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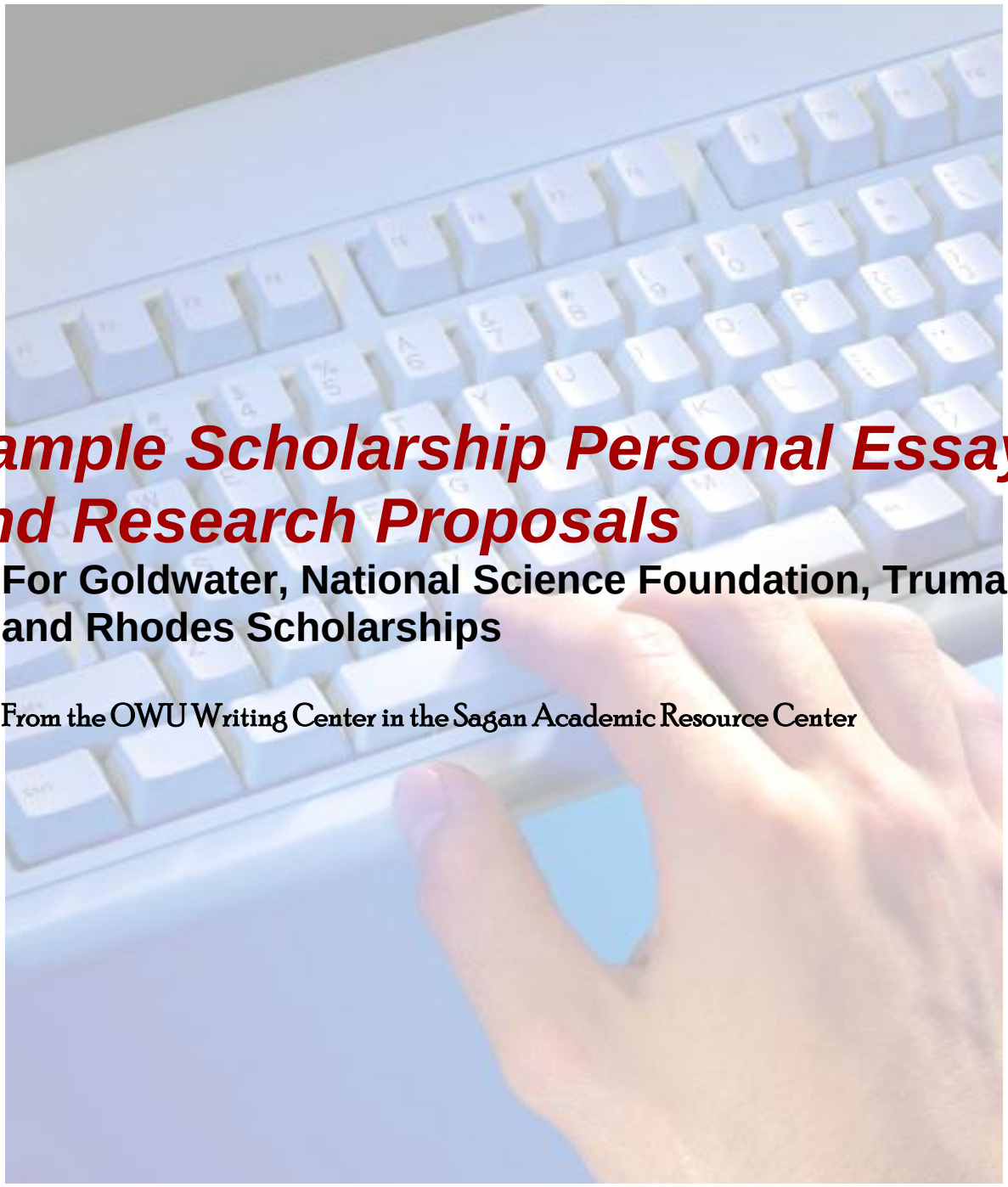

Sample Scholarship Personal Essays and Research Proposals

For Goldwater, National Science Foundation, Truman, and Rhodes Scholarships

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Sample Scholarship Personal Essays and Research Proposals

Contents

Goldwater Scholarship

Goldwater Scholarship nominees answer a few questions that invite personal responses and write a longer essay that discusses a problem in the applicant's field of study and describes any ongoing or planned research that is related to that problem. Following are samples from three Goldwater Scholarship applicants. The first is a nominee's essay, including a bibliography, from an Ohio Wesleyan University alumna and is presented here without commentary. The second and third are examples of an applicant's responses to the narrative questions followed by that same applicant's essay. The second and third samples are followed by short commentaries.

Goldwater Sample 1

Title: "Conservation of Fragmented Cheetah Populations in the Arabian Peninsula"

The cheetah *(Acinonyx jubatus)* was once a common animal that inhabited five continents, ranging from southern Africa well up into Asia (Marker 1998). With cheetah populations having decreased approximately 90% since the 1900s, the cheetah is considered Vulnerable worldwide and subspecies are listed as Endangered and .Critically Endangered in Northern Africa and Iran, respectively (Marker 1998, Nowell and Jackson 1995). Cheetah extinction is being brought about by habitat loss and degradation, a declining prey base, and conflicts with humans (Marker 2002). Apart from a few remnant populations in the Northern Arabian Peninsula and Northwestern Afghanistan, the majority of free-ranging cheetahs today are located in Namibia, where the declining cheetah population was stabilized at 2,500 animals thanks to the extensive efforts of the Cheetah Conservation Fund (Morsbach 1987, Marker 1998).

However, as the world population of cheetahs is genetically impoverished to a high degree, it is of immense importance that these other fragmented populations of cheetahs be studied and preserved in order to maintain the genetic integrity of the species. Lack of heterogeneity most likely resulted from a bottleneck in the population during the Pleistocene period and increases the cheetahs' susceptibility to ecological and environmental changes (O'Brien et al. 1983, O'Brien et al. 1985). Cross breeding populations with different variations can bolster the genetic diversity of the species and promote long-term viability (Muson et al. 1997).

Smaller cheetah populations have been surveyed in Northern Africa, and are reportedly found in areas of Iran and Pakistan (Busby 2006, Nowell and Jackson 1995). In developing a conservation strategy for preserving the cheetah populations of the Arabian Peninsula, it would first be necessary to establish baseline data on cheetah abundance, distribution, and habitat use within the potential preservation site (Marker-Kraus et al 1996). Only small fractions of the lands cheetahs inhabit have been set aside as wildlife reserves and natural habitat is being destroyed and fragmented at an increasing rate by the expansion of agriculture and human development. It is important for the long-term survival of a population to assess how well it fares both within and outside of protected areas and develop methods for maintaining wild populations in different parts of the landscape matrix. Information on the genetic diversity and degree of heterogeneity of the cheetah population should also be gathered, as should data on the physiological wellbeing of the animals, for comparison between those living in different parts of the landscape matrix. If the cheetahs can sustain themselves in agricultural lands without causing a great degree of damage to farmers' property, the future conservation effort could focus on educating farmers and developing

a system for tolerance and sustainable land use. If not, data from the study could be used to prioritize lands for conservation.

While the CCF investigated cheetah ecology in Namibia by surveying local inhabitants and collecting biological samples from cheetahs captured opportunistically by farmers, other studies of cheetahs have successfully gathered similar data by collecting and analyzing fecal samples (e.g. Busby 2006). Scat analysis is particularly convenient and provides a great deal of useful information. Collection of scat is noninvasive and ideal for determining the relative abundance of cryptic animal with a large home range. A novel scat-collecting technique that has been employed in studies of the distribution of black bears and grizzly bears in Canada involves the use of detector dogs trained to sniff out feces of the target species (Wasser 2004). Dogs can cover extensive geographic areas easily and quickly find a large number samples that would have gone unnoticed by human collectors, increasing potential data sets.

Several useful pieces of data can be gleaned from fecal samples. Microsatellite studies from genetic material in the scat can be used to assess the genetic variation of the population, which can be compared to that of other populations through libraries and online database (e.g. Driscoll 1994). DNA analysis can also provide a description of the relative abundance of cheetahs by distinguishing individual animals. Hormone and endocrinology analyses can assess the physiological health and stress levels of individuals, which may reveal differences among animals utilizing different areas of the landscape matrix.

Examining human impact and its effect on species survival is at the core of all conservation biology. I anticipate conducting this type of study for my Master's or Ph.D. research and I have experience utilizing similar collection and processing methods to those described above while assisting other graduate students with their conservation projects. It is important to conduct the type of work where one interacts with both the organism in its ecosystem and the human population on a local and worldwide scale, incorporating the desires and needs to each to develop a more effective way to promote the longevity of endangered species.

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Goldwater Sample 2a: Responses to select questions

Question D: What are your professional aspirations? Indicate in which area(s) of mathematics, science, or engineering you are considering making your career and specify how your current academic program and your overall educational plans will assist you in achieving this goal.

