

Dr. Amit Kumar Bhattacharjee

CONTACT INFORMATION

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EDUCATION

- Ph.D. (Theoretical Physics), **Institute of Mathematical Sciences**, Chennai, India ('04-'10) [Registered: 01/09/06, Submitted: 28/02/10, Defended: 05/12/11, Awarded: 15/03/13].
- M.Sc. (Physics), **Indian Institute of Technology**, Kharagpur, India ('02-'04).
- B.Sc. (Physics Honours), **B.B. College**, University of Burdwan, India ('99-'02).
- X^{th} & XI^{th} , DVC HS School, **W.B.B.S.E.** & **W.B.C.H.S.E.**, India ('97,'99).

PROFESSIONAL EXPERIENCE

- Assistant Professor, **Asutosh College (University of Calcutta)**, Kolkata, India ('17-), & DST-INSPIRE Faculty, **Asutosh College**, Kolkata, India ('17-).
- DST-INSPIRE Faculty, **Indian Institute of Science**, Bangalore, India ('15-'17, 1.75 years).
- Visiting Researcher, **Institute of Mathematical Sciences**, Chennai, India ('15, 3 months).
- Assistant Researcher in **Applied Mathematics**, **Courant Institute**, New York, USA ('13-'15).
- Helmholtz-University Young Investigator, **University of Konstanz**, Germany ('12-'13).
- DLR-DAAD Post Doctoral Fellow, **German Aerospace Center** Köln, Germany ('10-'12).

HONOURS AND AWARDS

- Ranked 6th in *College Service Examination*, West Bengal State ('17).
- Work featured in **Science Letter**: “**Researchers from IISc report findings in Science**” ('17),
- *DST-INSPIRE* award from *INSA-DST*, Govt. of India ('15-'20).
- Work selected for “**Francois Naftali Frenkiel Award**” by *Physics of Fluids* ('15), &
- Featured in **Phys.org** highlighting “**Mathematicians model fluids at the mesoscale**”.
- *Research Scientist*, Courant Institute of Math. Sciences, New York University, USA ('13).
- Work selected for “**Special Topics in Glass Transition**” issue by *J. Chem. Phys.* ('13).
- “*Helmholtz-University Young Investigator*” at University of Konstanz, Germany ('12).
- “*DLR-DAAD*” award from German Aerospace Centre Köln, Germany ('10).
- All India rank 128th in *Joint Entrance Screening Test [JEST]* ('04).
- All India rank 117th (95.79 percentile) in *Graduate Aptitude Test in Engineering [GATE]* ('04).
- Awarded CSIR-JRF & LS in **Joint CSIR-UGC JRF (NET) & LS**, Govt. of India ('04).
- *DST-Summer Research* fellow at SN Bose Centre for Basic Science, Kolkata, India ('03).
- *National Scholarship* from **Department of Education**, Govt. of India ('03).
- All India rank 6th in *M.Sc. Entrance Test*, IIT Kharagpur ('02).
- “*University Silver Medal*”, 2nd rank in **University of Burdwan**, India ('02).
- DVC 1st prize for performance in XII^{th} Board Examination ('99).
- DVC 2nd prize for performance in X^{th} Board Examination ('97).

RESEARCH EXPERTISE

Soft Condensed Matter Theory & Computation: (a) **Field theoretic methods** ($\mu\text{m-m}, \mu\text{s-hr}$): (i) Fluctuating hydrodynamics with Projection methods, (ii) hybrid Lattice-Boltzmann method, (iii) Landau-de Gennes energy landscape method, (b) **Particle based methods** (pm-nm, ps-ns): (iv) Molecular dynamics simulation, (v) Kinetic monte carlo methods, (c) **Multiscale methods**: (vi) Dissipative particle dynamics simulations, (vii) High performance computation (HPC).

