Personal Statement, Relevant Background, and Future Goals

Distinct sub-headings to orient reader

Background

I was in the sixth grade when I learned about the decommissioning of the Maine Yankee Nuclear Power Plant. A classmate's father worked in the power industry, and he gave a presentation to our science class about the decommissioning and waste disposal process. I was intrigued by the science behind the concept of nuclear power. This curiosity eventually became one of the many factors that influenced me to pursue my undergraduate education in the [redacted] One thing that drives me toward excellence in my education is that I am a first-generation college student from a rural background. The lack of opportunities in technical and scientific fields in my early education has motivated me to give back, when home from school each winter, as a substitute teacher in my hometown.

Personal background and motivation; set up the narrative you are using to define youself

In the years between sixth grade and today, I have become increasingly convinced that nuclear power will have to be a major component of the solution to the seemingly intractable problems of energy and climate change that now face the world. My purpose in pursuing a graduate education in Nuclear Engineering is to prepare myself to the fullest extent to contribute to a field of particular interest to me and one that will be a vital component to the solution of these intertwined problems.

Short statement of your purpose before getting into details

Education

My academic background, working toward my B.S. in [redacted] has, I believe, prepared me well for graduate study in the field of Nuclear Engineering. The program has provided me with a strong background in many area of physics and has also allowed me to pursue studies in a wide variety of technical areas; I have taken courses in astrophysics, biophysics, electronic circuitry, computer instrumentation, and, most recently, nuclear engineering. This fall I received an invitation to join Tau Beta Pi, the Engineering Honor Society, which not only serves as a standard of academic excellence, but also promotes opportunities to support the local community through tutoring for both high school and undergraduate students in [redacted]

Quantifiable, concrete set of educational experiences

The most influential course I have taken at [redacted] was a graduate-level "Energy Seminar." It was during this seminar, facilitated by Professor [redacted] Plasma Physics Lab, that I was introduced to some of the issues common in today's discussion of energy and climate. In my mind, the views of speakers ranging from [redacted] professors to Exxon Vice Presidents converged in a single idea: renewable energy alone will not be an economical solution to maintain the globe's standard of living. Therefore, I intend to continue my education in Nuclear Engineering, with the hope of being part of the solution to the energy crisis.

Identify a problem, how does your path address that problem?

Research Experience

During most of my time at [redacted]. I have participated in research at the [redacted] Laboratory. As a student research associate, I worked with a group of staff scientists in the [redacted] program. This program is providing crucial research and development for the damping rings of the proposed International Linear Collider (ILC). The ILC, when it is eventually built, has the potential to provide a window into the high energy realm where all the forces of nature are unified. Also, the superconducting technology being developed for the ILC could produce gamma rays that can be used to characterize nuclear waste, allowing for more efficient waste treatment.

Technical competence is part of intellectual merit

Specifically, the group I worked for at [redacted] studies mitigation techniques for the electron cloud problem in lepton storage rings. The buildup of a diffuse electron gas within the storage ring can cause many problems, including severe degradation of beam quality and a reduction in beam current. The project I was primarily involved with consisted of characterizing the secondary electron yield of various metals and technical surfaces that are being used as beam chamber materials.

Make sure personal input to prior research is highlighted

I assumed several roles during the course of this research. I was responsible for the development and testing of the data acquisition software that controls our apparatus. This software is fully automated and makes millisecond precision measurements over the course of several hours. By developing this software, I was able to increase the efficiency of our measurement procedure and allow a broader range of data to be captured. I also worked on electron cloud model optimization using secondary emission data and worked directly with several suppliers to design tailor-made cabling and shielding systems for our apparatus.

What is the meaning of your experience?

Through my experience at [redacted] I have come into contact with many aspects of the research process. The ability to take a project from theory to implementation is the aspect of research I look forward to the most in graduate school. I have been involved with the [redacted] program for three academic years and nearly two summers at [redacted], so I am comfortable with making the commitment to a long-term project. During this time, I have co-authored three papers on various aspects of the project [1, 2, 3].