Few generations have had the amazing power to impact our environment on a worldwide scale. Even fewer generations have realized humankind could have such a large impact on the Earth. The past century has seen many advancements in technology and quality of life. These great achievements have also given humankind the power to permanently alter our Earth and its fragile ecosystems. It is important to improve our quality of life, but it is also important not to compromise that of future generations by sacrificing our natural environment. My professional aspirations are to lead a team conducting research on new methods to reduce and control pollution output from industrial chemical processes. My research will be performed either in an industrial setting or in combination with teaching as a college professor.

My current academic program in chemical engineering provides knowledge of industrial chemical processes along with a solid background in mathematics and chemistry. My current research project provides a jumpstart on the type of research I can expect to perform as a graduate student and as a professional investigator. Graduate school in chemical engineering provides the in-depth knowledge required to understand and improve pollution control in industrial chemical processes. A Ph.D. degree will provide me with the essential skills needed to develop my own research projects and lead a team of researchers.

Question E: Describe an activity or experience that has been important in clarifying or strengthening your motivation for a career in science, mathematics, or engineering.

My research experience this past summer has greatly solidified my interest in pursuing a career in scientific and engineering research. I have always had an interest in how the world operates and how humankind has obtained its vast wealth of knowledge, but I was not certain how I would pursue these interests in my career. In my first month of laboratory research, I encountered several unique challenges. Bacteria would not grow properly and the ionic strength of sample solutions and ratios of particles to bacteria had to be constantly altered and adjusted. I soon realized the tremendous degree of work, number of failed attempts, and good amount of luck that can go into even the smallest of advances. It gave me a newfound respect and admiration for the great minds of the past to which we owe our knowledge of the world. When I was ultimately able to perform a successful bacterial adhesion experiment, I had a great feeling of satisfaction. It reminded me that the most rewarding achievements are often those that require many failures before success is achieved.

Working with the graduate students in lab, each of whom had his or her own specialized research topic, was inspiring. I realized that there are plenty of opportunities available and there is plenty of room to make an impact. Most of all I realized that I would genuinely enjoy working to solve new problems and learning more about our world as a scientific researcher.

Question F: Goldwater Scholars will be representative of the diverse economic, ethnic, and occupational backgrounds of families in the United States. Describe any characteristics or other personal information about yourself or your family that you wish to share with the review committee.

I grew up in a highly rural area. My father works as a Union Ironworker traveling between jobsites throughout the seasons while my mother works as a bookkeeper. I will be the first member of my family to pursue a technical degree and a career in science. I was fortunate enough to be raised by a family that worked very hard to provide the opportunities available to me and instilled in me the importance of respecting people of diverse backgrounds and differing views on life.

To gain a more global perspective, I will study abroad in New Zealand next semester. I am excited about the opportunity to be immersed in a new culture. I hope that I can continue to expand my horizons by experiencing new cultures throughout my life.

(Schall 164-65)

Goldwater Sample 2b: Nominee's Essay

Title: "Investigating the Role of Orientation in Bacterial Adhesion"

Bacterial adhesion can cause industrial equipment biofouling,[1] medical implant failure,[2] and is a problem for *in situhiorerae&iaXion* of polluted soils. [3] Despite extensive studies, mechanisms of bacterial adhesion remain inadequately understood. This makes it difficult to treat or control biofilm formation (a result of bacterial adhesion), which is the long-term goal of this research.

As a bacterium nears a surface, a balance between several forces will determine its course of action. Such forces include van der Waals, electrostatics, hydrophobic, solvation, depletion, and biospecific interactions. The importance of these forces can depend on a number of factors including the structure of the bacterial surface, solution ionic strength, and properties of the inert surface. The large variety in bacterial surfaces and the conditions under which adhesion can occur prove to complicate the bacterial adhesion process."[4]

There have been only a few studies examining the *orientation* of a bacterium as it adheres to a surface.[5,6] One such study performed by Jones et al. has observed that when the bacterium *Escherichia* coli adheres to colloidal particles, over 90% of the particles adhere to nanoscale regions at the ends of the rod-shaped bacterium.[7] These findings suggest that the ends of the bacterium may play a key role in the adhesion process. It is possible that the ends of the bacterium contain surface nonuniformities that facilitate the adhesion process. Surface nonuniformities may include lipopolysaccharide (LPS) chains and surface proteins in addition to the often-seen flagella.[3] If these surface nonuniformities can be isolated and identified, it may be possible to control the adhesion process through molecular biology.

In my undergraduate research project, the work of Jones et al. has been extended to two strains of the bacterium *Bulkholderia cepacia. B. cepacia* has been shown to degrade both trichloroethylene (TCE) and tetrachloroethylene, molecules representative of many halogenated pollutants.[7,8] Injection of this bacterium into polluted soils is a promising method of bioremediation, but bacterial adhesion to soil prevents movement through porous media.[9,10] As the particles adhere to the bacteria, the bacteria are less likely to be transported through small micro-pores in the soil. It would be advantageous to decrease adhesion in order to enable the bacteria to better disperse through polluted soils during *in situ* bioremediation.

In order to examine bacterial adhesion, we used video microscopy to observe and record the orientation of various sized particles as they adhered to bacteria. Images of rod-shaped bacteria adhering to various-sized spheroid particles are shown below.

(Image included in original here)

B.cepacia G4 1.54 pm silica particle

(Image included in original here)

5. *cepacia* G4 0.9 }im silica particle

The rate of end-on adhesion for the *B. cepacia* was observed to be near 75% with the same-sized particles used by Jones et al. in studying *E.* coli bacteria. This indicates that there may be different surface nonuniformities on *B. cepacia* or perhaps a different mechanism of adhesion. It was also observed that the size of the particles plays an important role in determining where the particle will adhere to the bacterium. Larger particles tend to adhere on cell ends more often than smaller particles of the same silica or polystyrene material. The preference for bacteria to adhere to larger particles end-on can be partially explained by geometric coincidence. As a particle approaches a bacterium rotating under Brownian motion, depending on the particle size it may rarely be able to meet the middle of the bacterium without first encountering the ends.

Future work will include additional oriented adhesion experiments substituting spheroidal colloidal particles for bacteria. These experiments will provide a basis of comparison for the previous sets of data. We will examine whether the high end-on adhesion rates are observed when there are no biological factors in play. In addition, oriented bacterial adhesion experiments with varying particle sizes will be performed to see if a quantifiable relationship between particle size and rate of end-on adhesion can be obtained. This research will help identify molecular mechanisms of bacterial adhesion, which will enable strains of bacteria to be altered in order to improve bioremediation processes. This study will be submitted to a scientific journal for publication in the near future and will be included in my senior honors thesis in chemical engineering.

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(Schall 166-67)

Comments (2a and 2b)

"In answering the narrative questions, [this] writer stresses his aspiration to lead a team of researchers studying pollution control in industrial chemical processes, and cites specific problems he has encountered in his current research on bacteria growth. His tone is almost philosophical at times, discussing the rewards of both achievement and failure in the sciences, and he notes that he is the first in his family to pursue a technical degree. His nominee's essay stresses the long-term goal of his research in bacterial adhesion, and he carefully describes his team's use of video microscopy to record particles as they adhere to bacteria." (Schall 163)

Goldwater Sample 3a: Responses to select questions

Question D: What are your professional aspirations? Indicate in which area(s) of mathematics, science, or engineering you are considering mailing your career and specify how your current academic program and your overall educational plans will assist you in achieving this goal.

Currently, I am pursuing a combined B.S./M.S. through the Integrated Undergraduate Graduate program because it allows me to take upper-level classes in my major earlier than one would experience in the normal B.S. program. This accelerated coursework is preparing me for a technical internship this summer. My participation in the Women in Science and Engineering Research Program has given me the unusual opportunity to work in a research group of graduate students as an undergraduate sophomore. The research I have been doing on nanoindentation of glass and glass melting has provided a hands-on experience to complement my accelerated coursework. It is also a way to prepare for my honors thesis.

After I get my Ph.D., I plan to work in research and development for a national lab such as Sandia or a government institution such as NASA. I would like to have my own lab with a research team and eventually take a project into space as a mission specialist. To prepare for a future career in research, I am applying to Sandia National Labs for a summer internship.

I plan to continue to participate in the activity of glass blowing throughout my professional career. By occasionally working as a glass blower at a seasonal Renaissance Faire I would be able to raise the awareness of materials science through one of its more artistic forms.

Question E: Describe an activity or experience that has been important in clarifying or strengthening your motivation for a career in science, mathematics, or engineering.

I became aware of the field of Materials Science and Engineering (MatSE) during my junior year of high school when I attended the Society of Women Engineers High School Day at Carnegie Mellon University. Up until that point I had been considering Aerospace Engineering because of my acute interest in space. That day every student was sent to three workshops; one was for their preemptively chosen major and the other two were random. One of the workshops I attended was on Materials Engineering. I was instantly fascinated. The demonstration that I remember most vividly was the brittle fracture of metals after immersion in liquid nitrogen. I immediately decided to major in MatSE.

