Curriculum Vitae — ANAMIKA AGRAWAL

Interests

Soft Condensed Matter Physics & Biophysics

Education

Bachelor of Technology in Engineering Physics with Honors and Minor in Humanities and Social Sciences *August 2016 (Expected)*
Indian Institute of Technology - Bombay, India
Cumulative Performance Index (CPI) of **8.22** *on a scale of 10*

Expected Publications

Estimation of Meteor Speeds by the pre-t_0 method
Primary work has been finished. Paper to be submitted to the Meteoroids-2016 conference

Test Scores

- **Subject GRE (Physics):** 990/990 (Overall 94th Percentile)
- **General GRE:** *Quantitative:* 170/170, *Verbal:* 163/170, *Writing:* 4.0/6.0
- **TOEFL:** *Total:* 119/120 (*Reading:* 30/30, *Listening:* 30/30, *Speaking:* 29/30, *Writing:* 30/30)

Research Experience

Summer Internship: Estimation of Meteor Speeds by the pre-t_0 method
Guide : Prof. Peter Brown *Summer 2015*
Department of Physics & Astronomy, The University of Western Ontario, London, Canada
Designed and implemented an automated algorithm for the Canadian Meteor Orbit Radar (CMOR) to measure the pre-t0 speeds of meteors through phase data from their trails. The speeds thus measured were compared with speeds calculated from other independent measurement algorithms so that the most robust ones could be used for entry modelling. Earlier methods of amplitude-dependent speed detection involve multi-station data which can constrain the set of meteors whose speeds can be estimated. On the other hand, single-station data is often too noisy to give relevant phase information to estimate velocities. The algorithm developed offered a method to measure speeds from single-station data with an advantage of low computation cost, leading to a marked improvement in the speed-measurement efficiency of the CMOR.

Senior Thesis: Statistical Mechanics of Mictrotubules
Guide: Prof. Ranjith Padinhateeri *July 2015- Ongoing*
Co-Guide: Prof. Mithun K. Mitra *[Project Report]*
Department of Biosciences and Bioengineering & Department of Physics, IITB
Studying and developing a model to explain temperature-dependent phase transitions and between the stable and unstable states and dynamic instability in Microtubules (MT) which form an essential part of the cytoskeleton in all eukaryotic cells. In our model, we consider stabilizing interactions between the 13 proto-filaments and destabilizing bending interactions within each proto-filament equilibrated by thermal fluctuations.

Junior Thesis: Hydrodynamics at Low Reynolds Number and Locomotion of Microorganisms *Fall 2014*
Guide: Prof. Anirban Sain *[Project Report]*
Department of Physics, IIT Bombay
Studied hydrodynamic flows at low Reynolds number using multipole expansion techniques for action of point force on fluids. These dynamics resemble the case of microscopic organisms in a fluid. Due to their size, they feel the fluid flow with very Low Reynolds number which dramatically changes the methods used by them to swim in fluid. We studied a model of semi-flexible chain of chemoactive beads for the flagella of microorganisms and their action in fluid.

National Initiative on Undergraduate Science (NIUS) Project: Understanding the upgraded GMRT *Dec.2013- Dec. 2014*
Guide: Prof. Divya Oberoi *[Project Report]*
National Centre for Radio Astrophysics(NCRA), Pune
The project encompassed the analysis of autocorrelation data in CASA from individual antennae in Giant Metrewave Radio Telescope (GMRT) to analyze the efficiency of the instrumentation of the upgraded system, and studying the improvements vis-a-vis the old instrumentation system.

Gravitational Wave Astronomy
Guide: Prof. A. Gopakumar *Fall 2014*
Tata Institute for Fundamental Research, Mumbai
Studied the signal processing methods implemented in Gravitational Wave Astronomy at LIGO with special emphasis on black hole binaries.

Indian Academy of Sciences Summer Project
Guide: Prof. Uday Shankar *Summer 2014*
Raman Research Institute, Bangalore
Studied the Epoch of Reionization by beginning with the Saha thermal ionization equation and using relations between redshift and temperature to understand the recombination equations involving further more parameters.

