Curriculum Vitae

Amlan Datta

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Educational Qualifications

1. Presently a **Fifth-Year student of 5 years BS-MS Dual Degree Program** (2016 – 2021) at IISER Kolkata, West Bengal, India. Admitted through JEE Advanced (2016) Channel.
   Expected year of achieving MS: 2021
   SGPA: 8.50, CGPA: 8.01 (Semesters covered: 8, Total Credits: 202)

2. **Higher Secondary (10+2):** Burdwan CMS High School, West Bengal, India. % Marks: 90%

3. **Madhyamik (10)**: Burdwan CMS High School, West Bengal, India.
   % Marks: 88.43%

Publications

1. Tikhonov, D. S., **Datta, A.**, Chopra, P., Steber, A. L., Manschwetus, B., & Schnell, M. (2020). Approaching black-box calculations of pump-probe fragmentation dynamics of polyatomic molecules. *Zeitschrift für Physikalische Chemie*, 234(7-9), 1507-1531.

Research Experiences

1. Master's Project under **Dr. Rangeet Bhattacharyya, IISER Kolkata, India** since August 2020.
   Topic: "Spin noise in open quantum system."
   Spin systems show fluctuations like any multipartite systems. Fluctuations are central to the discussion of spin relaxation, but when the spin system is in a magnetic field, these fluctuations are also measurable as spin noise. Bloch first proposed the term spin noise found in the experiments. But till now there is no proper theory to explain the phenomena. So my goal is to develop a theory which will explain it using Fluctuation Regulated Quantum Master Equation(frQME).

2. Independent study under **Dr. Nirmalya Ghosh, IISER Kolkata, India** since August 2020.
   Topic: "Weak measurements as a tool for observing spin hall effect."
   The main motive is to understand the physics behind weak measurements commonly the weak value amplification (WVA) concept, introduced by Aharonov, Albert, and Vaidman. It has proven to be fundamentally important and extremely useful for numerous metrological applications. This quantum mechanical concept can be understood using the wave interference phenomena and can therefore be

realized in classical optical settings also. I am reading about the spin-dependent displacement perpendicular to the refractive index gradient for photons passing through an air-glass interface, which is the photonic version of the spin Hall effect in electronic systems and treating the effect effect as a weak measurement of the spin projection of the photons.

3. Summer project 2019 under **Prof. Dr. Melanie Schnell, Deutsches Elektronen Synchrotron DESY, Hamburg, Germany**.
   Topic: "Experimental and Theoretical Investigation of Photofrgamentation Mechanisms of Polycyclic Aromatic Hydrocarbons (PAHs) Exposed to XUV Radiation."
   Abstract: "The project is divided into two parts. The first part contains the analysis of the partial covariance maps of three PAHs of our interest: Fluorene, Phenanthrene and Pyrene. This is an investigation of mechanisms behind photofragmentation of these molecules subjected to harsh XUV radiation. The idea for that is to simulate the processes appearing in the interstellar medium (ISM), when the PAHs are excited by spaceous syncrotron radiation sources (such as Crab Nebula, etc.). The results from the time-of-flight – time-of-flight (TOF-TOF) partial covariance maps of these molecules are presented and analyzed to observe their behaviour under XUV excitation.
   The second part is thee theoretical modelling of the photochemical dynamics. It is inspired from the experimental results of some ultrafast pump-probe dynamics research going on all over the world including the study depicted in the first part of the report. Simulations are very nice tool in science to analyze the phenomena happening in the labs. So, in addition to pure experiment, simulation methods are implemented to see whether they match with the experimental data. We have focussed on the single photon excitation processes only and we have taken the reference accordingly. Most importantly we are concerned more about the nuclear dynamics which leads to better understanding of fragmentations in pump-probe experiments. Also the result or more specifically the pump-probe fragmentation dynamics yields from the simulations will lead us better understanding of the physics of these processes in pump-probe experiments."

4. Summer project 2018 under **Dr. Rangeet Bhattacharyya, IISER Kolkata, India**.
   Topic: "Measurement of the surface tension and the viscosity of a liquid using the capillary waves as diffraction grating."
   Abstract: "Apart from the conventional method of measuring surface tension and viscosity of a liquid, we are taking the help of optics to measure those quantities. Capillary waves are generated on the liquid surface and the crests formed are used for diffraction grating. The dispersion relation of capillary waves has been used to determine the surface tension of water. For viscosity we have used the fact of dependence of amplitude of the capillary waves on the root mean square voltage of the signal driving the capillary waves. The surface tension and viscosity of distilled water is verified and how surface tension varies with the addition of any kind of salt, surfactant and alcohol to water is also observed. There is an interesting trend in the variation of surface tension of water with the variation of concentration of salt solution and alcohol-water mixture."

5. Summer project 2017 under **Dr. Rajeev Singh, IIT Varanasi, India**.
   Topic: "Entanglement Entropy and Mutual Information of Many-body Localized Quantum System."
   Abstract: "In this project we have two models for both interacting and non interacting particles (Many-body localization and Anderson localization respectively). We study entanglement entropies and mutual information for the two models and understand the structure of the many-body localization by analyzing structures of single site entanglement entropy, two site entanglement entropy, mutual information and half chain entanglement entropy for both time independent and time dependent Schrodinger equation. We find that the entanglement entropies decrease almost monotonically with increase in disorder strength, whereas mutual information is not monotonic. We also see some interesting properties which depend on the periodic boundary condition."

National Achievements and Camps

1. **INSPIRE** Fellow (2016-present). Fellowship offered by Departmnet of Science and Technology, Govt. of India to the top 1 percentile students of the country to pursue career in science.
2. Attended **"Contemporary trends in Optics: From atoms to stars"** jointly organized by SPIE, OSA and CESSI at IISER Kolkata, India.
3. Selected for "Quantum Physics and Consciousness Conference 2017"
4. Attended **VIJYOSHI 2016** National Science Camp at IISER Kolkata, India.
5. **JEE Advanced 2016** qualified. All India rank: 9865

Computer Skills

- Programming languages: Julia, Python, Matlab, R, TEX.
- Softwares: LATEX, gnuplot, Origin Lab, ImageJ.

Teaching experiences

1. Teaching Assistant of **Mechanics II (Course code: PH2102, Course type: Theory)** in **Autumn Semester 2020(ongoing)** at Indian Institute of Science Education and Research Kolkata. Instructor: Prof. Dr. Biswarup Mukhopadhyaya.
2. Teaching Assistant of **Introduction to Computation (Course code: CS2201, Course type: Laboratory)** in **Spring Semester 2020** at Indian Institute of Science Education and Research Kolkata. Instructors: Dr. Ananda Dasgupta (Department of Physical Sciences) and Dr. Susmita Roy (Department of Chemical Sciences)

References

1. Dr. Rangeet Bhattacharyya, IISER Kolkata, India.
2. Prof. Dr. Melanie Schnell, Deutsches Elektronen Synchrotron DESY, Hamburg, Germany.
3. Dr. Rajeev Singh, IIT Varanasi, India.

Extracurricular activites

1. Photographer by passion.
2. Music fanatic.
3. Playing indoor games: Table tennis, Carrom, Billiards(still a noob).
4. Playing outdoor games: Football, Badminton.

My Family

- Father: Prof. Utpal Datta, M.Tech.(NITTTR, Kolkata)
- Mother: Smt. Rajashree Datta, M.A. (Burdwan University)
- Paternal Uncle: Mr. Abhijit Datta, M. Tech. (IIT, Kanpur)
- Maternal Uncle: Mr. Ranen Das, MBA (IIM, Kozhikode)