My next college visit was to Mythic University for an Engineering Open House. The glass blowing demonstration impacted me the most. The Materials Science and Engineering Department at Mythic University has a facility for off-hand glass blowing. I pursued that interest last semester by stopping by the glass lab for 3 or 4 hours every week to watch the graduate students blowing glass. My interest paid off because starting this semester I will be taking glass blowing lessons from the same graduate students I watched at the open house two years ago. I will also have the opportunity to help out with the glass blowing demonstration at this year's open house.

Question F: Goldwater Scholars will be representative of the diverse economic, ethnic, and occupational backgrounds of families in the United States. Describe any characteristics or other personal information about yourself or your family that you wish to share with the review committee.

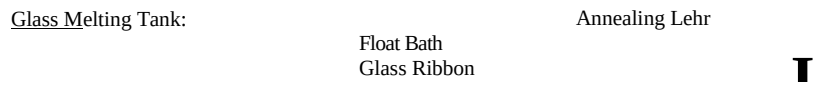
My family lives in a very rural area, and as such there was sparse opportunity for distinction in high school. I did my best, graduated as valedictorian, and completed my graduation project my junior year. My graduation project was inspired by my longstanding interest in space and a search through a NASA website. With the help of my father, a senior bank auditor but country man at heart, I built a drop box with a special candle holder to successfully demonstrate the effect of microgravity on candle flames.

When I go home over breaks from school, I make a point to visit my former high -school teachers and present MatSE information to their new students. Living in a rural area, while refreshing and without frills, often does not provide information about the wealth of opportunities available, including career opportunities such as engineering for women. I always look forward to these visits home to share my experiences with other upcoming students.

(from Schall, Joe. *Writing Personal Statements and Scholarship Application Essays: A Student Handbook.* Eden Prairie, MN: Thomson-Brooks/Coe, 2006. 168-69.)

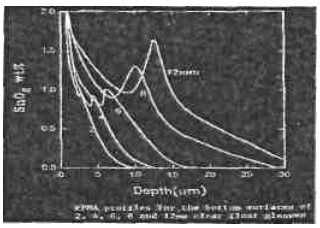
Goldwater Sample 3b: Nominee's essay

Title: "Nanoindentation Interrogation of Float Glass for Elastic Modulus and Hardness"



(Complete image appeared in original here)

Contemporary window glass is made by the float bath process to ensure that both sides are perfectly parallel and smooth. The molten glass batch is poured from the melting tank onto a bath of molten tin. As the glass floats across the tin it cools. It then flows off the bath onto rollers that take it through an annealing lehr to remove thermal stress. As the glass rolls out of the lehr it is cut into pieces for further processing. Tin is chosen for the, float because of its low reactivity with soda lime silica glass. However, it is not perfectly unreactive because contaminants enter the tin bath and change its chemistry. Some of the tin diffuses into the float side of the glass as Sn2+ and Sn4+. The diffusion of tin is governed by many factors including the composition of the glass and the time spent on the float bath. The thicker the glass is, the longer it spends on the bath. Consequently the tin has more time to diffuse. This difussion process typically produces a hump in tin content as shown.



Traditionally, the bottom side of float glass is used as the external side of the glass when it is used in applications such as automobile windshields and commercial windows. This side was found to perform better during normal use. A better understanding of this phenomenon is desired in order to improve the mechanical and chemical durability of these glasses for future applications.

A hypothesis was formed by Dr. John Teacher that there should be a significant difference in the elastic modulus and hardness of the air and tin sides of float glass. This would be expected to alter the resilience of the float side of the glass relative to the unaltered surface. A nanoindentation technique was chosen to interrogate whether or not this is the case. Three different 4-mm-thick soda lime silica float glasses varying in iron content were chosen for examination. A Hysitron nanoindenter outfitted with a Berkocitch indenting tip was chosen for the analysis because it would be able to analyze the upper 400 nanometers of the chosen samples for hardness and elastic modulus. The loads used were 100, 300, 500, 1000, 2500, 5000, 10000, and 15000 micronewtons, yielding data points for depths of 20, 40, 60, 90, 150, 200, 300, and 380 nanometers, respectively. Nine indents were performed at each load per run and at least 3 runs were performed to ensure reproducibility.

The results obtained did not show the expected differences in elastic modulus or hardness. Instead they were almost identical at about 75 GPa for the elastic modulus. The elastic modulus of the fused silica with which the nanoindenter was calibrated was 72 Gpa.

These results suggest that the observed enhanced durability of the tin-side of float glass is due to more complex issues, possibly related to chemical interactivity between the glass and the atmosphere in service. The research group I work in is currently investigating these issues, through controlled atmospheric exposure and nanoindentation techniques. This research is expected to provide a fundamental insight into how to compositionally tailor float glass for improved chemical and mechanical durability in structural applications.

(A statement identifying research team members appears in the original here.)

(Figures illustrating the results appeared in the original here.)

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Comments (3a and 3b)

"[This] writer addresses the narrative questions by outlining her participation in programs related to women in science and her personal aspirations, ranging from serving as part of a NASA research team to working as a glass blower at a Renaissance Faire. Her diversity background is grounded in her hailing from a highly rural area (even her influential father is a "senior bank auditor but country man at heart"). Finally, her nominee's essay, addressing the goal to improve the durability of window glass, offers precisely detailed information even to the extent of giving exact nanometer depths that yielded different data points. Such an approach closely resembles a technical abstract that would appear in a journal. Significantly, this student did receive a Goldwater Scholarship." (Schall 163)

National Science Foundation Graduate Research Fellowship (NSF GRF)

Applicants for the NSF Graduate Research Fellowships answer several questions and write personal statements, descriptions of previous research, and proposals for future research projects. Following are five sample sets. The first three are from Ohio Wesleyan University alumni and are presented here without commentary; the last two sets of short essay answers to questions plus research descriptions and proposals are followed by brief comments.

NSF Sample 1: Personal Statement

Somewhere in the night, I could hear the dilapidated bus rumble as it maneuvered across the moldering bridge. Rain trickled down through the tangle of branches and vines over my head, and off in the distance faint streaks of lightning traced across the sky. It was dark, and although the chorus of frogs and cicadas suggested a forest filled with life, I could see very little in the understorey that surrounded me. A mudslide had blocked our intended route from San Jose, capital of Costa Rica, to our field station, resulting in a day fraught with travel and travail for me and my fellow primatology students. We faced one final obstacle: a bridge too unsound to support a fully loaded bus. To lighten the load, I had disembarked with the others, stepping into the rainforest for the very first time.

Growing up, I fantasized about exploring rainforests such as this and other kinds of exotic environments. The steamy tropical forests, blistering African savannas, and frozen tundras

recreated for me in zoos and museums, however, were so different from my suburban environment that they seemed unreachable and unreal. Instead, I explored the nature that did surround me (despite its lack of elephants or polar bears). I was one of those children always getting into trouble for raising tadpoles in the bathroom sink or storing bird nests in the cereal cupboard. At nature camps, I learned about the relationships between our native animals and their environment and, through patient observation, became able to observe these interactions for myself The more I discovered, the more questions I had; every query I asked made me more curious about the world around me.

In high school, one of my childhood fantasies became reality when I served as a volunteer at the Jaguar Conservation Fund in one of the world's most endangered savannas, the cerrado grasslands of Brazil. Though it was teeming with unfamiliar flora and fauna, my excitement of being in a new ecosystem was tempered by the realization of how little savanna remained among the vast tracts of farmland. Using methods ranging from camera- and live-traps for measure species diversity to extracting hormones from feces to estimate stress and reproductive levels, I helped researchers as they developed a picture of how animals were faring as their habitat rapidly disappeared. This was my introduction to "real" scientists - hard-working researchers who showed me the process and importance of collecting scientific data and revealed how research could be applied to protect habitats under threat.

When I started university, my experience in Brazil inspired me to take "Conservation Biology", "Conservation Genetics", and "Endangered Species" classes, which focused on exposure to primary literature and taught me a great deal about methods scientists use to preserve threatened organisms. In addition to coursework, I also conducted my own research projects and have probed systems as diverse as the bacteria living in bird plumage to the parasites inhabiting a puma's intestines. Beginning my freshman year, I studied the antibacterial properties of feather pigments, characterized preening behaviors, sequenced DNA from tapeworms, and examined mate choice and the development of behavioral syndromes in fish. Independent research was a chance for me to apply theoretical principles from my classes to real-world processes. I learned techniques for characterizing behavior in different organisms, gene-sequencing methods, how to use PCR, SEM, spectrophotometers, and other instruments and gained a good grounding in a broad array of statistical methods. The national fellowships I earned, including the National Merit and Goldwater awards, along with the $150,000 of other grants and scholarships I have received, have funded a majority of my research. I have presented my research at over 17 conferences and symposia and my preening behavior study is currently in press.

