

# Rajesh Singh

## Curriculum Vitae

The Institute of Mathematical Sciences

Chennai 600113, India

+919444985120

+91-44-22543-116

rsingh@imsc.res.in

rajeshrinet.github.io

### Present Position

- 2012- Ph.D. student in Physics at The Institute of Mathematical Sciences, Chennai, India  
Supervisor Professor Ronojoy Adhikari
- Description My PhD work is on studying the dynamics of hydrodynamically interacting colloids with active boundary layers. The fluid flow at this scale is governed by the Stokes equation. We have used the boundary integral formulation of the Stokes equation to analytically obtain the forces and torques acting on these active colloids. We use these equations to perform computer simulations of active colloids in experimentally studied geometries of the flow. We find excellent agreements of our theory with experiments on synthetic active colloids and microorganisms.

### Education

- 2010–12 M. Sc. Physics, Indian Institute of Technology Kanpur, India, *CPI* – 8.5/10  
Master thesis: Design and Study of Erbium Doped Fiber Ring Laser
- 2007–10 B. Sc. (Honours) Physics, Hindu College, University of Delhi, India, *Percentage* – 79

### Publications

- 2016 Universal hydrodynamic mechanisms for crystallization in active colloidal suspensions  
Rajesh Singh and R. Adhikari.  
*Phys. Rev. Lett.* 117, 228002 (2016)
- 2016 Generalized Stokes laws for active colloids and their applications  
Rajesh Singh and R. Adhikari.  
*arXiv:1603.05735* (2016)
- 2016 Fluctuating hydrodynamics and the Brownian motion of an active colloid near a wall  
Rajesh Singh and R. Adhikari.  
*under review*
- 2016 Fast Bayesian inference of optical trap stiffness and particle diffusion  
S. Bera, S. Paul, Rajesh Singh, D. Ghosh, A. Kundu, A. Banerjee, R. Adhikari  
*arXiv:1610.00315* (2016)
- 2015 Many-body microhydrodynamics of colloidal particles with active boundary layers  
Rajesh Singh, Somdeb Ghose, and R. Adhikari.  
*J. Stat. Mech.* (2015) P06017

- 2012 Phase-plane analysis of driven multi-lane exclusion models  
Vandana Yadav, Rajesh Singh and Sutapa Mukherji.  
*J. Stat. Mech.* (2012) P04004

## Software

- PyStokes PyStokes is a Cython library for computing Stokes flow produced by spheres and their rigid body motion in unbounded, wall-bounded and periodic geometries. The library is freely available on GitHub.  
Webpage: <https://github.com/rajeshrinet/pystokes>.
- PyBISP PyBISP is a pure Python package for Bayesian Inference of Stochastic Processes.  
Webpage: <https://github.com/ronojoy/pybisp>.

## Work experience

- 2016 Teaching assistant: Statistical physics - I  
2015 Teaching assistant: Statistical physics - II  
2015 Teaching assistant: Statistical physics - I  
2015 Volunteer as student organiser in Soft Matter Young Investigators Meetings - III  
2015 Volunteer as student organiser in Soft Matter Young Investigators Meetings - I and II  
2014 Teaching assistant: Classical field theory, Jan-May  
2014 Organised students seminars - Soft condensed matter physics : Jul 2013 - Dec 2014  
2014 Organised students seminars - Python programming for sciences : Jan-May

## Other qualifications

- 2012 JEST (Joint entrance screening test for PhD in India): All India Rank - 6  
2011 CSIR Scholarship in Physics, JOINT CSIR-UGC: All India Rank - 25.  
2010 JAM - 2010 for admissions in IITs for M.Sc. (Physics): All India Rank - 20.  
2010 National top 1% candidate at National Graduate Physics Examination  
2009 First prize in "Kabaad se juggad" event in National Science Fest, St. Stephens College, University of Delhi

## Computer skills

- Operating systems Linux, Microsoft Windows, Mac OS X
- Programming Python, Cython, C/C++, Matlab, Mathematica, Julia, Fortran

## Talks Presented

- 2016 Universal hydrodynamic mechanisms for crystallization in active colloidal suspensions, 25 May 2016, IASBS-ICTP School on Active Matter and Chemotaxis, Zanjan, Iran  
2016 High performance computing, 5 Feb 2016, The Institute of Mathematical Sciences, Chennai

- 2015 Many-body microhydrodynamics of colloidal particles with active boundary layers, International Conference on Discrete Simulation of Fluid Dynamics, DSFD-2015, Edinburgh, 13-17 July 2015
- 2015 Many-body microhydrodynamics of colloidal particles with active boundary layers, 9 July 2015, University of Oxford.
- 2015 Many-body microhydrodynamics of colloidal particles with active boundary layers, 6 July 2015, University of Durham
- 2015 PyStokes, 31 January 2015, Chennai Python Users Group

## Conferences and Workshops

- 2016 IASBS-ICTP School on Active Matter and Chemotaxis, Zanjan, Iran, 14-25 May 2016
- 2016 International Complex Fluids Conference (CompFlu-2016), Pune, India, 2-4 January 2016
- 2015 International Conference on Discrete Simulation of Fluid Dynamics, DSFD-2015, Edinburgh, UK, 13-17 July 2015
- 2015 Soft Matter Young Investigators Meeting, Puducherry, India, 17-20 December 2015
- 2014 Eighth Symposium on Complex Fluids - JNCASR Bangalore, India, 22-24 December 2014
- 2014 Soft Matter Young Investigators Meeting, Puducherry, India, 5-7 January 2014
- 2013 SERB School and Symposium on Rheology of Complex Fluids - IIT Delhi, India, 16-20 December 2013
- 2013 4th RRI school on Statistical Physics - RRI Bangalore, India. 01-13 April 2013

## Referees

Professor Ronojoy Adhikari  
 The Institute of Mathematical Sciences  
 Chennai 600113, India  
 Webpage: <https://www.imsc.res.in/users/rjoy>  
 Phone: +91-44-22543253  
 Email: [rjoy@imsc.res.in](mailto:rjoy@imsc.res.in)

Professor Ganesh Subramanian  
 Jawaharlal Nehru Centre for Advanced Scientific Research  
 Bangalore 560064, India  
 Webpage: <http://www.jncasr.ac.in/sganesh/>  
 Phone: +91-80-22082896  
 Email: [sganesh@jncasr.ac.in](mailto:sganesh@jncasr.ac.in)