invited workshop on genome modeling at the NSF Genome organization meeting in Boston (July 2024).
- Organizer of the DBIO-sponsored focus session: DNA Mechanics and Gene Expression, at the American Physical Society March Meetings (2023 and 2024).
- Organized workshop on Quantitative Approaches to Modeling Biological Systems (January 2023) hosted by the Center for Theoretical Biological Physics, Rice University.

TEACHING EXPERIENCE

- | | |
|------|--|
| 2017 | Teaching Assistant (Northwestern University) for Quantitative Biology (IBiS-410) |
| 2016 | Teaching Assistant (Northwestern University) for Quantum Mechanics II (Phys 412-2) |
| 2015 | Teaching Assistant (Northwestern University) for Quantum Mechanics III (Phys 412-3) |
| 2014 | Teaching Assistant (Northwestern University) for General Physics Laboratory (Phys 136-1) |

SELECTED PRESENTATIONS

- | | |
|------|---|
| 2026 | Invited talk at the Institute of Mathematical Sciences, Chennai (Mar) |
| | Invited talk at the Indian Institute of Technology, Chennai (Mar) |
| | Invited talk at the Indian Institute of Technology, Kanpur, India (Feb) |
| 2025 | Invited talk at the APS March meeting, Las Vegas, US (Mar) |
| | Invited talk at Istituto Italiano di Tecnologia, Genova, IT (Apr) |
| | Invited talk at the Genome architecture and Function Workshop, Sofia, Bulgaria (Jul) |
| | Invited talk at the Department of Molecular Biophysics and Biochemistry, Yale University (Jun) |
| | Invited talk at the Department of Biochemistry and Molecular Biology, UTMB, TX (Oct) |
| 2024 | Invited talk at Tata Institute of Fundamental Research Hyderabad, India (Sep) |
| | Invited talk at the Dept. of Bioengineering, Indian Institute of Sciences, Bengaluru, India (Sep) |
| | Invited talk at Interdisciplinary challenges in non-equilibrium physics, MPIKS, Germany (Apr) |
| | Invited talk at Department of Physics, Georgia Tech, Atlanta, Georgia (Mar) |
| | Invited talk at Department of Physics, University of Alberta, Edmonton, Canada (Mar) |
| | Invited talk at Dept. of Molecular Biology, Colorado State U., Fort Collins, Colorado (Mar) |
| | Invited talk at Department of Physics, University of Florida, Gainesville, Florida (Feb) |
| 2023 | Invited talk at the International Plant and Animal Genome Conference, Perth, Australia (Sep) |
| | Invited talk at Indian Institute of Technology Bombay (IITB), Mumbai, India (Sep) |
| | Invited talk at Jawaharlal Nehru Center for Advanced Scientific Research, Bengaluru, India (Sep) |
| | Invited talk at International Center for Theoretical Sciences (ICTS), Bengaluru, India (Sep) |
| | Invited talk at National Center for Biological Sciences (NCBS), Bengaluru, India (Sep) |
| | Invited talk at the American Physical Society (APS) March Meeting, Las Vegas, US (Mar) |
| 2022 | Contributed talk at the American Physical Society March Meeting, Chicago, US (Mar) |
| 2020 | Contributed talk at the Genome Organization Workshop, held virtually at MIT, US (Jun) |
| 2019 | Contributed talk at APS March meeting, Boston, US (Mar) |
| | Poster at Gordon Research Conference on Chromosome Dynamics, Newry, US (Jun) |
| | Poster at Genome Architecture Meeting, Varna, Bulgaria (Jul) |
| 2018 | Contributed talk at the APS March meeting, Los Angeles, US (Mar) |
| 2017 | Contributed talk at the APS March meeting, New Orleans, US (Mar) |