The are solid foundations for my future research

Business, Career

The most important scientific and technical achievements in the mid-twentieth century, inmy opinion, is the invention of semiconductor transistors and the development of computersbased on those transistors. This achievement led to the information revolution, which not onlychanged the way people entertain, but also changed ways of working, especially for studies andresearch. In the near future, the development of quantum computation and nanophotonics willlead to another information revolution, and I am determined to lead this scientific progress. Torealize this goal, I have achieved excellent performance in relevant courses and participatedin four research projects about optics and nanophotonics in my undergraduate study. Withproficient theoretical and experimental skills acquired during these years, I have developed acomprehensive understanding of this field. From my point of view, theoretical knowledge and computational skills are two key elementsfor an excellent researcher, since they provide strong guidance and useful techniques for conductingresearch.

Based on such a belief, after I entered University of Science and Technologyof China (C9 League; Ranking: 3; Ranking System: US News Best Global University in China)for my B. S. degree, I tried my best to gain knowledge and skills in classes and achieved A+ inmany of my core courses, such as Electrodynamics, Quantum Mechanics, Solid State Physicsand Computational Physics. These basic physical concepts and analytical methods are solidfoundations for my future research experiences. After classes, I also developed a great passion for conducting experiments and I tried to improvemy experimental skills as much as possible. My first research project was “ Preparation ofBessel beam”. As the leader of a group of four

students, I wrote a C program and then designedand set up an optical system to test the properties of the spatial light modulator. Then I wroteanother C program and displayed the hologram on the spatial light modulator.

By using thishologram, we managed to prepare the Bessel beam. Our project won the first prize in theLevel 4 Physics Experiment. This experiment not only taught me how to adjust the beam path, but also taught me how to design an experiment scheme properly with limited experimentaldevices.

As a collaborator of this team, I quickly valued strong communication skills as aneffective tool for team meetings. As a leader of this team, I managed to get everyone on thesame page and set the ultimate goal which motivated us through the hardships. To further strengthen my research ability, I joined Professor Changling Zou’s group in KeyLaboratory of Quantum Information, University of Science and Technology of China. Aftera discussion with Professor Zou, I decided to do some theoretical research about the Faradayeffect in the yttrium iron garnet microsphere. I derived the theoretical formula based onsome relevant papers and used COMSOL-Multiphysics to test my formula. Then I successfullywrote a Mathematica code by using the formula to calculate the frequency shift betweencounter-clockwise light and clockwise light for each whispering gallery mode. This experienceenhanced my awareness of the steps to efficiently carry out a project. First, I need to developa clear understanding of the project’s major problem and what I expected as the result.

ThenI need to choose an appropriate method and painstakingly run experiments to achieve it. Althoughthere were many obstacles that frustrated me and made me ponder whether it wasworth all the effort, my great faith in science built up my confidence and guided me to conquerall the difficulties. I finally overcame them and enjoyed the excitement of solving problems. For example, when I tested my formula for the first time, I found that the frequency shift I derivedfrom my formula was inconsistent with what I derived from the numerical simulation. For along time, I thought that my formula was incorrect or the settings of the simulation were inappropriate.

But after several rigorous inspections, I failed to find any problems. Then I soonrealized that the frequency shift might have a second-order term, but I was only interestedin the first-order term. After I eliminated the second-order term, the two results fit togethervery well. By solving this problem, I realized my potential to be a researcher who truly enjoyssolving complex problems. In the summer of 2017, I did a summer internship in Professor Hong Tang’s group in YaleUniversity.

My project was to design a superconducting electro-optical modulator, which isa key device in the superconducting quantum computer of the future and is exactly what Iwant to do in the future. After thoroughly investigating its background, I designed the basicparameters of the optical waveguide by using COMSOL-Multiphysics. Then I discussed thestructure of this modulator with my mentor and Professor Tang and calculated the opticalloss by using Fimmwave and Fimmprop. At last, I got V ? with a limit of 3dB optical

losssuccessfully by writing a MATLAB code simulating our designed structure. This summerinternship not only introduced me to the major problems top scientists are concerned about andthe reasons behind their importance, but also cultivated my skills in designing nanophotonicdevices. It broadened my horizons and convinced me that nanophotonics will be my lifelongcareer direction. To sum up, I have gained fruitful theoretical knowledge and experimental skills in nanophotonicsand I seek to passionately devote myself to this field.

I hope to pursue a Ph. D. degree inthis field to further enhance my abilities.

While in summer, I studied electro-optic effects inelectro-optic modulators in Professor Hong Tang’s group. Now, I am doing some research on optomagnoniceffects in the yttrium iron garnet sphere. With these research experiences, I havehad a good understanding of interaction between different harmonic systems in nanophotonicdevices and I was highly attracted by their potential applications in classical and quantuminformation processing. Therefore, I eagerly hope to join Professor Hong Tang’s group and Iwant to design and fabricate other novel nanophotonic devices and further study nonlinearoptical effects in these devices during my Ph.

D. study. I am sincerely looking forward to yourfavorable review of my application and hope to continue my journey of discovery and inventionin Yale University.