Anirban Sain

Address: Department of Physics, IIT Bombay, Powai, Mumbai 400076, India.
Phone: +91-22-2576-7553, Cell: 9820368553, Email: asain@phy.iitb.ac.in.
Web: http://www.phy.iitb.ac.in/en/employee-profile/anirban-sain

Research areas (Theoretical Soft Matter and Biophysics)
Bio-physics: Dynamic processes in the Cell (cell division, endo/exo-cytosis).
Soft Matter Physics: Bio-membranes, bio-polymers and nematic liquid-crystals.
Grain dynamics in polycrystals: MD and Phase field simulations.

Professional Experience
Professor, Indian Institute of Technology (IIT)-Bombay,India; since Oct,2014.
Guest Scientist, Max Planck Inst. for physics of complex systems, Dresden; June,2010-June,2011.
Associate professor, Indian Institute of Technology (IIT)-Bombay,India; 2009-2014.
Assistant professor, Indian Institute of Technology (IIT)-Bombay,India; 2004-08.
Postdoctoral Fellow, McGill University, Canada; 2003, with Prof. Martin Grant.
Postdoc., University of Waterloo, Canada, 2002, with Prof. Jeff Z.Y.Chen.
Industrial Research scientist, Hindustan Lever Research Center, Mumbai,India, 2001.
Postdoc., Simon Fraser University, Canada; 1999-2000, with Prof. Michael Wortis.

Education
Integrated M.Sc.- Physics, Indian Institute of Technology(IIT)-Kanpur, India, 1988-93.
PhD- IISc Bangalore, 1999, *Thesis:* Multiscaling in Fluid turbulence. *Guide:* Prof. Rahul Pandit.

Publication

1. *Dynamic surface patterns on cells*, M.Chatterjee and A. Sain, J. Chem.Phys. **156**, 084117 (2022).
2. *Dynamics and stability of the contractile actomyosin ring in the cell*, M. Chatterjee, A. Chatterjee, A. Nandi, and A. Sain, **Phys. Rev. Lett. 128**, 068102 (2022).
3. *Cytoplasmic streaming in C. elegans: forces that drive oogenesis*, V.V. Menon, M.M. Inamdar and A. Sain, **Euro. Phys. Lett. 135**, 24003 (2021).
4. *Deformation of membrane vesicles due to chiral surface proteins*, A. Behera, G. Kumar, Sk A. Akram and A. Sain, Soft Matter, **17**, 7953 (2021).
5. *Chiral molecules on curved colloidal membranes*, Sk A. Akram, A. Behera, P. Sharma and A. Sain, Soft Matter, **16**, 10310 (2020).
6. *Poiseuille Flow of Soft Polycrystals in 2D Rough Channels*, T. Sarkar, P. Chaudhuri, and A. Sain, **Phys. Rev. Lett. 124**, 158003 (2020).
7. *Non-Gaussian subdiffusion of single-molecule tracers in a hydrated polymer network*, R.K. Singh, J. Mahato, A. Chowdhury, A. Sain, and A. Nandi, J. Chem. Phys. **152**, 024903 (2020).
8. *Confined filaments in soft vesicles - case of sickle red blood cells*, A. Behera, G. Kumar and A. Sain, Soft Matter, **16**, 421 (2020).
9. *Tubulation pattern of membrane vesicles coated with bio-filaments*, Gaurav Kumar, N. Ramakrishnan, and A. Sain, Phys. Rev. E **99**, 022414 (2019).
10. *Grain size distribution in sheared polycrystals*, T. Sarkar, S. Biswas, P. Chaudhuri and A. Sain, Phys. Rev. M. **1**, 070601 (**Rapid Comm.**) (2017).
11. *Asymmetric flows in the intercellular membrane during cytokinesis*, V.V. Menon, S.S. Soumya, A. Agarwal, S.R. Naganathan, M.M. Inamdar and A. Sain, Biophys. J. **113**, 2787 (2017).
12. *Curvature Instability of Chiral Colloidal Membranes on Crystallization*, L. Saikia, T. Sarkar, M. Thomas, V. A. Raghunathan, A. Sain, and P. Sharma. **Nat. Commun. 8**, 1160 (2017).
13. *Shape transitions during clathrin-induced endocytosis*, G. Kumar and A. Sain , Phys. Rev. E. **94**, 062404 (2016) .
14. *Dynamic force balances and cell shape changes during cytokinesis*, A. Sain, M.M. Inamdar and F. Jülicher **Phys. Rev. Lett. 114**, 048102 (2015).