Key Course Projects

K-mer Evaporation-Deposition Problem in 1 Dimension (Course: Advanced Statistical Mechanics) *Fall 2015*
Guide: Prof. Dibyendu Das *[Project Report]*
Studied how density profiles of k-mers in a one-dimensional lattice vary with an external potential. I first simulated the distribution using Metropolis Monte Carlo Method and verified the recursive numerical formula derived using the assumption of excluded volume interactions in hard rod fluids.

Smart Solar Water Heater (Electronics Lab Project) *Fall 2014*
Guide: Prof. Pradeep Sarin *[Project Report]*
Developed a prototype for a 'smart' version of solar water heaters which would provide water at a user-defined temperature and volume by implementing a PID controller using Arduino microcontroller board.

Evolution of Racial Characteristics (Course: Topics in Evolution) *Spring 2015*
Guide: Prof. Kiran Kondabagil *[Project Report]*
Studied how 'racial' characteristics are defined in biological terms and how they have evolved starting from the first Sub-Saharan human forms.

Chirped Pulse Amplification (Course: Photonics)
Guide: Prof. B. P. Singh *Autumn 2013*
Studied the novel method of chirped pulse amplification to amplify ultrashort laser pulses which almost all high power lasers utilize.

Analysis of 'The Stranger' by Albert Camus (Course: Philosophy of Life)
Guide: Prof. Pravesh Jung *Autumn 2013*
Studied the famous philosophical novella by the French Philosopher Albert Camus and analyzed its significance.

Workshops

Pulsar Observatory for Students (POS-2014) *July,2014*
Radio Astronomy Centre (NCRA-TIFR), Ooty *[Presentation]*

- The camp involved guest lectures on Pulsar astrophysics and related topics.
- Used Ooty Radio Telescope (ORT) to observe the Pulsar PSR B1933+16, and a quasar to be used as calibrator.
- Ran several analyses on the data collected to find out the time period, Dispersion Measure, flux density and Modulation index of the pulsar.

Radio Astronomy Winter School (RAWS-2013) *Dec.,2013*
Radio Physics Lab, IUCAA and NCRA, Pune *[Poster Presentation]*

- Learned basics of radio astronomy via hands-on experiment on construction, initialization and operation of radio telescopes.
- Presented a poster with a team of 4 on 'Radio frequency line emission in astrophysics'.
- Worked particularly on H-1 line observation using a 4m Radiotelescope and analysed the data for 5 sources.

National Initiative for Undergraduate Students(NIUS 10.1) *Summer 2013*
Homi Bhabha Center for Science Education, Mumbai, India *About the camp*

- Was among the 60 students selected from all across the country for a nurture program for undergraduate students.
- Attended lectures on topics of front line research in the fields of Astronomy, Astrophysics, Quantum Mechanics and Informatics and Experimental Physics by leading scientists of India.
- Was among the top 30 students selected for projects and subsequent camps.

Orientation cum Selection Program for IOAA (Astronomy Olympiad) *April,2012*
Homi Bhabha Center for Science Education, Mumbai *About the camp*

- Trained in basics of Celestial Mechanics, Spectroscopy, Coordinates and Times, Stellar Properties and Evolution, Stellar Systems (Binary and Multiple systems, Clusters, Galaxies) Elementary Cosmology, Instrumentation and Space Technologies
- Observational skills developed - Night sky observation and Telescope handling

