

LETTER OF MOTIVATION

I am applying for the Masters Program in Optics in Science and Technology. I am interested in studying and doing research in Applied Physics especially Optics.

I have been interested in Physics since my high school. After Class 10, I was awarded SIA Youth scholarship to study in Singapore, where I got greater exposure to research in physics. During that period I read a lot of popular science books and got fascinated by the subject. In my first year in Singapore, I got the opportunity to work in the physics department of National University of Singapore (NUS) on a project titled 'Nanomanipulation using Optical Tweezers in water and air' under Science Training and Research program. During this project I was introduced to cutting edge research and sophisticated techniques, which I was able to understand (albeit vaguely, in hindsight). In this project, we were not only taught (hands on) what researchers in the lab generally did, which is optically trap colloid particles suspended in water using focused laser beams, but were also challenged to try and trap them in air. This challenge helped us exercise our creativity to use the given knowledge and apply it in a very different scenario. We came up with a few techniques to try and do so, but unfortunately, none of our schemes worked. It turned out to be too tough as we were unable to isolate a single colloid particle in air despite several ingenuous attempts, but nevertheless this project gave me valuable experience and also made me choose physics as my career and got me interested in optics. We also presented the project in the Singapore Science and Engineering Fair, and received a merit award (ours was one of the very few physics projects to receive it). My confidence that I am capable of doing physics was boosted by my receiving Bronze Medal in Singapore National Physics Olympiad and an Honorable Mention in Singapore National Mathematics Olympiad..

After finishing my GCE 'A' Level exam, I was admitted to various colleges for engineering as well as physics, and despite the social pressure to choose engineering, I chose physics. I heard about Chennai Mathematical Institute (CMI), as an institute with a very high standard of teaching and research and an advanced course considered to be one of the best undergraduate program in physics in India. It became the natural choice for my Undergraduate education.

Through five semesters of Physics, Mathematics and Computer Science courses, summer camps, lab sessions, and personal discussions with professors, I have developed a strong foundation in mathematics, theoretical physics and experimental physics with some flavour of computer science.

CMI has collaborations with various institutes of India for providing practical training to students. Under these programs, I went to Homi Bhabha Centre for Science Education (HBCSE), Mumbai, in the summer of 2006. There, we were introduced to graduate level experiments, designed to train us with experimental attitudes. In the summer of 2007, we went to Indra Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, for one month where I did a project to find the pressure distribution in a Diamond Anvil Cell (DAC), for which I used Ruby Fluorescence to measure pressure at various points inside a DAC by exciting ruby with Laser and seeing the shift in the spectral lines due to the pressure. This project involved a lot of aligning of laser and other optical instruments which provided me with valuable experience.

Later in the summer, I went to IISc under Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR) summer fellowship program, and studied Quantum Computing under Prof. Apoorva Patel. I learnt the theoretical aspects of quantum computing, the circuit model, Shor's and Grover's algorithm, after which I studied Measurement Based Quantum Computing. This study got me really interested in Quantum Computers and their implementation, and I decided to learn more about experimental techniques and methods which could help in the implementation. For this, in December 2007, I worked under Prof. Unnikrishnan at Tata Institute of Fundamental Research (TIFR) in his lab where they have made an all optical BEC. There, I studied Ion trapping theory and built a Linear Ion Trap, and tried to do frequency measurements of the trapped

particle. I understood the theory of Doppler free (Saturation Absorption) Spectroscopy and did experiments to see the hyperfine structure of Rubidium. Using this technique, I saw Zeeman splitting in Rubidium. I also understood the theory of Laser cooling, Magneto-Optical trapping (MOT) and creating an all optical BEC. I learned a lot of nice experimental techniques and this experience furthered my interest in Optics.

Given my deep interest in Optics, and my experience in this subject, I think that Optics in Science and Technology will be the perfect course for me, as the course provides the right mix of theoretical and experimental physics, and also gives the opportunity to visit various places and see what all is happening in the field. With my firm theoretical background, and good experience with optical experiments, I think I'll be able to make good use of the resources available for this program. If selected, I would love to major on implementation of quantum computers and quantum information technology, which Imperial College, Institut d'Optique, University of Paris-Sud 11 and Delft University work on, though I am open to other options.