15. *How helix-coil transition influences translocation of a single stranded DNA and kinetics of its fluctuation inside the channel*, Kulveer Singh and Anirban Sain, **Euro. Phys. Lett. 104**, 18007 (2013) (**Editors Choice**).
16. *Micromechanics of emergent patterns in plastic flows*, Santidan Biswas, Martin Grant, Indradev Samajdar, Arunanshu Haldar and Anirban Sain, **Sci. Rep. 3**, 2728 (2013). (An **NPG** Jl.)
17. *Plasticization of Poly(vinylpyrrolidone) Thin Films under Ambient Humidity: Insight from Single-Molecule Tracer Diffusion Dynamics*, S. Bhattacharya, D.K. Sharma, S. Saurabh, S. De, A. Sain, A. Nandi and A. Chowdhury, J. Phys. Chem. B **117**, 7771 (2013).
18. *Stretching force dependent transitions in single stranded DNA*, Kulveer Singh, Surya Kanta Ghosh, Sanjay Kumar and Anirban Sain, **Euro. Phys. Lett.**, **100**, 68004 (2012).
19. *From chemosensing in bacteria to practical biosensors*,Surya K. Ghosh, Tapanendu Kundu and Anirban Sain, Phys. Rev. E., **86**,051910 (2012).
20. *Stuttering Min oscillations within Escherichia coli bacteria: a stochastic polymerization model*, S. Sengupta, J. Derr, A. Sain and A.D. Rutenberg, Phys. Biol., **9**, (2012) 056003, (2012).
21. *High electron mobility through the edge states in random networks of c-axis oriented wedge-shaped GaN nanowalls grown by molecular beam epitaxy*, H. P. Bhasker, S. Dhar, A. Sain, M. Kesaria, and S. M. Shivaprasad, **Appl. Phys. Lett**, **101**, 132109 (2012).
22. *Force generation in bacteria without nucleotide-dependent bending of cytoskeletal filaments*, Biplab Ghosh and Anirban Sain, Phys. Rev. E., **83**, 051924 (2011).
23. *Coarsening in polycrystalline material using Quaternions*, Santidan Biswas, Indradev Samajdar, Arunansu Haldar and Anirban Sain, J. Phys.: Condens. Matter, **23**,072202 (2011) (Fast track comm.) (included in **IOP select**).
24. *Effect of hydrodynamic interaction on polymeric tethers*, Suman G. Das, Dimitri Pescia, Mithun Biswas and Anirban Sain, Phys. Rev. E. **82**, 041910 (2010). Highlighted by **Nature-India**.
25. *Effect of Intrinsic Curvature on Semiflexible Polymers*, Surya K. Ghosh, Kulveer Singh and Anirban Sain, Phys. Rev. E. **80**, 051904 (2009).
26. *Predicting the coherence resonance curve using a semianalytic treatment*, Santidan Biswas, Dibyendu Das, Punit Parmananda and Anirban Sain, Phys. Rev. E **80**, 046220 (2009).
27. *Self-organization of the MinE ring in subcellular Min oscillations*, Julien Derr, Jason T. Hopper, Anirban Sain and Andrew D. Rutenberg, Phys. Rev. E **80**, 011922 (2009).
28. *Origin of contractile force during cell division of bacteria*, Biplab Ghosh and Anirban Sain, **Phys. Rev. Lett.**, **101**, 178101, (2008). Highlighted by **Nature-India**. http://www.nature.com/nindia/2008/081111/full/nindia.2008.317.html.
29. *Effect of hydrodynamic interaction on partially stretched polymers*, Anirban Sain, Phys. Rev. E, 77, 061919 (2008).
30. *Microscopic strain distribution profile in a 1-D chain during rupture - a many body Kramers calculation*, Anirban Sain, Cristiano Dias, and Martin Grant, Phys. Rev. E, **74**, 046111 (2006).
31. *Review of "Resistance to Hydriding in Zirconium - An Emerging Possibility"*, K.V. Mani Krishna, A. Sain, I. Samajdar, G.K. Dey, D. Srivastava, S. Neogi, R. Tiwari and S. Banerjee, Acta Materialia, **54**, 4665 (2006).
32. *Effect of base stacking interaction in heterogeneous single stranded DNA*, Anirban Sain, Bae-Yeun Ha, and Jeff.Z.Y. Chen, Physica-A, **369**, 679, (2006).
33. *Phase ordering kinetics of a binary fluid mixture : the inertia dominated regime*, Anirban Sain, and Martin Grant **Phys. Rev. Lett.**,**95**, 255702, (2005).
34. *The Influence of tether dynamics on forced Kramers escape from a kinetic trap*, Anirban Sain and Michael Wortis, Phys. Rev. E, **70**, 031102, (2004).
35. *Chain persistency in single stranded DNA*, Anirban Sain, Bae-Yeun Ha, Heng-Kwong Tsao and Jeff.Z.Y. Chen, Phys. Rev. E, **69**, 061913, (2004).
36. *Langevin equation for the motion of a Brownian particle in an ideal gas environment*, Rangan Lahiri(late), Arvind and Anirban Sain, Pramana: J. Phys., **62**, 1015 (2004).
37. *Counterion distribution and charge-fluctuation-interactions between like-charged fluid membranes*, Anirban Sain and Bae-Yeun Ha, Physica A **320**, 67 (2003).
38. *Multiscaling in the Randomly Forced and Conventional Navier-Stokes Equations*, Anirban Sain and Rahul Pandit, Physica A **270**, 190 (1999)