Scholastic Achievements

- Secured an **All India Rank 737** in IIT-JEE 2012 with 99.85 percentile among $\sim$ 0.5 million students.
- Among the **top 35** students selected to attend Orientation cum Selection Camp (OCSC) for International Olympiad on Astronomy and Astrophysics **(IOAA)**, after clearing two nationwide examinations participated in by more than 15000 students.
- Secured certificate of merit for being in the national **top 1%** in National standard examination in Physics (**NSEP**) and National standard examination in Chemistry (**NSEC**), organized by HBCSE.
- Secured the **KVPY** (Kishore Vaigynaik Protsahan Yojana) fellowship awarded by the Govt. of India which, competitively based on a comprehensive examination and a technical interview, is given to promising students of the physical sciences.
- Awarded the **NTSE** (National Talent Search Examination) fellowship by National Council of Educational Research & Training through an examination selecting top 1000 students in the country.
- Invited to the Republic Day Parade at Janpath, New Delhi as Prime Minister's Guest for outstanding academic performance **CGPA 10/10** in the Central Board of Secondary Education Board Examinations.
- Among the **top 42** medallists in the IGNOU-UNESCO Science Olympiad for SAARC nations.

Technical Skills

- **Programming:** C/C++, Python
- **Operating Systems:** Linux (Ubuntu), Windows
- **Analysis Tools:** CASA (Common Astronomy Software Applications) package, MATLAB, Mathematica, GNUPLOT, MS Office
- **Typesetting and markup languages:** LaTeX, HTML

Relevant Courses

Advanced Physics Courses:
Advanced Statistical Mechanics, Group Theoretical Methods, General Theory of Relativity, Photonics, Methods in Experimental Nuclear and Particle Physics
Other Physics Courses:
Atomic & Molecular Physics, Condensed Matter Physics, Quantum Mechanics I & II, Nuclear & Particle Physics, Statistical Physics, Waves & Thermodynamics, Analytical Physics Methods, Classical Mechanics, Continuum & Fluid Mechanics, Optics
Mathematics & Electrical Engineering:
Linear Algebra, Differential Equations, Complex Analysis, Data Analysis & Interpretation, Ordinary & Partial Differential Equations, Numerical Analysis, Analog & Digital Electronics, Microprocessors Lab
Other Courses:
Topics in Evolution, Introduction to Reading and Literature, Language and Literature, Approaches to Literature, Philosophy of Life, Applied Psychology in Modern Life, Theory and Policy of Managerial Finance, Economics

Extra-curricular Activities

Foreign Languages

- Cleared DELF-A2 examination for French language proficiency.
- Completed French Basic course (100 hours) and French Advanced course (100 hours).

Journalism

- Editorial Board Member, Insight, IIT Bombay [April 2014-March 2014]
  Was a member of a 15-member body of Insight, the official student media body of IIT Bombay, responsible for leading and writing articles on the pressing issues in the institute.
- Received the **'Journalism Special Mention'** award from the institute for exceptional work in Journalism. I led two important projects - one to bring forth Gender Inequality issues in the institute and the other to study Happiness and Stress correlations in students by conducting an institute-wide psychological survey with the guidance of the Department of Psychology.

Mentoring and Social Service

- Freshers' mentor as part of Institute Student Mentorship Program (ISMP), to help Freshers in adjusting to campus life. [2015-Present]
- Coordinator of Department Academic Mentorship Programme (DAMP) for the Physics Department. [2015-Present]
- Mentor for Department Academic Mentorship Programme (DAMP) for the Physics department, helping academically weak students [2014-Present]
- Worked for the division 'Vikas' under National Service Scheme (NSS) to promote environmental and social awareness [2012]

Writing

- Co-editor for the blog run by Samwad, an institute-based social awareness body [2013]
- Literary expert for the web page of Desh Raag [Summer 2013]
  A patriotic music contest by Rakshak Foundation, a Santa-Clara based NGO and think-tank
- Literary Content developer for the organization YForce (Youth for Centre Stage) [2013]

Quizzing and Debating

- Second runner up in the conceptual science quiz 'Mimamsa' organized by IISER Pune[2014]
- Second runner up in the Swedish Memorial quiz, 2012 [2012]
- Among the top 6 finalist teams in the GenQuiz open, 2012 (institute-level open quiz) [2012]
- Represented IIT Bombay in the IIT-Delhi Parliamentary Debate Contest [2012]

References

- **Prof. Peter Brown** (Summer Internship Guide) pbrown@uwo.ca
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- **Prof. Kiran Kondabagil** (Course instructor) kirankondabagil@iitb.ac.in
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