Writing a graduate school personal statement

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[redacted] – MIT Biological Engineering PhD – Statement of goals

broad statement of goals and "branding"

During my lifetime, I expect that medicine, biology, and engineering will be revolutionized as we come to better understand and control the nanoscale. The overwhelming opportunity for creative, collaborative work across multiple disciplines has attracted me to experimental and theoretical research at the interface between nanotechnology and cell biology. Though I intend to also serve as a communicator and leader during my career, I will always be, first and foremost, a scientist and researcher.

very brief description of early research

Since the start of undergraduate I have had broad research interests. During my first two years at [redacted] College I worked briefly on projects in four different research areas: theoretical biophysics, experimental atomic spectroscopy, ultrafast lasers, and Middle Paleolithic archaeology. Each project spanned a few months at most, and they were geared for a new scientist: the research goals and methods were set up for me, and I had close supervision.

the big yellow block of research details is preceded by this paragraph explaning how those experiences related to applicant's research career trajectory

Over the next two years I worked on two more research projects. These required more creativity than my earlier efforts and I had less supervision. Again the goals of research were set up for me, but I was left to devise my own methods for achieving those goals. My senior thesis, the second of these projects, required much more time and intellectual commitment than any research I had worked on before.

The first project was a Winter Study course supervised Prof. [redacted] during my junior year at [redacted]. I simulated experimental output corresponding to the various physical theories we had about the behavior of probe fluorophores trapped inside a glassy polymer. I then analyzed the results and compared them to the actual data. The results of this experiment were published in the Journal of the American Chemical Society.

I started the second project, a senior research thesis supervised by Prof. [redacted] In spring of junior year. This project used a special type of molecule, a diblock copolymer, to create a dynamic nanoscale stripe system. We were concerned with the conclusion of a previous experimental study on a diblock system that a certain route to order in striped systems was universal. Because the ordering process in striped systems is important to biology, chemistry, physics, and industrial applications, verifying or overturning this supposed universality was an important goal.

gory details here are capped above and below by "meaning" sections

I developed a procedure for producing and analyzing samples, which included selecting a diblock, developing purification apparatus, finding a way to produce clean sample substrates, establishing a procedure that could anneal the samples without damaging them, and finally imaging the samples. Aside from the experimental work, I also designed and coded algorithms for data processing using Mathematica and ImageJ. After a full year of work, I had established the experimental procedure, taken the preliminary data, and identified some later avenues of research. In recognition of the quality of my thesis, I was awarded my BA with Highest Honors in Physics.

"meaning" transition from undergraduate to early graduate work and maturity

In the course of my academic and research work, my initial fascination with the idea of simple, fundamental laws that could govern the universe was gradually replaced by excitement about richer, more complicated systems. As I was starting to apply for PhD programs, I won funding for two years of postgraduate study at the University of Cambridge. After careful thought, I ended my PhD application process, reasoning that these two years would give me a chance to improve my research and communication skills, to mature as a person and a scientist, and to pursue coursework and research I might not have been able to during a PhD.

The summer after graduating from [redacted] I worked at the University of [redacted] with Prof. [redacted]. His group uses lasers to excite fluorophores bound to biological molecules in vitro and thereby observe the behavior of these molecules. While in the lab, I did my best to learn techniques for optical experiments and have a first crack at working with biological samples. After replicating some experiments, I noticed a problem with the logic of

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direct statements of accomplishments, even from short projects

some of the statistical distributions used to fit the experimental data, and I mathematically derived a more appropriate distribution for the experimental data I collected.

I spent my first year at Cambridge in a taught degree learning some of the theoretical physics I always wanted to be familiar with. Now I am pursuing a one-year research degree with Prof. [redacted] in the Department of Chemistry. His group studies potential energy landscapes, a unifying concept in self-assembling systems, using Monte Carlo simulations. As a starting project, I have been simulating the behavior of rigid bodies composed of Paramonov-Yaliraki ellipsoidal sites. These ellipsoidal sites have adjustable "soft" and "hard" parameters, making them a suitable building block for a variety of soft matter systems, including functionalized viruses, protein domains, and diblock copolymers. I believe that being able to model and simulate my own experimental work in soft condensed matter will prove a very valuable skill.

more biology

says what all this computer work has to do with graduate career

In order to be fully capable of tackling problems at the nanoscale, I still need to take coursework and learn research skills in biology, chemistry, and engineering. I only have minimal training in these three areas, so the amount of coursework I would need to do as a Biological Engineering student is sizeable. I find this exciting rather than burdensome, however, since the obstacle standing between me and the research in which I desperately want to be involved is this training.

shows understanding of course requirements; meets concerns about background head-on

Once I have gained this formal background, I will be fully capable to joining the leading research at the bio-nano interface that is happening at MIT. I am enthralled by the possibilities of the work currently being done by Professors [redacted] is the first step into a new generation of bio-nano-transducers. I would happily work night and day to make up deficiencies in my education for the chance to work on such tremendously exciting research.

talks about potential work with particular professors

Now although research would be my main focus during a PhD, my career interests are more broad than research alone. As medicine, biology, and engineering change with nanoscience, legislators will need help from the scientific community to enact coherent, useful science policy, and I intend to serve as one of those liaisons. Furthermore, the structure of the global scientific community is changing, and US scientists and legislators will need to carefully evaluate their place in the shifting scene and to create a strategy for how to get there. This effort will require leadership from within the scientific community, and I hope to be part of that effort.

These are ambitious goals, and to reach them I will need to use my PhD years to develop my communication and leadership skills. This past fall I was selected as a member of i-Teams, a technology commercialization project run by Cambridge's Institute of Manufacturing and based on the program at MIT's Trust Center for Entrepreneurship. Working on a team with business students, consultants, and scientists of various backgrounds was challenging and immensely fulfilling, and I expect that the community that devised such an innovative project will provide me with an astounding array of opportunities for me to develop the skills I need to achieve my later career goals.

most relevant non-academic experience that relates to larger career goals

wraps up all these experiences

In short, by the end of MIT's Biological Engineering graduate program, I would have the technical skills, scientific knowledge, and interpersonal contacts I need to combine theory and experiment (mens et manus) in exciting new research, and I will have taken a significant step toward my later goals of serving as a scientific communicator and leader.

MIT-specific!

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Adapted from MIT Biological Engineering Communication Lab.

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