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Proposed Program: Graduate PhD program(Department of Biology)

Statement of purpose

Science has disintegrated life into an intricate network of chemical reactions. But to reintegrate the chemical reactions and understand life bottom-up is proving to be a formidable task, the challenges transgressing the traditional limits of basic science research and demanding a high-level of inter-disciplinary expertise. Having majored in a basic science course like **Biotechnology**, from the ***Indian Institute of Technology (IIT) Guwahati*** renowned internationally for its engineering courses, I believe that I have been trained to pursue basic science research with an engineer's perspective. I was exposed to **Molecular Biology** for the first time at IIT. I was astounded to learn how even the simplest of observable events in a living system originates at the cellular level with a complex array of biochemical signals acting in unison. But as I learnt more, I was impressed even more by the methods developed by molecular biologists to capture what goes on in the cells during these events. To further develop my expertise and sate my thirst for research, I wish to undergo doctoral studies in an environment that nurtures academic excellence with a spirit of innovation. With that end in sight, I am applying for graduate studies at **California Institute of Technology**. My research interests are **Cellular and Molecular Biology**.

I have proactively looked to engage in research activity throughout my undergraduate program. The summer after my second year(**Jun-July, 2010**), I was one among the 10 undergraduate students selected from all over India to train at **Astra Zeneca India Private Limited, Bangalore**. I worked as a summer trainee in the biosciences lab of the R&D department. The training was basically aimed at learning important laboratory techniques in microbiology, molecular biology and biochemistry. Some short term projects were undertaken. They included cloning and restriction analysis of various plasmids and protein expression analysis in *E.coli* at different conditions of temperature and concentrations of IPTG. An optimal temperature and concentration of IPTG was found and large scale purification of the protein was done. The experimental techniques of cloning, PCR, nucleic acid extraction, gel electrophoresis and HPLC were used. Having studied these methods at IIT, it was gratifying to put them to use in a laboratory at an industrial level.

I spent the following summer working under **Dr. Tim Elliot** at **University of Southampton, U.K.** Dr. Elliot heads a lab aiming at novel research in cancer therapy. I was able to be a part of an ongoing project. The project studies the role Tapasin in MHC class 1 assembly and peptide presentation. This is done by

analyzing the peptide half lives in the presence and absence of Tapasin. My role in the project was aimed at making the Recombinant Fab Antibodies required to analyze the peptide half-lives. The work involved large scale production of protein using transformed E.coli cells and quantitatively analyzing the protein. This was done by staining RMA-S cells first with the peptide and then with the isolated antibody and then analyzing the stains using FACS (canto) machine.

On this internship apart from gaining deeper technical experience, it was also important for me to see for myself if I could work on a research problem with a certain degree of independence. I came back satisfied on this count. I could figure out appropriate ways to approach problems and propose useful experiments. This internship gave me more confidence in my aptitude for research and it has been boosted while working on my ongoing undergraduate project. For my **Bachelor thesis**, I am studying the genetic variation in chitinase and protease genes of *Beauveria bassiana* and *Metarhizium anisopliae*. The work is aimed at making fungal bio insecticides which act by producing chitinases and other proteases to disintegrate the protective chitin layer of insects. All the methods of molecular biology are extensively being used in this project.

I do not regard research as a means to get a PhD, but I see PhD as a milestone in starting a career in research and scientific academia. I see myself eventually as a research professional and a teacher working in an academic/research institute. I realize the importance that the environment from where I obtain my PhD holds in shaping my style of scientific thinking and in a way my future prospects. With my research interests and research experiences being what they are, I cannot find a better place to do my graduate studies than the California Institute of Technology. CalTech being one among the best universities of higher learning in the United States has over the years created a peerless name in fostering the spirit of research. Hence I seek to work here to obtain my PhD and provide a great start for a career in research and teaching.

My undergraduate training at IIT and my proactive attempts at gaining research experience have adequately prepared me for graduate school. Over the last four years I have sampled various flavors of research working in industry and academia, in my country and abroad. Alongside engaging in research projects, I have maintained a good academic record at one of the most prestigious and competitive engineering institutions in the country. With this background, my desire to learn and a sense of commitment to all my undertakings, I am confident that I will be able to perform well in graduate school taking off from this stage. I hope I will be found adequate for a PhD position in the Department of Biology.