As interesting as I find the world beneath a microscope or inside a fish tank, I wanted to emulate the scientists I met in Brazil and conduct research in the field. I carried out my first independent field study while attending a class on Primatology & Conservation in Costa Rica. Conditions in the field were spartan, with no electricity or running water, in an area miles from civilization. Our study site was a muddy, treacherous lowland swamp forest that was swarming with mosquitoes. Yet I embraced the challenges of living and collecting data in this environment. I learned techniques for gathering behavioral information on individuals and groups of animals, how to design sound, repeatable methods such as setting up transects or plots, and how to characterize biotic and abiotic environmental conditions. I applied these methods in my independent research project, where I compared different species of monkeys as seed dispersal agents. The class also had an intense conservation focus. Lectures on anthropogenic disturbances and biodiversity loss were driven home by the habitat destruction we saw firsthand in the slash-

and-bum pastures and barren monocultures encroaching upon the small patch of forest that we worked in.

I used the research techniques I learned at field school when I developed and implemented subsequent field research projects in Costa Rica, Panama, and Puerto Rico, studying competition trade-offs in hummingbirds, signaling plasticity in lizards, and developmental switchpoints in tree frogs. Not only have I learned a great deal working with a number of scientists during these projects, but the degree of habitat destruction and environmental alteration in each new location has deeply shocked and disturbed me. I have witnessed clear-cutting, illegal logging and poaching, seen the devastating effects of human expansion and pollution, and encountered multiple cases of meaningless destruction of animals due to prevalent local misconceptions.

In order to learn more about conservation initiatives while acting to protect endangered ecosystems, I have engaged in multiple volunteer projects around the world. After Brazil, I helped with the Monkey Bridge Project in Costa Rica to connect fragmented habitats for primates. Volunteering at the Cheetah Conservation Fund in Namibia, I not only learned how to collect important hormonal, genetic, and morphological data from these highly endangered carnivores, but I also discovered the importance of educating the local population and inspiring them to see their native wildlife as something worth protecting while making it economically favorable for them to do so. In Borneo, a biodiversity hotspot that is predicted to be completely destroyed by 2020, I worked with indigenous villages to develop an ecotourism business while also assisting with reforestation efforts and wildlife surveys.

My volunteer work and field research has opened my eyes to the devastation mankind is inflicting on these ecoregions and shown me what needs to be doije if we are to save these areas for the future. As such, I plan on pursuing a graduate degree in biology with the goal of doing research that can be directly implemented for conservation efforts. My primary goal is to work with conservation organizations to develop better methods for monitoring, managing, and preserving wildlife. Receiving the NSF fellowship would enable me to conduct my proposed research project, which would involve working closely with Africa farmers to manage wildlife in such a way that the native people receive an economic benefit from maintaining wildlife populations while still being able to carry out their livelihoods. This project would enhance our understanding of co-existence between people, livestock, and wildlife and produce results that could be applied to multiple ecoregions throughout the globe. I possess the field experience, research experience, and academic knowledge to be a successful scientist. Furthermore, I plan on engaging other students in my work to teach and inspire them the way that researchers took me under their wings when I was first starting out. Ideally, I can use my research to preserve that first moment of being in a tropical forest - the rain, the cicadas, the slimy bridges and amphibian chorus - for those who come after me.

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NSF Sample 2: Description of Previous Research

My research experience began my freshman year and has spanned from field to lab and from organismal to molecular. I have initiated and conducted multiple independent projects as well as assisted with data collection for larger projects. My field research has taken me to Costa Rica, Panama, and Puerto Rico. Overall, I have presented the results of my research 17 times at

conferences and seminars, earned over $150,000 in grants, have a paper of my own research in press and have contributed to publication of a second paper.

My first semester of college, I designed and implemented an independent project investigating feather pigmentation's role as a defense against bacterial degradation as a possible driving force in the evolution of bird coloration. Using a spectrophotometer to measure oligopeptides released as bacteria digest feather proteins, I quantified and compared rates of degradation in feathers containing metal ions, melanin protein, or lacking pigmentation. I presented my findings at the Wilson Ornithological Society 2008 meeting. This was my introduction to lab work and to the process of presenting my results to an audience of scientists.

Although I continued ornithological research for several years, the next semester I began a parasitology study identifying tapeworm species through genetic and morphological means. I learned how to do PCR and use gene sequencing software to create phylogenetic trees. My study on intestinal parasites from pumas revealed that a species of tapeworm specific to bobcats had adopted a new definitive host when it spread to Central America. I gave an oral presentation of this project to the Ohio Wesleyan student research seminar.

I began field research the summer of my freshman year at the El Zota field station in Costa Rica. While attending a class on primatology and conservation, I carried out an independent research project comparing the mechanisms of seed dispersal in the threatened black-handed spider monkey and abundant mantled howler monkey. Using methods taught in class, I tracked monkeys to collect behavioral data, quantified viability and growth rates of seeds collected from monkey feces, and characterized habitat elements at feces deposition sites. I presented this research at both the Ohio Wesleyan student research seminar and the 2008 Midwestern Primate Interest Group conference. While at El Zota, I assisted in data collection for a graduate student at Ohio State University, Michelle Rodgriuges, and am an author on her study of play behavior in juvenile spider monkeys, which was presented at the same conference.

Returning to Costa Rica the following January with my tropical biology class, I developed a project characterizing competitive behavior among four hummingbird species. I was becoming increasingly interested in the discipline of ethology, and I used many of the techniques I learned in El Zota to quantify inter- and intra-specific calorically-expensive aggressive behaviors. My observations revealed that high-energy interactions mainly occurred between conspecifics, but the interspecific hierarchy of deferral was not based, as I had hypothesized, on size alone. I presented the results of this study as a poster at both the 2009 Wilson Ornithological Conference and the 2009 Patricia Belt Conrades Science Research Symposium.

Continuing with the ornithological theme, the next research project I developed involved observing house sparrows to characterize and quantify different forms of feather maintenance behavior. A comprehensive description of preening behavior and its effects on bacterial and parasite loads in plumage had never before been undertaken, and I presented the results of my study, coupled with extensive background research I completed on the evolution of feather maintenance behaviors, at the 2009 American Ornithologists' Union conference and at an Ohio Wesleyan student research seminar. As I was unable to attend, my advising professor presented my work at the 25th International Ornithological Congress in Brazil, and this study is now in press *{Proc. Internat. Ornithol. Congr.).*

At the same time, I was also studying the development of syndromes (correlations between different behaviors) in stickleback fish. This work will serve as preliminary data for a proposal that my advisor, Dr. Shala Hankison, is writing for the NIH. I examined whether the threat of predation could induce the formation of behavioral correlations, which would shed light

on whether possessing syndromes has fitness benefits. This was my first time studying behavior in a lab setting, and I learned techniques for quantifying different behavioral characteristics and controlled methods for releasing predatory cues. My analysis of the data unexpectedly revealed that more syndromes developed in the fish that were not exposed to predators. Additional replicates under less variable circumstances will be necessary to confirm these results. I gave a presentation of this project at the Ohio Wesleyan student research seminar, at the 2009 Patricia Belt Conrades Science Symposium, and at the 2010 Ohio Academy of Sciences conference.

I gained further behavioral research experience assisting a Harvard professor, Dr. Terry Ord, gather data on the territorial displays of anoles. We tested the hypothesis that animals that communicate visually have the plasticity to change the intensity of their communication in order to overcome factors in the background, such as movement or light, which may drown out the original signal. Working in Caribbean National Park, Puerto Rico, we captured and marked male lizards, filmed their territorial displays, and took measurements on wind, light intensity, and other abiotic conditions. The data we collected were analyzed at Harvard, and the results of this study are in press. I described my role in the project in an oral presentation given to the Ohio Wesleyan student research seminar.

More recently, I have conducted research at the Smithsonian Tropical Research Institute (STRI) in Panama under the tutelage of Dr. Karen Warkentin. I worked with red-eyed tree frogs, which can change the timing of certain developmental events in their lifecycles in order to avoid predation. A fellow intern and I studied the tradeoffs of hatching prematurely. In mesocosms, we exposed same-age tadpoles that were either hatched prematurely or naturally to three species of predator. In half of our experiments, predators were free to consume tadpoles; in the rest, predators were caged, releasing cues but not directly interacting with the tadpoles. We collected data on mortality, growth, and behavior. I presented the results of this study at a STRI research seminar, the 2010 Patricia Belt Conrades Science Symposium, and will be presenting again at the 2011 Society of Integrative and Comparative Biology conference. This experience introduced me to some of the more powerful statistical techniques and software, including R, and was a wonderful opportunity for me to interact with the variety of researchers at our field station.