PEER REVIEWED
PUBLICATIONS

[h-index: 6,
i10-index: 6, Total
Citations: 115, Total
impact factor (IF):
29.971 (source:
Google Scholar)]

LIQUID CRYSTALS:

- **A.K. Bhattacharjee.** Controlling motile disclinations in a thick nematogenic material with an electric field, *Nature Scientific Reports*, **8**, 2517 (2018), [citation:0, pages:18, ISSN:2045-2322, IF:4.259].
- **A.K. Bhattacharjee.** Stochastic kinetics reveal imperative role of anisotropic interfacial tension to determine morphology and evolution of nucleated droplets in nematogenic films, *Nature Scientific Reports*, **7**, 40059 (2017), (Highlighted in “**Review Article**” and featured in “**Science Letter**”), [citation:3, pages:17, ISSN:2045-2322, IF:4.259].
- **A.K. Bhattacharjee**, Gautam I. Menon and R. Adhikari. Fluctuating dynamics of nematic liquid crystals using the stochastic method of lines, *J. Chem. Phys.* **133**, 044112 (2010), [citation:22, pages:7, ISSN:1089-7690, IF:2.965]. [Contribution: G.I.M. & R.A. designed the project, A.K.B. developed the code &, with R.A., wrote the paper.]
- S.M. Kamil, **A.K. Bhattacharjee**, R. Adhikari and Gautam I. Menon. The isotropic-nematic interface with an oblique anchoring condition, *J. Chem. Phys.* **131**, 174701 (2009), [citation:6, pages:10, ISSN:1089-7690, IF:2.965]. [Contribution: R.A. & G.I.M. designed the project, A.K.B. & R.A. developed MOL and Spectral code. S.M.K. & G.I.M. performed analytics. G.I.M. wrote analytical section and A.K.B. & R.A. wrote numerical section of the paper.]
- S.M. Kamil, **A.K. Bhattacharjee**, R. Adhikari and Gautam I. Menon. Biaxiality at the isotropic - nematic interface with planar anchoring, *Phys. Rev. E* **80**, 041705 (2009), [citation:13, pages:5, ISSN:2470-0053, IF:2.366]. [Contribution: Same as previous.]
- **A.K. Bhattacharjee**, Gautam I. Menon and R. Adhikari. Numerical method of lines for the relaxational dynamics of nematic liquid crystals, *Phys. Rev. E* **78**, 026707 (2008), [citation:25, pages:10, ISSN:2470-0053, IF:2.366]. [Contribution: G.I.M. & R.A. designed the project, A.K.B. & R.A. developed MOL code and, together with G.I.M., wrote the paper.]

DENSE COLLOIDS:

- **A.K. Bhattacharjee.** Stress-structure relation in dense colloidal melt under forward and instantaneous reversal of shear. *Soft Matter (Royal Society of Chemistry)*, **11**, 5697 (2015), [citation:1, pages:8, ISSN:1744-6848, IF:3.889].
- F. Frahsa, **A.K. Bhattacharjee**, J. Horbach, M. Fuchs and Th. Voigtmann. On the Bauschinger effect in supercooled melts under shear: results from MCT and molecular dynamics simulation, *J. Chem. Phys.* **138**, 12A513 (2013), (Appeared in “**Special Topics in Glass Transition**”), [citation:19, pages:14, ISSN:1089-7690, IF:2.965]. [Contribution: T.V. designed the project and performed Maxwell-model calculation. A.K.B. & J.H. developed MD, DPD code for Yukawa and WCA colloids and A.K.B. performed DPD simulation, F.F. & M.F. performed MCT calculations. A.K.B. wrote numerical section, M.F. & T.V. wrote theoretical section of the paper.]

MULTISPECIES LIQUIDS & REACTIVE GASES:

- **A.K. Bhattacharjee**, K. Balakrishnan, A. L. Garcia, J.B. Bell and A. Donev. Fluctuating hydrodynamics of multispecies reactive mixtures. *J. Chem. Phys.*, **142**, 224107 (2015), [citation:16, pages:22, ISSN:1089-7690, IF:2.965]. [Contribution: K.B. developed non-reactive code with A.L.G. & J.B.B. for different project. A.D. designed the project and A.K.B. developed SSA, CLE & LME codes to couple with non-reactive code and performed comparison study. A.L.G. & J.B.B. performed pattern formation study. A.D. wrote the paper].
- A. Donev, A.J. Nonaka, **A. K. Bhattacharjee**, A. L. Garcia and J. B. Bell. Low Mach Number Fluctuating Hydrodynamics of Multispecies Liquid Mixtures. *Physics of Fluids* **27**, 037103 (2015), (Selected for “**Francois Naftali Frenkiel Award**” and featured in “**Phys.org**”), [citation:13, pages:34, ISSN:1089-7666, IF:2.232]. [Contribution: A.D. & J.B.B. designed the project. A.K.B. performed the analytics and devised code for density equations. A.J.N. coupled velocity solver. A.K.B. performed giant-fluctuation and Soret-effect studies. A.J.N., A.L.G. and J.B.B. performed instability studies. A.D.

wrote the paper.]

- INVITED REVIEWER
- Journal reviewer: (i) **Soft Matter (RSC)**, (ii) **Physical Review**, (iii) **Reviews of Modern Physics**.
 - Proposal reviewer of **Netherlands Organisation for Scientific Research (NWO)**.
 - Biographical interview by **Deutsche Welle** at DLR, Germany.

TEACHING /
MENTORING
EXPERIENCE

Asutosh College, University of Calcutta

- **Environment and Energy** for 1st year Environemnt Science (M.Sc.) (Spring'18).
- **Computer Laboratory** for 3rd year B.Sc. Physics (Honours and General) (Fall'17).
- **Waves and Oscillations & Communication Theory** for three-year B.Sc. physics (General) (Fall'17).
- **Thermal Physics I, Thermal Physics II & Solid State Physics** for three-year B.Sc. physics (Honours), (Fall'17).

Indian Institute of Science, Bangalore

- Mentored a Ph.D. student (Name: Pranab J. Bhuiyan) in a project “**Emergent structures in colloidal membranes**” (Oct'15-Feb'16).
- Mentored a Summer student (Name: Anuj Shetty, Engineering Physics, IIT Bombay) in a project “**Nematic rheochaos in two spatial dimensions**” (May-July,'16).

Universität Konstanz

- Mentored M.Sc. student (Name: Martin Evers) towards “**Ausarbeitung**” in the course **Materie und Ordnung** (Spring'12).
- Bilingual teaching assistant and grader (in German and English) in the course **Classical Field Theory** (Fall'12).

INVITED SPEAKER

- Complex Fluids - CompFlu-2017, IIT Madras, India (December 2017).
- Complex Fluids - CompFlu-2016, IIIT Hyderabad, India (December 2016).
- TSU, J.N. Centre for Advanced Scientific Research, Bangalore, India (March 2016).
- TUE-CMS, S.N.Bose National Centre for Basic Sciences, Kolkata, India (January 2016).
- Department of Physics, Indian Institute of Technology, Delhi, India (January 2016).
- 3rd Soft Matter Young Investigator Meet, Pondicherry, India (December 2015).
- Journal Club, The Institute of Mathematical Sciences, Chennai, India (July 2015).
- Indian Institute of Science Education and Research, Bhopal, India (April 2015).
- School of Physical Sciences, Jawaharlal Nehru University, New Delhi, India (April 2015).
- Indian Institute of Science Education and Research, Mohali, India (April 2015).
- Workshop Bartholomäberg, Vorarlberg, Austria (August 2012).
- Konstanzer Kolloidal Klub, Universität Konstanz, Konstanz, Germany (June 2012).
- Fachbereich Physik, Universität Konstanz, Konstanz, Germany (February 2012).
- Institut für Theoretische Physik, Heinrich-Heine-Universität Düsseldorf, Germany (October 2011).
- Institut für Materialphysik im Weltraum, DLR Köln, Germany (April 2011).
- Journal Club, The Institute of Mathematical Sciences, Chennai, India (April 2009).
- Mahabaleswar Seminar on Modern Biology, TIFR, Mumbai, India (January 2008).