39. *Large momentum expansions in fluid turbulence*, J. K. Bhattacharjee and Anirban Sain, Physica A **270**, 165 (1999)
40. *Extended self-similarity and dissipation range dynamics of three-dimensional turbulence*, Anirban Sain and J. K. Bhattacharjee, Phys. Rev. E **60**, 571 (1999).
41. *Multiscaling in randomly stirred fluid model for turbulence*, Anirban Sain, Manu and Rahul Pandit, **Phys. Rev. Lett. 81**, 4377 (1998).
42. *Multiscaling in models of Magnetohydrodynamic turbulence*, Abhik Basu, Anirban Sain, Sujan K.Dhar and Rahul Pandit, **Phys. Rev. Lett. 81**, 2687 (1998).
43. *Inertial and dissipation range assymptotics in fluid turbulence*, Sujan Dhar, Anirban Sain and Rahul Pandit, **Phys. Rev. Lett. 78**, 2964 (1997).
44. *Some recent advances in the theory of homogeneous and isotropic fluid turbulence*, Sujan K. Dhar, Anirban Sain, Ashwin Pande, and Rahul Pandit, *Pramana: J. Phys. (Special issue on Nonlinearity and Chaos in Physical Sciences)*, **48**, 325 (1997).
45. *Scaling of resistance in the 2-dimensional Anderson Tight Binding model of disordered systems-2*, Anirban Sain and Abhijit Mookerjee, **Mod. Phys. Lett. B 8** 195(1994).

Teaching Experience

Soft Matter Physics (4th year undergrad, MSc - elective course): 2018, 2019 (current semester).
Clasical Mechanics (2nd yr undergrad): 2015-17.
Advanced Statistical Physics (4th yr, undergrad and MSc): Fall 2011-13.
Electricity and Magnetism (1st yr, undergrad): Spring 2008-09.
Nonlinear Dynamics (4th yr, undergrad): Spring 2006,2007.
Statistical Physics (4th yr, undergrad and MSc): Spring 2004-06,2009,2015-17.
Continuum Mechanics (3rd yr, undergrad): Fall 2004-05,2007; Spring 2010,2012-13.
Classical Mechanics (Honors, 4th yr undergrad): Spring 2003,McGill University, Canada.

Awards

BUTI foundation award (2008), given by Indian Physics Association.
IRCC (IIT Bombay) Research paper award (2013).