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} & XII^{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 6^{th} 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 128^{th} in *Joint Entrance Screening Test* [**JEST**] ('04).
- All India rank 117^{th} (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 6^{th} in *M.Sc. Entrance Test*, IIT Kharagpur ('02).
- *"University Silver Medal"*, 2^{nd} rank in **University of Burdwan**, India ('02).
- DVC 1^{st} prize for performance in XII^{th} Board Examination ('99).
- DVC 2^{nd} prize for performance in X^{th} Board Examination ('97).

Research Expertise

Soft Condensed Matter Theory & Computation: *(a)* **Field theoretic methods** (μm-m,μs-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**, *Sole Author*♣*:* **3**, *Total Citations:* **119**, *Total impact factor (IF):* **31.231** *(source: Google Scholar)]*

LIQUID CRYSTALS:

- ♣**A.K. Bhattacharjee**. Controlling motile disclinations in a thick nematogenic material with an electric field [Submitted at *Nature Scientific Reports*, **pages:17, 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:3.798**].
- 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 deviced 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

- Teaching courses on **Computer Laboratory** for 3^{rd} year Physics (Honours and General), Asutosh College, Kolkata (Aug'17-).
- Teaching courses on **Waves and Oscillations** & **Communication Theory** for three-year degree physics (General), Asutosh College, Kolkata (Aug'17-).
- Teaching courses on **Thermal Physics I, Thermal Physics II** & **Solid State Physics** for three-year degree physics (Honours), Asutosh College, Kolkata (July'17-).
- Mentored a Ph.D. student (Name: Pranab J. Bhuiyan) in a project "**Emergent structures in colloidal membranes**" at IISc Bangalore (Oct'15-Feb'16).
- Mentored a Summer student (Name: Anuj Shetty, Engineering Physics, IIT Bombay) in a project "**Nematic rheochaos in two spatial dimensions**" at IISc Bangalore (May-July,'16).
- Mentored M.Sc. student (Name: Martin Evers) towards "**Ausarbeitung**" in the course **Materie und Ordnung** at Universität Konstanz (April-July, 2012).
- Bilingual teaching assistant and grader (in German and English) in the course **Classical Field Theory** at Universität Konstanz (Oct'12-Feb'13).

Invited Speaker

- Complex Fluids - CompFlu-2017, IIT Madras, India (December 2017).
- Complex Fluids - CompFlu-2016, IIIT Hyedarabad, 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).
- 3^{rd} 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).
- Mahabaleswar Seminar on Modern Biology, TIFR, Mumbai, India (January 2008).

Conferences / Workshops attended

- Complex Fluids - CompFlu-2017, IIT Madras, India (2017).
- Complex Fluids - CompFlu-2016, TIFR Hyedarabad, India (2016).
- Indian Statistical Physics Community Meeting, ICTS Bangalore, India (2016).
- 3^{rd} Soft Matter Young Investigator Meet, Pondicherry, India (2015).
- Growing Length Scale Phenomena, JNCASR Bangalore, India (2015).
- Kurt Binder honorary workshop, Johannes Gutenberg-Universität Mainz, Germany (2012).
- Workshop Bartholomäberg, Vorarlberg, Austria (2012).
- SimBioMa2011, Universität Konstanz, Konstanz, Germany (2011).
- School on Nonlinear Response to Vitrification, Universität Konstanz, Konstanz, Germany (2011).
- Glastag, Universität Marburg, Marburg, Germany (2011).
- 8^{th} 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).
- Mahabaleswar Seminar on Modern Biology (TIFR), Mahabaleswar, 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 IMSc 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 electronematics' 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 hydrodyamics (CFHD) integrator with *Law of mass action* on 3D collocative grid using BOXLIB.
- Low-Mach (incompressible) fluctuating hydrodyamics (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

- 5^{th} year ("Sangeet Visharad") in Rabindrasangeet on Hawaiian Guitar, Nikhil Bharat Sangeet Samiti, Kolkata, 1999.
- 5^{th} year ("Chitra Visharad") in Art, Pracheen Kala Kendra, Chandigarh, 1999.
- Nature Photography (https://500px.com/amitbhattacharjee).
- Travel Blogs (https://www.tripoto.com/profile/amitbhattacharjee).