My current research is examining the role that UV-characteristics play in mate choice for sailfin mollies. As several closely-related species of poeciliid fish possess markings only visible in the UV range and appear to evaluate these characteristics when choosing mates, I anticipate finding that mollies have similar markings for the same purpose. I will be taking spectrophotometric readings of the fish to determine the presence and location of UV reflectance and conducting mate-preference tests in which females are presented with males whose markings are visible or have been blocked. For my senior honors thesis, I will analyze and defend my results of this study to a committee. Furthermore, I plan on presenting this project at the 2011 International Animal Behavior Conference.

Publications

Burtt, E. H., Jr., **M.** S. **Palmer,** S. M. Williams, and A. A. Alamshah. Plumage microbial community as a force driving the evolution of maintenance behavior. *Proc. Internat. Ornithol. Congr.* 25: (submitted).

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NSF Sample 3: Proposal for Future research

Title: Using Cattle to Conserve: Wildlife & Livestock Management in a Human-Occupied Savanna
Key words: apparent competition, predator-prey, range management, rare species, wildlife conservation

Introduction. Human disturbances underlie declines, extirpations, and extinctions of wildlife across the globe. African savannas are one of the last remaining strongholds of charismatic megafauna, whose activities are critical for the maintenance of these rangelands. Humans modify not only the abundance of, but also interactions between, these key constituents of savanna ecosystems. In addition, humans and their livestock increasingly vie for access to resources in savannas; thus, the conservation of savanna ecosystems hinges on the extent to which wildlife, humans, and their livestock are compatible over the long-term. In light of this information, we may be able to manage these relationships to increase and sustain biodiversity while still maintaining the livestock production practices critical to the economy of local peoples.

In the Laikipia District of central Kenya, cattle and plains zebra are the two most common large mammalian herbivores. Both are unselective grazers whose populations are limited by rainfall \ Other wild herbivores, including eland, hartebeest, and waterbuck (hereafter "declining antelopes"), have populations regulated by predation rather than rainfall . These ungulates have experienced marked declines over the last 15 years that coincide with the restoration of lions and spotted hyenas to the region. Range managers are now considering lethal removal of predators to encourage ungulate biodiversity in an attempt to bolster revenues from ecotourism\

Grazing by cattle creates nutrient-rich "grazing lawns" that attract mobile, wide-ranging zebra. Hypothetically, one should be able to manipulate zebra spatial distribution by manipulating placement of cattle grazing lawns. Declining antelopes, on the other hand, are more sedentary and unlikely to encounter grazing lawns established away from their home ranges. As zebra comprise more than half of the total prey biomass in Laikipia, it is likely that they drive the distribution of predators; that is, predators may also be attracted to the grazing lawns^. Under this scenario, zebra and declining antelopes exhibit apparent competition, whereby declining antelopes incur greater risk of predation by virtue of their proximity to zebra. Therefore, if ranch owners manage cattle grazing proactively to establish grazing lawns away from declining antelopes, they should be able to reduce predation pressure by shifting hunting activity of lions and hyenas. This would bolster declining antelopes while maintaining livestock production, predator populations, and ecotourism efforts over the long term. Alternatively, if predators selectively hunt in areas where prey are more catchable (rather than more abundant), predation on declining antelope should be determined largely by landscape features that provide cover".

I propose an experiment testing how cattle affect the balance of predators and prey in the Laikipia District, under the guidance of Dr. J. Goheen (Dept. Zoology, University of Wyoming).

Specific aims and hypotheses. There are two main questions that need to be addressed:

(1) **Do predators hunt where zebra are most abundant?** Zebras are the most common prey of lions in Laikipia . Thus, lions and other predators may selectively hunt in areas where zebra are most abundant. If so, cattle management might be used to manipulate distributions of predators. Alternatively, predators may target areas of high tree cover where prey is easier to catch^.

(2) **Can cattle be used to increase survival of declining antelopes?** If cattle can be used to attract zebra to particular areas, and if predators selectively hunt where zebra are most abundant, I predict that the survival of declining antelopes should increase as zebra populations are attracted to grazing lawns established away from declining antelopes. Here, survival of relatively sedentary lawns. In particular, I expect proportionally more calves and sub-adults (those individuals most vulnerable to predation) in herds of declining antelopes away from zebra^.

Methodology. This project will be conducted with the cooperation of three pro-wildlife properties: the Borana Ranch, Loisaba Wilderness, and 01 Pejeta Conservancy. Together, the properties span ca. 700 km and each has agreed to make 300 cattle available for this project. The lion prides on each property are subjects of a concurrent study by the Laikipia Predator Project which has agreed to share radio-telemetry movement data. This data will be used to inform the distance at which grazing lawns must be established away from declining antelopes.

Using an orthogonal, two-way factorial design, we will manipulate cattle grazing over twelve 2.25 km x 2.25 km replicates which will be assigned to one of four treatments: (1) control + low tree cover (cattle not grazed, 10-15% tree cover), (2) cattle grazing + low tree cover (cattle grazed at 1 livestock unit per 5 ha, 10-15%) tree cover), (3) control + high tree cover (cattle not grazed, 30-35%) tree cover), or (4) cattle grazing + high tree cover (cattle grazed, 30-35% tree cover). Cattle will be shifted weekly for two months immediately preceding the long rains (April through May) to create an even distribution of grazing lawns throughout each replicate

Following establishment of grazing lawns, I will record distribution and abundance of zebra herds in relation to cattle grazing through line-transect methods. Using a combination of camera traps and radio-telemetry, I will be able to model dynamic changes in activity and occurrence of lions and spotted hyenas in response to spatial distribution of zebras following cattle manipulations. We will also record the distribution, abundance, and age structure of declining antelopes using a combination of distance sampling and direct counts.

Originality and significance. This project has direct conservation and economic applications. Using proactive cattle management to increase recruitment and survival of rare wildlife represents a novel and immediately applicable series of findings crucial for conservation in Laikipia and applicable to wildlife conservation throughout human-occupied sub-Saharan Africa. More generally, my findings will be of interest to population and community ecologists, particularly those working on predator-prey relationships and in human-occupied landscapes.

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NSF Sample 4: Responses to Selected Questions

Personal or Professional Experience. *Question Summary: Describe any personal, professional, or educational experiences or situations that have contributed to your desire to pursue advanced study in science, mathematics, or engineering.*

Simply put, learning for the sake of understanding the world better is what drives my intellectual pursuits. This desire to know pervades my daily life—too much so according to some. However, by this point in my life, I have come to realize and accept that many people find my outlook on learning and life somewhat odd. Still, learning is my passion, and through this "odd" view of the world I have come to recognize an important pattern in the educational process. By fervently studying one subject area you begin to appreciate its enormity. Once reaching this appreciation, you become capable of selecting an appealing subset of that area to further study. Yet this subset expands beyond any hope of total understanding, forcing you to choose an even more specific area and thus continuing the cycle. Paramount to understanding how this cycle relates to my educational goals is to realize that my passion for learning increases (exponentially so) as I choose more and more specific fields to study. But perhaps I have gotten ahead of myself and should start from the beginning: high school.

In high school I took all of the advanced science and math courses available. With this expansive background, I realized that I enjoyed science and wanted to study it further but appreciated the need to find a specific focus. Hence, when I stumbled upon materials science, I recognized it as an amalgamation of the scientific areas I most enjoyed studying. Without my broad scientific background, though, I would not have been able to make this decision as definitively. This appreciation for having a well-rounded knowledge of a field has remained with me during my undergraduate studies. For example, although I have already chosen to focus on electronic/photonic materials, I have opted to take additional courses, which explore polymers, glasses, and refractories. These classes benefit me in two ways. First, they expand my knowledge base. Second, by exposing me to such topics as conducting polymers and glass-ceramic electronic packages, these classes diversify my appreciation for electronic/photonic materials. Moreover, in contrast to my general fondness for high school science classes, studying materials science generates a fervor for learning in me that I never thought possible.

As my passion for materials science grows, I realize that it is time once more to refine and focus my learning objectives. To some extent, this change will be a difficult one because I honestly love the entire field of materials science. However, through my various work experiences, I have come to realize that there exists yet another level of learning in which you act as both student and teacher. At this level you can become so engrossed in learning that you feel a sense of ownership for the work. Such learning has shown me education's ultimate satisfaction. Such learning is called research.

Unfortunately, my previous exposures to research have only provided me partial fulfillment. With just a single summer to complete a research project, the feeling of ownership

only begins to coalesce near the end of the appointment. In fact, I often feel a void within myself when I am forced to leave the project incomplete. To that end, I have been known to work extra hours, even weekends, just to satisfy my own needs of completeness in my research. This is why I have chosen to pursue graduate school. In graduate school I will be able to continue my passion for learning in a research-oriented environment. Hence, it will become possible to expand that feeling of ownership for a project beyond any of my previous experiences. Simultaneously, I will be creating my own learning—learning that I genuinely hope will benefit the rest of society.

