

Dr. Sagnik Chakraborty

85/3B Lakshmi Narayan Motilal Road, Kolkata, West Bengal 700061

+91-6290785879

sagnik@vectorideas.com | sagnik.chakraborty@gmail.com

<https://vectorideas.com/about-us/> | www.linkedin.com/in/chakrabortysagnik

<https://www.youtube.com/channel/UCrjYA8tABsQOwzL3Ye0gRjw>

Work Experience

Co-founder, Faculty & Mentor | March 2020-Present | Vector Educational & Consultancy Services

- Co-founded Vector for best-in-class physics education from secondary to master's level
- Mentored students to be efficient and effective problem solvers in physics
- Fostered adaptive learning, curiosity, and independent thinking
- Managed technical as well as administrative roles
- Honored to have received excellent student feedback

Yield Engineer | May 2018-February 2020 | Intel Corporation

- Owned and led the development, stability, improvement, and performance functions of extremely advanced characterization instruments in Semiconductor Physics
- Used expertise of Experimental Physics, Optics, Statistical Analysis acquired during PhD to troubleshoot issues gating product yield and solve them efficiently, driven by solid models

Education

PhD Physics | March 2018 | University of Illinois at Chicago (UIC)

- PhD in Physics (March 2018),
- Core coursework: Classical Mechanics, Quantum Mechanics, Electrodynamics, Statistical Mechanics
- Elective coursework: Solid State Physics, Transmission Electron Microscopy, Molecular Biophysics, Computational Biophysics, Programming in MATLAB, Statistics and Machine Learning

Master of Science, Physics (M.Sc.) | 2011 | Indian Institute of Technology Madras (IITM)

- Elective coursework: Advanced Electronics, Mathematical Methods in Physics, Experimental High Energy Physics, Computational methods in Physics, Laser Applications

Bachelor of Science, Physics (B.Sc.) | 2009 | St. Xavier's College, University of Calcutta

- Physics Honors with 1st class
- General coursework: Mathematics, Computer Science

Research Experience

Post-doctoral Research Associate at Ansari Biophysics Lab, UIC (April 2018-May 2018)

- Trained graduate students in the lab pursuing research in direction set forth in PhD thesis

Research Assistant at Ansari Biophysics Lab, UIC (June 2014 – March 2018)

- Performed interdisciplinary and collaborative research employing strong foundation of techniques and analysis methodologies in Physics to address a central question in the life sciences
- Developed a new fluorescence-based approach to study DNA dynamics and fluctuations that are central for its interactions with proteins
- Technical skills: Fluorescence Lifetime Spectroscopy, Time-Correlated-Single-Photon-Counting, Ultrafast Laser Temperature-Jump (T-jump) Spectroscopy, Steady State Fluorescence Spectroscopy, Fluorescence Resonant Energy Transfer (FRET), Maximum Entropy Analysis Algorithm, Molecular Dynamics Simulations, Transmission Electron Microscopy, Scanning Electron Microscopy
- Thesis title: **Visualizing spontaneous DNA dynamics and its role in mismatch recognition by damage repair protein Rad4**
- Significant results from thesis research are summarized as follows:
 - Conformational distortions in matched/mismatched DNA including bending deformations in DNA minicircles can be detected by tcO-tcniro FRET pair
 - Mismatched DNA constructs exhibit deviations from canonical B-DNA conformations even in the absence of Rad4; consistent with MD simulations. Distortions are amplified in specific Rad4 substrates.
 - Rad4-binding significantly alters the conformational distribution of mismatched DNA to more distorted conformations, but not matched DNA in both linear and DNA minicircles, complexes are dynamic
 - Rates of intrinsic conformational dynamics in mismatched DNA can be measured by ultrafast laser Temperature-jump spectroscopy with the specific Rad4 substrate exhibiting ~3-5-fold faster kinetics compared to the non-specific substrate
 - Bending deformations in mismatched DNA minicircles appear to enhance Rad4 binding specificity
 - Taken together the results provide strong evidence for conformational selection in DNA mismatch recognition

CPLC summer school at University of Illinois at Urbana Champaign (July 2016)

- Part of 8-member team comprising of graduate students and post-doctoral fellows hosted by the Center for Physics of Living Cells, UIUC
- Performed single molecule FRET experiments and all atom MD simulations in the Physics of DNA module in the genome biology track of this National Science Foundation funded “Frontiers in Physics” program

Junior Research Fellow at Saha Institute of Nuclear Physics, India (August 2011 – July 2012)

- Employed C++ and ROOT programming to analyze data from high energy physics experiments
- Project: A comparative study of Electromagnetic shower shape variables for photons, charged pions and neutral pions in CMS Electromagnetic Calorimeter

Master of Science, Physics M.Sc. candidate at Indian Institute of Technology Madras (August 2010 – April 2011)

- Modeling phenomenon in high energy physics such as decays and resonances
- Thesis topic: Study of the strong phase parameters of the decay $D^0 \rightarrow K_s^0 \pi^+ \pi^- \pi^0$ and their use in CP violating parameter in the Standard Model

