

Letter of motivation

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The universe around us is the same; it is merely our perception that varies. Many unanswered problems are there in our world, and science has the best solutions. As a science student, I have never been able to gratify my curiosity in everything that happens around me, from how nature and its products aid with real-life issues to how these limited resources meet the need of living organisms. Science is on the hunt for this fantasy.

This desire has pushed me to devote my time to scientific education since I was young. During the first two years of my undergraduate education, I had the opportunity to learn the fundamentals of science from the Indian Institute of Science Education and Research (**IISER**), Berhampur, where an ensemble of the nation's most eminent scientists is united to encourage interdisciplinary research. During my initial semesters of BS-MS, I learned that chemistry is one of the disciplines that synthesizes from small chemical compounds to natural products, and bio-inspired micro and macro materials based on scientific requirements. As a result, I majored in Chemical Sciences during my BS-MS at IISER BPR and became intrigued by the organic aspects of the topic.

The more I delved deep, the more I was captivated by modern organic synthesis, and I was also quite fascinated by observing catalysis during my coursework and practical laboratory course. This leads me to devote my final year project in organic synthesis under the supervision of Assistant Professor Dr Thirupathi Barla at Natural Products and Catalysis Laboratory (NPCL) in IISER Berhampur. The project was involved in "**Synthetic studies towards natural products Berkeley Lactone-I & Ilyoresorcy-I**". The yearlong project of Assistant Professor Dr Thirupathi Barla's Research group was solely motivated by various applications of natural products. The medicinal uses that natural products exhibit have inspired chemists alike, and the result is what we see towards Taxol total synthesis in the last 30 years, to name a few.

The limitation (decreased efficacy against resistant bacteria) of existing antibacterial medications demands more clinical studies for novel antibacterial compounds, prompting us to focus on **Berkeley Lactone-I**. According to our retrosynthetic plan of Berkeley Lactone-I, we could successfully synthesize two aliphatic fragments in two different directions from commercially available starting materials in 11 steps by using various reactions. Successful Completion of this natural product is currently under process.

The growing global need for anti-cancer medications motivated us to concentrate on **Ilyoresorcy-I**. We synthesized an aromatic partner using several processes based on the retrosynthetic plan. However, the coupling of aromatic & presynthesized aliphatic fragments by decarboxylative cross-coupling and Nozaki-Hiyama Kishi was unsuccessful. Based on the modified retrosynthetic plan, we synthesized another aromatic partner. However, we couldn't connect these two fragments via LDA coupling. Modifications in the aliphatic fragment are under process.

This was my first experience working in a synthetic organic chemistry lab and I took full advantage of the opportunity to learn about various synthetic, purification methods and spectroscopic techniques like NMR, HPLC, IR & HRMS. Apart from experience in the above organic reactions, I have also got trained in NMR handling and analyses by a professional NMR technician. The project results were compiled, documented and submitted to IISER Berhampur. This master's thesis taught me that hard work and patience are integral to research.

Soon after BS-MS, I joined as Project Associate-I in the Council of Scientific and Industrial Research-Indian Institute of Chemical Technology (**CSIR-IICT**) under the guidance of Senior Scientist Dr Avijit Jana. The CSIR-IICT is an old and modernized R&D agency whose primary goal is to benefit society by developing a solid knowledge base in chemistry and chemical technology with a group of world-leading scientists.

Currently, I am working on a six-month-long project titled "**Practical organic synthesis with harnessing light & Synthesis of Photo responsive drug delivery system**" (July 2022-Jan 2023)

as Project Associate-I under Senior Scientist Dr Avijit Jana at CSIR-IICT. The emergence of chemical photocatalysis typically involves only single-photon excitation and is in high demand. This project has involved the synthesis of an organic photocatalyst and its application in organic transformations. Organic photo catalyst Perylenediimide (PDI-reduced to stable and colourful radical anion through visible light photoinduced electron transfer) was synthesized and its subsequent excitation of the radical anion accumulates enough energy for the reduction of stable aryl chlorides, yielding aryl radicals that were trapped by hydrogen atom donors or employed in the creation of carbon-carbon bonds. Further experiments using this technique are in progress.

This project also included the synthesis of fluorescent organic nanoparticles for real-time monitoring of Anticancer drug release. The designed fluorescent organic nanoparticle was synthesized in 7 steps using Sonogashira coupling and hydrolysis with mercury sulphate as crucial steps. A novel ketone was synthesized which may lead to further future scope. Studies on drug delivery using the above synthesized fluorescent nanoparticle are completed. Currently, the manuscript is in progress.

During my five years of BS-MS studies, I worked on an internship that exposed me to gold catalysis. The internship was about **“Literature Review on Gold catalyzed Enantioselective C-H functionalization of Indoles”**. As a result of the pandemic, I did an online internship at **IISER Bhopal** during the summer of 2021 under the supervision of Associate Professor Dr Nitin T Patil. The project aim was to learn about gold catalysis by writing a brief review. The review highlighted “gold-catalyzed enantioselective C-H functionalization of indoles for 2005-2021 to accentuate the strengths and limitations of the adopted methods. I have also delivered and participated in various presentations on gold catalysis and submitted an internship report to IISER Bhopal.

Aside from academics and research, I have been active in various administrative, extracurricular, and athletic activities, which have sharpened my leadership, management, coordination, and social interaction abilities. I am a team player who enjoys debating and solving scientific difficulties. When necessary, I begin processes and meticulously complete tasks. This is why I believe I would be better off in academia, conducting active research and communicating the information I have gained (and hope to achieve) during my student career.

Broadly my research interest revolves around synthetic chemistry, methodology development, catalysis and medicinal chemistry. But specifically, I would like to pursue my doctoral studies to develop Luminescent supramolecules for applications in data storage.

The PhD position in **“Luminescent supramolecules for applications in data storage”** aligns very well with my research interest and research experience. As I have experience in organic synthesis (total synthesis), drug delivery and photophysical & photochemical studies, it will be helpful for the project. Using the academic and research experience which I have gained during my Bachelor's, Master's degrees and project associate and under proper guidance, I would prove to be a valuable asset to your lab and make the project a scientifically productive one. So, I would like to submit my application for the PhD position in the research groups of Pradip Kumar Chakraborty and Louise Natrajan.

Working closely with senior PhD, and postdoctoral fellows & from my personal experience, I have got the flavour of a researcher's challenging life, which motivates me to take research as my career. Moreover, my daily life at the lab makes me realize the beauty & importance of teamwork in the world of research which undoubtedly has sharpened my ability to be a team player & also made me more accommodative.

Thank you for your time and consideration. I look forward to your positive response.