Integrating research. *Question Summary: Describe your experiences in the following or describe how you would address the following in your professional career: integrating research and education, advancing diversity in science, enhancing scientific and technical understanding, and otherwise benefiting society.*

As an undergraduate I have been very involved with student organizations in both my college and department. I have been a member of the Mythic University Student Council and the student branch of the American Ceramics Society (ACerS). Furthermore, Ihave held various positions in these organizations ranging from vice president to social chair. Thus, I consider myself quite active in the professional, educational, and social proceedings that affect me most, and I plan to continue my involvement after graduation. More relevant, though, is my motivation for becoming involved in these specific groups.

Six years ago, when I witnessed a demonstration of shape-memory alloys at an engineering convention, I became enticed to enter the field of materials science. Since that time, I have wanted to educate others about the field in the hopes of also captivating their interests. Discussing materials science with others is one of my favorite hobbies, and I have been pursuing this mission since that fateful day six years ago. Even from conversations with friends during my meagerly informed high school days, I was able to influence one peer to pursue a degree in materials science and another to pick up a minor in polymers. (I guess pure excitement alone can be sufficiently persuasive at times.) However, in college I wanted to extend this personal campaign even further, and therefore chose to join groups that allowed me the opportunity to communicate with prospective students and undecided undergraduates.

During my undergraduate career, I have been involved with every recruiting opportunity made available to me. At these events, my goal has never been to simply coax these students to come to Mythic University, but instead to inform them of what a fantastic career choice materials science and engineering can be. In the early spring, I am awake several hours before dawn to prepare decorations and displays for the Mythic University's annual open house, which is organized by the student council. Although this deprives me of several hours of sleep (on a Saturday even!), I still manage to exude excitement when I explain to prospective students all the wonderful "stuff that materials scientists get to explore. Similarly, as a part of ACerS, I participated in a materials science departmental tour for high schoolers visiting Mythic University for the annual Junior Science and Humanities Symposium. This activity involved leading discussions on materials-related exhibits set up throughout the department. A third activity that I continually participate in is the Mythic University's annual phone-a-thon. This involves calling all prospective students accepted to the college for the upcoming year. I found this experience so rewarding that last year I took over as chair of the event. Additionally, I have also participated in various other engineering open houses and outreach programs, acting as a representative of the materials science department.

Recently I met up with a student who thanked me for persistently leading her and her parents to the materials science exhibits at the spring open house. That experience made her select materials science as her field of study. Like many others, she had never heard of materials science until that day but was immediately drawn to all of the opportunities it offered. This unexplainable magnetism that materials science can induce drives me to further educate others and compels me to extend my outreach efforts. In the future, I would like to develop a short interactive lecture that could be presented in high school chemistry or physics classrooms and would relate concepts these students already know to the field of materials science. This would expose the students to the field, show them its similarities and applications to subjects they are already familiar with, and hopefully inspire a few to pursue a degree in materials science. It is my hope that student branches of materials-related professional organizations (like ACerS) could act as the distributors for such classes. Whether such a project would then lead to even more involved endeavors like websites or textbooks is unclear, but no matter where my career takes me, I will continue informing others about the wonders of materials science.

Future Research. *Question Summary: In a clear, concise, and original statement, describe research topics you may pursue while on fellowship tenure, and include how you became interested in these topics. Your statement should reflect your own thinking and work, demonstrate your understanding of research principles necessary to pursue these interests, and explain the relationship to your previous research, if any. Present your plan with a clear hypothesis or questions to be asked by the research. If you have not yet formulated a plan of research, your statement should include a description of one question that interests you and an analysis of how you think the question may best be answered.*

As early as grade school, I was intrigued by the fact that energy can transform between multiple forms. This notion that heat, light, motion, and electricity are all forms of the same abstract quantity known as energy continues to fascinate me even today. Therefore, it should be of little surprise that as a materials scientist, I am most intrigued by the properties of materials that convert energy from one form to another. These materials are valuable because certain forms of energy are often more useful than others. Hence, numerous practical devices rely on these principles, including thermocouples, solar cells, and light-emitting diodes. However, of greatest interest to me are ferroelectric/piezoelectric materials that are capable of transforming electrical energy into mechanical motion.

One of the most innovative uses of piezoelectrics in recent years is as a component of microelectromechanical systems (MEMS). Piezoelectric materials truly represent a means for coupling electronics with mechanical motion and so seem destined for integration into MEMS technology. The material of most interest for these applications is the solid solution, ferroelectric lead zirconate titanate (PZT).

At room temperature, PZT is equilibrated as a tetragonal or rhombohedral perovksite phase depending on the composition. The piezoelectric response of this phase can be divided into two components: the intrinsic and extrinsic contributions. The intrinsic contribution is simply the result of the B-site cation shifted along the c-axis with respect to the oxygen sub-lattice. Although slightly more complex, the extrinsic contribution is typically attributed to domain wall movement between adjacent domains with non-180° orientations. Each of these factors contribute about 50% to the piezoelectric response of bulk PZT.

However, PZT thin films show a significant decline in piezoelectric response. In the literature, this unfortunate outcome is often attributed to mechanical constraints placed on the film, which hinder the extrinsic contribution. To appreciate the mechanisms for this constraint, consider the Si-PZT system. Silicon has a considerably lower thermal expansion coefficient than PZT. Hence, upon cooling a crystallized PZT film, tensile stresses will arise in the PZT layer. Because crystallization is performed well above the Curie temperature, PZT will be in the non-ferroelectric cubic phase. However, as the film is cooled below the Curie temperature, the tensile stresses present will energetically favor tetragonal phases with the c-axis parallel to the plane of the film. Therefore, very few non-180° domain walls will develop, and the extrinsic contribution will be vastly diminished. Thus, silicon-based MEMS must work around this limitation when incorporating PZT into the device.

However, during my recent senior thesis work, I have become fascinated with the possibilities of ceramic microsystems. Similar to how MEMS evolved from silicon processing technology, ceramic microsystems are spawning from multilayer ceramic technology, which was originally developed for electronic packaging and multilayer capacitors. Today, this technology is becoming a viable way for constructing three-dimensional systems on the micro-scale for applications such as microfluidics and micro-combustion. These ceramic microsystems offer many advantages over silicon MEMS such as parallel processing, ease in packaging, and lower equipment costs. More relevant, though, is the closer match in thermal expansions between these ceramic substrates and PZT in comparison to the match between silicon and PZT. Thus, I propose a project that would focus on determining the piezoelectric capabilities of thin film PZT on multilayer ceramic substrates.

The first step in such a process would be to fabricate these PZT films on electroded ceramic substrates. I am intimately familiar with this topic since it is the crux of my current undergraduate thesis. Therefore, I confidently anticipate that these films will be fabricated using sol-gel techniques. Once this process is reasonably optimized, uniform test samples will need to be prepared. A set of control samples with silicon substrates should also be prepared. Next, electrical tests will need to be performed to determine the extent of intrinsic and extrinsic contributions to the piezoelectric effect and dielectric constant. Typically, this information is extracted from one of two methods. The first involves making measurements as a function of increasing firequency. At high fi^equencies, the extrinsic contribution is eliminated and the pure intrinsic contribution can be determined. However, this technique is only applicable for dielectric measurements. To determine the contributions to the piezoelectric response, measurements must be made as a function of temperature. At temperatures near absolute zero, the thermally activated extrinsic component is effectively nullified and again the intrinsic component can be determined. However, both of these techniques have their shortcomings, and I will need to take these issues into consideration while developing these experiments.

Furthermore, piezoelectric measurements on thin films are complicated at best. The same mechanical constraints imposed by the substrate that limit the extrinsic response are also responsible for limiting the indirect piezoelectric response. Often a more appropriate approach is to derive the piezoelectric coefficient fi:om the direct response. This measurement involves applying stress to the film and monitoring the charge build-up. The fenroelectric group at Mythic University has been a world leader in developing techniques to make such measurements, and this fact has contributed to my serious consideration of continuing at this institution for my advanced degree.

In summary, the basic hypothesis for this work is that PZT thin films with thermal expansion matched ceramic substrates will have a higher extrinsic contribution to piezoelectric and dielectric properties than films on substrates with lesser thermal expansion matches, such as silicon. If this hypothesis is found to be valid, then PZT films on ceramic substrates should show stronger piezoelectric responses, assuming all other film properties (such as structure, thickness, and composition) are equal. Consequently, such films would be extremely useful in advancing ceramic MEMS technology.

Apparatuses such as pumps for microfluidics and valves for microcombustion chambers could all be possible consequences of such technology. In addition, this research would lead to a better scientific understanding of the intrinsic and extrinsic contributions to ferroelectric properties.

As a final note, let me briefly comment on my selection for possible graduate school institutions. Clearly, Mythic University is a leader in ferroelectric materials science, and a transition into its graduate program would be nearly seamless for me. Thus, I could promptly begin my research and have the opportunity to work with faculty at the top of their field. On the other hand, I realize the professional advantages of changing environments, and as a result, I am also seriously considering other institutions. My two major criteria for evaluating institutions are my own interests in the research opportunities available and the facilities that these institutions offer.