CONFERENCES
ATTENDED /
POSTERS
PRESENTED

- Indian Statistical Physics Community Meeting, ICTS Bangalore, India (2016).
- Growing Length Scale Phenomena, JNCASR Bangalore, India (2015).
- Kurt Binder honorary workshop, Johannes Gutenberg-Universität Mainz, Germany (2012).
- SimBioMa2011, Universität Konstanz, Konstanz, Germany (2011).
- School on Nonlinear Response to Vitrification, Universität Konstanz, Konstanz, Germany (2011).
- Glastag, Universität Marburg, Marburg, Germany (2011).
- 8th Liquid Matter Conference, Universität Wien, Vienna, Austria (2011).
- SERC School cum Symposium on Rheology of Complex Fluids, IIT Madras, India (2010).
- Disorder, Complexity and Biology II, BHU Varanasi, India (2009).
- The Interface of Life, IIT Madras, India (2008).

- School on Understanding Molecular Simulation, JNCASR Bangalore, India (2007).
- Assembly Organization and Propulsion in Complex Systems, IIT Madras, India (2007).
- SERC School on Nonlinear Dynamics and Pattern Formation, IACS Kolkata, India (2006).
- Common Trends in Traffic: Physical and Computational Models in Transportation Engineering and Biological Sciences, IIT Kanpur, India (2006).
- Discussion Meeting on Statistical Physics, Vardanahalli, India (2005).

OUTREACH
ACTIVITY

- Seminar on “Computational Science” at B.B.College, Asansol (December 2010).
- Question-Answer session with students of X^{th} std. at DVC High School, Maithan (April 2015).

COMPUTATIONAL
SKILLS

Languages : C, Fortran (77,90/95), Python (Numpy, Scipy, Matplotlib), Unix shell-scripts.

Libraries :

- GSL, Numerical Recipes in C.
- BoxLib, PETSc, LAPACK, HDF5 and dXHDF5.
- LAMMPS and PyMol.
- Matlab (including DMSuite, IDL and Spectral Methods), Mathematica.

Visualizations: Paraview, OpenDX, Ovito, VisIt.

Familiarity with Operating Systems: Linux, Sun, Cray, Blue-Gene.

Familiarity with version control: GIT and SVN.

High Performance Computation: Computations with (i) 80 million degrees of freedom (DOF) on 1024 node clusters at IISc Chennai, (ii) 7 million DOF on 64 node cluster at Courant Institute, New York and, (iii) 100 million DOF on CRAY system and smaller clusters (Rahman, Tyrone, Fermi etc.) at IISc Bangalore.

DEVELOPED CODES

- *Stochastic Electrodynamics* solver in 3D for Maxwell-GLdG integrator (explicit) using PETSc.
- Hybrid Gay-Berne/Aasakura-Oosawa NEMD for nematic-polymer raft using LAMMPS.
- Kinetic Monte Carlo, GENERIC formalism (LME) and Chemical Langevin Equation (CLE) integrator for dimerization reaction, Schlögl reaction and Baras-Pearson-Mansour model.
- Compressible fluctuating hydrodynamics (CFHD) integrator with *Law of mass action* on 3D collocative grid using BOXLIB.
- *Low-Mach* (incompressible) fluctuating hydrodynamics (IFHD) integrator on 3D staggered grid using BOXLIB.
- Dissipative particle dynamics with Lees-Edwards boundaries for WCA/Yukawa forces in three dimensions.
- Stochastic Method of Lines nematic integrator using GSL and PETSc.
- Method of Lines nematic explicit/implicit integrator using GSL, Numpy-Scipy and Spectral Collocation Method.
- Data-parallel (cross platform) Allen-Cahn explicit/implicit solver using PETSc.
- ADI operator splitting integrator to study patterns in motor-microtubule mixtures.

EXTRACURRICULAR
ACTIVITY

- 5th year (Sangeet Visharad) in Tagore songs on Hawaiian Guitar, Nikhil Bharat Sangeet Samiti, Kolkata, 1999.
- 5th year (Chitra Visharad) in Art, Pracheen Kala Kendra, Chandigarh, 1999.
- Nature Photography & Birding (<https://500px.com/amitbhattacharjee>).
- Travel Blogs (<https://www.tripoto.com/profile/amitbhattacharjee>).