Research Publications

- D. Paul, H. Mu, A. Tavakoli, Q. Dai, S. Chakraborty, C. He, A. Ansari, S. Broyde, J-H. Min, **Impact of DNA sequences on DNA ‘opening’ by the Rad4/XPC nucleotide excision repair complex**, DNA Repair, 107, 103194, 2021
- D. Paul, H. Mu, A. Tavakoli, Q. Dai, X. Chen, S. Chakraborty, C. He, A. Ansari, S. Broyde, J-H. Min, **Tethering-facilitated DNA ‘opening’ and complementary roles of β -hairpin motifs in the Rad4/XPC DNA damage sensor protein**, Nucleic Acids Research, 48 (21), 12348-12364, 2020
- S. Chakraborty, P. J. Steinbach, D. Paul, J-H. Min, A. Ansari, **Enhanced spontaneous DNA twisting/bending fluctuations unveiled by fluorescence lifetime distributions promote mismatch recognition by DNA-repair protein Rad4/XPC**, Nucleic Acids Research, 46 (3), 1240-1255, 2017

Conference Presentations

- S. Baral, S. Chakraborty, D. Paul, J-H. Min, A. Ansari, **Rapid (Sub-20 μ S) intrinsic DNA Fluctuations at Damaged Sites Implicated in Stalling Rad4/XPC DNA Repair Protein During Damage Sensing**, 65th Annual Meeting of the Biophysical Society 2021
- S. Chakraborty, S. Baral, D. Paul, P.J. Steinbach, P.A. Rice, J-H. Min, A. Ansari, **Evidence for conformational capture mechanism for damage recognition by DNA repair protein Rad4**, 63rd Annual Meeting of the Biophysical Society 2019
- S. Chakraborty, D. Paul, J-H. Min, P.A. Rice, A. Ansari, **Using minicircles to test the role of DNA bending in mismatch recognition by Rad4/XPC**, 63rd Annual Meeting of the Biophysical Society 2019
- S. Chakraborty, D. Paul, S. Baral, H. Mu, P.J. Steinbach, S. Broyde, J-H. Min and Anjum Ansari, **Visualizing spontaneous DNA dynamics and its role in mismatch recognition by damage recognition protein Rad4**, 62nd Annual Meeting of the Biophysical Society 2018
- S. Chakraborty, P.J. Steinbach, D. Paul, J-H. Min, A. Ansari, **Does enhanced dynamics in damaged DNA signal “distress” to a repair protein?** Annual March Meeting of the American Physical Society 2017
- S. Chakraborty, **Twisting/unwinding fluctuations in DNA reported by novel FRET probes**, Physics Fest, University of Illinois at Chicago 2016
- S. Chakraborty, X. Chen, Y. Velmurugu, P. Slogoff-Sevilla, P.J. Steinbach, J-H. Min, A. Ansari, **Dynamics of DNA damage recognition by Rad4/XPC DNA nucleotide excision repair complex**, 60th Annual Meeting of the Biophysical Society 2016
- S. Chakraborty, X. Chen, Y. Velmurugu, P. Slogoff-Sevilla, P.J. Steinbach, J-H. Min, A. Ansari, **DNA conformational distribution and dynamics during search and recognition of damaged sites by DNA repair protein Rad4/XPC**, Gibbs Conference on Biological Thermodynamics 2015

Teaching experience

- Mentored students across secondary to master's level to be efficient problem solvers in physics, kindling curiosity and interest in the subject at Vector
- Instructed classroom and lab based undergraduate Physics courses with excellent feedback from students at UIC

Honors and awards

- PhD candidate Travel Award awarded by College of Liberal Arts and Sciences, UIC (February 2017 and January 2016)
- Science Communication workshop ComSciCon Chicago 2016 attendee
- Debesh Kamal Scholarship for pursuing research abroad awarded by Ramakrishna Mission Institute of Culture, Kolkata, India (July 2012)
- National Eligibility Test & Junior Research Fellowship in Physics awarded by Human Resource Development Group, Council of Scientific and Industrial Research, Government of India (July 2011)
- Institute Junior Research Fellowship awarded by Saha Institute of Nuclear Physics, Kolkata, India (July 2011)

Test scores

- National Eligibility Test, **AIR: 55** (CSIR) out of approx. 20,000 test takers (2011)
- TOEFL iBT: 110 on a scale of 120 (2010)
- IIT JAM: **AIR: 91** out of approx. 5000 test takers (2009)
- Indian School Certificate Examination: 94% (I.S.C. 2005)

Volunteering and Outreach

- Served as a resource person for the state level special lecture cum career guidance programme on "Physics as a subject of higher education and career opportunities", MDM, Kolkata (2021)
- Volunteered for demonstrating experiments to Curie High School students visiting Ansari and Min labs at UIC for field trips (May 2017, May 2016)
- Represented UIC Physics in Science Communication Workshop, ComSciCon Chicago (2016)
- Coordinated Physics qualifier examination workshops for 1st and 2nd year graduate students at UIC (2016, 2015)
- Served as a Science Fair judge with fellow graduate students and faculty from UIC Physics at Poe Elementary School evaluating science projects by 5th and 6th graders (2013)
- Developed experiments for General Physics laboratory in M.Sc. Curriculum at Indian Institute of Technology Madras (2011)
- Organized 'Ramanessence', a science fest at Department of Physics, Indian Institute of Technology Madras (2010)
- Authored article titled 'Beyond the Horizons-A taste of the infinite' published in the annual college magazine of St.Xavier's College, Kolkata, 'The Xaverian' (2009)