Quantify and cite previous work

Now, in the fall of my final year, I am working in the research group of Professor [redacted] Department, in the field of nonlinear optics. My project involves the development of a technique to make ultrafast single shot amplitude and phase measurements of optical signals. The optics scheme makes use of a time lensing technique pioneered in Professor [redacted] group. This research has the ability to make an impact in the field of signal processing, which is vital to the telecommunications industry.

This reads a little weak; make sure you impress the impacts of your work

Outreach

In the fall of my third year at [redacted], I took a position within the College of Engineering facilitating seminars for new students as a Peer Advisor. It is the advisors' goal to introduce new students to [redacted] campus life, academics, and general requirements for the College of Engineering through weekly one-hour seminars. I found this experience extremely rewarding, so much so that I took the position again in my final year. I enjoy sharing things I wish I had known during my first semester with my advisees and helping them work through issues they face as first-year students.

Quantify experiences

Using what I had learned during my experience in the fall, I became a teaching assistant in the Physics Department during the spring of my third year. I taught introductory mechanics to students in small groups, led large-group problem solving sessions, and provided support to graduate TAs, a commitment of six- to eight-hours each week. I became enamored of teaching, especially the ability to help students in any discipline reach an understanding about a topic that fascinates me.

I had a similar experience earlier in my collegiate career, albeit not in a classroom setting. Throughout my years at [redacted], I have been a member of the Cross Country Skiing Team, and this year I am the president of the organization. I have also been the head manager of a student-run lighting and sound production company during my third and fourth years, for which I have consistently worked ten- to twenty-hours per week. In both of these settings, I have taught a variety of skills: instructing people who had never seen snow how to ski and teaching new employees the ins and outs of a complex sound system.

Outreach and giving back to the scientific community is especially important to the NSF, tell them explicitly what you have done so far

Your research experiences are not the only things that define you

During the summer of 2013, I decided to take a break from my research and continue to explore the area of education. I participated in the [redacted] program at the [redacted] This program, which is funded in part by the National Science Foundation, takes undergraduates in physics or engineering, and over the course of seven weeks, instructing them on how to teach physics to middle- and secondary-school students. Working with Professors [redacted] and [redacted], who have each been teaching physics to undergraduates for many years, while training these students was enlightening. It was easy to look back and see myself, not all that many years ago, wanting to explore the same topics we were teaching them.

If you were part of something the NSF funded, it doesn't hurt to say so

Future Goals

With all of these experiences in mind, my next goal is to pursue my Ph.D. in the field of Nuclear Engineering, ideally at the Massachusetts Institute of Technology. My educational and research backgrounds have prepared me well, I believe, to enter a field that will be vital to the solution of the energy crisis. This issue has widespread consequences; there is no doubt that advances in the field of nuclear energy have an enormous societal impact. With my background in research and strong training in physics and related technical fields, I hope to help advance this field toward safer and more efficient power generation, while also reaching out to the public to increase awareness of the benefits of nuclear technology.

Wrap up: What do you want to do technically and why are you prepared to do it?

The experiences I have had through my summer teaching program and as an undergraduate teaching assistant will be extremely important to both my graduate education and my future career. In graduate school, I look forward to being a teaching assistant, where I believe my familiarity with various aspects of instruction will serve me well. Education is also an especially important aspect of the field of nuclear energy. There has been so much public opposition in the past to nuclear that both a well-educated populace and convincing general outreach will be necessary to advance the industry. Throughout my graduate education, and in my later career, I intend to seek these outreach opportunities wherever possible; science, especially nuclear science, not only needs to be advanced in the lab, but also needs approval from the public to make a meaningful difference.

How does what you want to do fit with the NSF call? How do you intend to benefit the community?

Publications

[1] [redacted]

[2]

[3]