Past Research. *Question Summary: Describe any scientific research activities in which you have participated, such as experience in undergraduate research programs, or research experience gained through summer or part-time employment or in work-study programs, or other research activities, either academic or job-related. Explain the purpose of the research and your specific role in the research, including the extent to which you worked independently and/or as part of a team, and what you learned from your research. In your statement, distinguish between undergraduate and graduate research experience. If you have no direct research experience, describe any activities that you believe have prepared you to undertake research.*

During my short scientific career, I have conscientiously strived to gain as much research experience as possible. In fact, I began my first research project in materials science while still in high school. During the summer of 20xx, I worked at a local failure analysis company, MATCO Incorporated. For my project, I performed some basic studies on the oxidation of titanium and examined how different processing parameters affected the resulting color change. With the close of the summer, I submitted a report based on my findings and outside research. Admittedly, the project was rather mundane, and in fact, at the time I failed to grasp all of the underlying science involved. Yet, my work at MATCO gave me valuable experience in a laboratory environment, as well as exposed me to the daily routine of a materials science engineer. Most importantly, though, this experience solidified my desire to study materials science and seeded the notion to follow a research-oriented career path.

During my undergraduate career, I quickly developed an exact yet flexible plan on how I intended to spend my summers. My goal was to acquire three internships, one for each summer, and have these internships cover the three major working environments in which I could possibly find myself once I graduated: industry, academia, and government. I can happily say that I have accomplished this goal.

I spent my first summer in a research experience for undergraduates (REU) program at Mythic University. In this program I worked in a biomaterials laboratory learning how to manipulate the surface wettability of glass substrates. My objective was to create radially symmetric gradients of wettability. To accomplish this task I diffused hydrocarbon molecules with silane functional groups through a gel that was in contact with the glass surface. These molecules would then "silanate" the surface creating a region of lower wettability. Since the silane was diffused from a central location, the amount of "silanation" decreased radially from this point, hence forming a wettability gradient. To analyze my gradients, I used a Wilhelmy balance. I also developed a fairly basic, although useful, mathematical model (based on wetting forces) that helped to explain the data I collected from the Wilhelmy balance. Perhaps my most ingenious accomplishment, though, was analyzing the silanated glass substrates with optical microscopy while cooling them on a piece of ice. Cooling the glass samples forced water to condense on the surface. These condensed water droplets would bead in different shapes and sizes depending on the surface characteristics, hence allowing me to "see" my wettability gradients. This tool, which I discovered on my own, proved invaluable in providing me with both qualitative and semi-quantitative data. Overall, this research experience was outstanding because although the initial idea was my mentor's, I was left to independently carry out the research. By the end of the summer, I had a much better grasp on the scientific process and the importance of creating a research plan and modifying it when necessary.

I spent my second summer working at Carpenter Technologies, a specialty steel manufacturer. This was my introduction to working in industry. Although the work I did at Carpenter did not necessarily follow a purist's view of the scientific process, it did allow me to hone my skills in sample preparation, optical microscopy, and hardness testing. However, more importantly, this internship exposed me to working in a team environment and interfacing with multiple people to solve problems. In fact, at one point I traveled with my mentor to a hot rolling conversion facility outside the company to discuss problems occurring with Carpenter billets that they had been hot rolling. Also on that trip, we visited with a slitting facility to discuss possible methods of reducing the amount of scrap. These experiences and many others became invaluable lessons in how to communicate ideas and network with technical and non-technical personnel in order to achieve a desired goal. Hence, the communication tools that I gained from my work at Carpenter will better allow me to interface with professors, technicians, and other graduate students once I enter graduate school. Additionally, I have learned that working in a group can often be the wisest path for solving a problem.

However, my internship this previous summer at Oak Ridge National Laboratory (ORNL) proved to be the most rewarding and enjoyable of the three. This extremely positive experience was certainly the result of being able to synthesize my past experiences and use these lessons to perform research that was both efficient and valuable. Essentially, my project entailed coating metallic and ceramic components using pack cementation and then evaluating the effects microwave heating had on the process. My laboratory duties included preparing the samples and powder pack, operating the furnaces, mounting and polishing samples, and performing the necessary characterization. The important characterization tools I used were optical microscopy, scanning electron microscopy, energy-dispersive x-ray analysis, x-ray diffraction, and hardness testing. Furthermore, I performed nearly all of the data analysis on my own and reported my conclusions in both a poster and a technical paper. During the three months I spent at ORNL, I was the sole researcher on this project and was allowed to direct my own course of research.

Of course, initially I did receive training on the equipment, but even during these sessions I was treated as an intellectual equal who already understood the underlying scientific concepts of each technique. In fact, this was the treatment I received during my entire stay at ORNL. Because of this, I gained more confidence in my "textbook education" and in my ability to apply this knowledge. For the first time, I felt like a capable and valuable researcher. Still, I did acquire many new skills that will benefit my future research endeavors. The two most vital skills were maintaining a lab notebook and analyzing collected data. My ability to keep a complete and well-organized lab notebook improved over the summer and was aided by suggestions from my mentors. Now, I feel much more comfortable with maintaining a scientific record of my work.

Currently, I am performing research at Mythic University's Materials Research Laboratory as part of my senior thesis project. In this project, I collaborate with one of the faculty members and present my results in a thesis that will be archived in the library. My specific project involves depositing lead zirconate titanate films with liquid source misted chemical deposition on ceramic substrates similar to those used in electronic packaging. In the process, I will also be learning how to operate sputtering equipment and how to measure dielectric and piezoelectric properties of thin films. This work will certainly serve to further my research experience as well as teach me how to organize a literature review and prepare a thesis. I look forward to the challenges that this project presents as well as the opportunities for further maturation as a practicing scientist.

(Schall 132-39)

Comments

The responses in this first set of sample essays "are grounded completely in narrative and do not include any figures, tables, or references. The style is sometimes highly informal, to the point of what some might call a slightly hubristic tone, the use of an exclamation point (!), and even an admittance by the candidate that he has not yet decided on a particular graduate program. Nevertheless, if you read closely you realize that the informality is mostly placed within context of the personal motivation and scientific commitment discussions, while the discussions of previous research and proposed research are scientific and concerned with solving relevant problems related to microelectricalmechanical systems (MEMS). The research hypothesis and applications are also spelled out directly. Thus, we obtain a strong sense of the person (and personality) of this candidate, and we gain confidence in his abilities as a researcher." (Schall 131)

NSF Sample 5: Responses to Selected Questions

Personal or Professional Experience. *Question Summary: Describe any personal, professional, or educational experiences or situations that have contributed to your desire to pursue advanced study in science, mathematics, or engineering.*

Although math and science have been my favorite subjects since elementary school, with math games such as "Around the World" and "24" piquing my interest, it was not until high school that I decided upon engineering as my future career. In tenth grade, I began to study C-H- and computer programming and learned to love the feeling of accomplishment that came with the solution of a difficult problem. In eleventh and twelfth grades, I participated in the American Computer Science League competitions with a

team of two other students. Both years, our team earned a trip to the National All-Star competition where we placed in the top ten, and I was awarded for my individual performance. Success in this contest and in other traditionally male-dominated classes such as calculus, chemistry, and physics led me to believe that I could succeed in the field of engineering.

Another long-standing desire of mine has been to help others. From a young age, I have volunteered with different organizations in a range of capacities. In particular, since elementary school, I have enjoyed tutoring fellow students; helping a peer to understand a difficult concept is an extremely rewarding experience. Because of this, I searched for a way to integrate mentoring, math, and science into a career. I explored becoming a doctor or a teacher, but I found neither satisfactorily combined my academic and personal interests.

An event in my junior year of high school solved this enigma. That year, I toured the Bioengineering Department at the Mythic Medical Center. While there, I realized what I wanted to do with my life: become a bioengineering professor at a major research university, concentrating in the area of tissue engineering. This career path appears to be the perfect combination: I can apply my research to improve health care, while at the same time, mentoring and instructing future scientists and engineers.

Since then, I have pursued my career choice by becoming actively involved in biomedical research, beginning in my sophomore year. I find research challenging, and I enjoy the sense of accomplishment when a difficult problem is solved, yielding new knowledge that contributes to the betterment of society. Finally, I greatly enjoy working in the academic atmosphere that embraces the sharing of this new knowledge.

My academic success in college and my involvement with science-related extracurricular activities have encouraged me to persist in my goal of earning a Ph.D. in bioengineering. I am in the top 0.5% of my class and, in the last year, have been awarded the Barry M. Goldwater and the Astronaut Scholarship Foundation Scholarships. I have also helped to found an undergraduate chapter of the Biomedical Engineering Society (BMES) at Mythic University and have served as webmaster for the club. Through this club, I have had the opportunity to participate in outreach to high school students. Finally, I have confirmed my desire to become a professor by serving as a mentor to incoming freshmen in the Mythic University Honors College.

All of these factors have led me to believe that a career in academic research will best match my passions.

Integrating research. *Question Summary: Describe your experiences in the following or describe how you would address the following in your professional career: integrating research and education, advancing diversity in science, enhancing scientific and technical understanding, and otherwise benefiting society.*

"A hundred years from now it will not matter what my bank account was, the sort of house I lived in, or the kind of car I drove. But the world may be different because I was important in the life of a [child]."
—Forest Witcraft, Boy Scouts of America

My belief in the veracity of the statement by Witcraft is one of the reasons I have decided to become a research professor. I believe that this career will allow me to share my fervor for science and discovery with future generations, especially young women. From a young age, and continuing throughout my college career, I have tried to embody this principle and to volunteer in other capacities in order to improve the community around me.

One of the ways in which I have been able to share my field of bioengineering with others has been through the Biomedical Engineering Society (BMES). Last year, I worked with Prof John Teacher and a few of my peers to co-found an undergraduate chapter of BMES at Mythic University. The purpose of this club, according to the BMES, is to "promote the increase of biomedical engineering knowledge and its utilization." Our chapter seeks to fulfill this mission by bringing together undergraduate and graduate students and supporting activities such as mentoring, career information sessions, and outside speakers. As part of our outreach, I had the opportunity to return to my high school over spring break to speak to science classes about biomedical engineering and to share some of my experiences of college life. I have also

assisted the BMES at the annual Engineering Open House, which is an event geared to helping high school seniors learn more about the different engineering disciplines, hopefully encouraging them to consider engineering as a career. In addition, I have served as the captain of a BMES-sponsored intramural women's soccer team. Team sports depend upon each player cooperating and putting forth 100% effort toward a common goal, which directly translates to the demands of a research environment. This team not only encouraged bioengineers to interact outside of classes, but it also gave me the opportunity to promote communication between science and non-science majors, since I actively invited non-bioengineers to join the team.

Since beginning my honors thesis research as a sophomore, I have had many opportunities to share the knowledge I have gained by presenting my results in various settings. These have included a publication ("Procoagulant Stimulus Processing by the Intrinsic Pathway of Blood Plasma Coagulation," in *Biomaterials)* and several poster presentations among members of my field. I also participated in a poster presentation that included entries from all undergraduate majors. This presentation gave me the chance to explain my work to people from non-science backgrounds, challenging me to present technical details in a way that is meaningful to a wide variety of viewers.

I have also positively impacted the lives of incoming freshmen by serving as a mentor for the Mythic University Honors College students. I have helped these freshmen .. to make a smooth transition from high school to college by offering advice on ways to succeed in and out of the classroom and also by lending an ear to whatever troubles they may be experiencing. One of my former mentees recently informed me that I inspired her to succeed in her engineering studies despite it being a traditionally male-dominated field. She also gained interest in working towards the Goldwater Scholarship as a result of my award last year.

Finally, I seek to serve the rest of the surrounding community through my participation in Habitat for Humanity. Our chapter helps to raise money to build houses for people who would not ordinarily be able to afford them by performing odd jobs for people in the community, asking for donations from local people and businesses, and by holding an annual "House Walk," in which each walker is sponsored by family, friends, and members of Mythic University community.

Throughout my career, I hope to continue my commitment to public service by serving as a mentor to young women, volunteering for summer science enrichment programs, and performing other acts of community service such as participating in the Adopt-a-Highway program. In this way, I can share with others the blessings that have been given to me throughout my life.

Future Research . *Question Summary: In a clear, concise, and original statement, describe research topics you may pursue while on fellowship tenure, and include how you became interested in these topics. Your statement should reflect your own thinking and work, demonstrate your understanding of research principles necessary to pursue these interests, and explain the relationship to your previous research, if any. Present your plan with a clear hypothesis or questions to be asked by the research. If you have not yet formulated a plan of research, your statement should include a description of one question that interests you and an analysis of how you think the question may best be answered.*

Introduction **and** Relevance: Musculoskeletal pain was the most cited reason for visiting a physician in the year 2000.[1] Current orthopedic repairs utilize artificial materials such as ceramics, metals, and polymers, which cannot replicate the function of natural tissue and do not fully integrate with the body. Tissue engineering seeks to cultivate tissues that are physiologically similar to native tissue to solve these problems. Impeding the realization of these complex structures is the failure to successfully integrate cells, scaffolds, and signaling. My goal is to create a scaffold that will facilitate incorporation of implanted cells, growth factors, and extracellular matrix proteins in order to rebuild and repair cartilage tissue in joints.

Molecular self-assembly, or building from the "bottom-up," is increasingly being recognized as the next step in the development of novel biomaterials. In particular, researchers have begun investigating the utility of self-assembling polymers and peptides in the field of tissue engineering. In the development of tissue-engineered scaffolds, peptides have several advantages over polymers, including versatility in composition, chemical properties, and morphology. For example, polymer scaffolds typically only include one or two different biological ligands on their surfaces because it is difficult to control the concentration and arrangement of these ligands. Peptides offer the ability to easily synthesize different sequences with different properties that can then be combined to form self-assembled scaffolds. Peptides can also be designed to form gel structures under physiologic conditions.

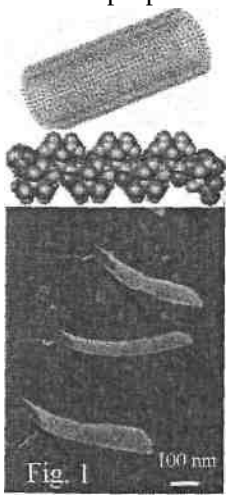

Fig. 1

Ground-breaking studies by Zhang et al.[2] demonstrated that chondrocyte proliferation can be supported by self-assembling peptides made of alternating hydrophobic and hydrophilic residues that do not elicit an immune response. However, these peptides have been shown to only assemble into the beta-sheet type nanofibril, the kind typically seen in the amyloid fibrils of Alzheimer's disease. This group has also recently developed surfactant peptides that self-assemble to form nanotube structures as seen in Fig. 1 .[3] These surfactant peptides have the advantage of forming well-defined hydrogel structures while remaining relatively easy to modify, which may lead to the ability to incorporate cell-binding sequences and other biomolecular sites on their surfaces. Stupp et al.[4] have recently reported on the construction of scaffolds made of self-assembling amphiphile peptides that contain a sequence promoting neurite growth. These scaffolds were seeded with neural progenitor cells and successfiilly induced neuron differentiation *in vitro.* Stupp et al. have also shown that the scaffold can self-assemble when a peptide solution is injected into tissue.

Background and Research Objective: I have focused my undergraduate degree of Bioengineering on biomaterials by choosing a concentration in materials science and by performing my honors thesis research in a biomaterials laboratory. I intend to build upon this foundation by pursuing my Ph.D. in Biomedical Engineering under the guidance of Dr. Phillip Messersmith at Northwestern University. Northwestern University is a leader in the nanotechnology field and recently expanded its facilities with the addition of the Robert H. Lurie Medical Research Building. This building is the new home of the Institute for BioNanotechnology in Medicine (IBNAM), which performs research in fields such as self-assembly, tissue engineering, genomics, and smart drug delivery. Dr. Messersmith's research is based upon utilizing biological strategies to develop new biomaterials and tissue engineering approaches for the repair, replacement, or augmentation of human tissue. His group has investigated the use of the natural tissue enzyme, transglutaminase (TG), in combination with stimuli-responsive lipid vesicles containing calcium (Ca) to induce the rapid *in situ* formation and cross-linking of peptide, protein, and polymeric hydrogels. [5,6]

My research will build on this background, with the goal of developing a self-assembling scaffold made of surfactant peptides, which employs Ca-dependent TG cross-linking. This peptide will include the cell-adhesion sequence RGD, intended to attach chondrocytes to the scaffold. Cross-linking will be triggered *in situhy* the release of Ca from lipid vesicles upon exposure to light, as demonstrated by Messersmith.[5] Growth factors—transforming growth factor beta (TGFb) and basic fibroblast growth factor (bFGF)—will also be included in the vesicles in order to encourage cell growth and differentiation. While each of these components has been investigated individually, the proposed combination of them is novel and will advance the goal of producing injectable scaffolds for the repair and regeneration of tissue. In order to prepare for this research, I will take courses at Northwestern University in biochemistry, biophysics, nanotechnology, tissue engineering, and self-assembled materials.

Research Design: The surfactant peptides described by Zhang et al.[3] include hydrophilic head groups and hydrophobic tails of the form n'-AAAAAAD-c'. My molecule will use this backbone, but sites for TG (Q, K) and cell binding (RGD) will be added. As a starting point, I propose the amino acid sequence: n'-AAAAQARGDK-c'. A peptide solution will be formed by mixing the cell-binding peptide with peptides that do not contain the cell-binding sequence of the structure: n'-AAAAAAQAAK-c'. Self-

assembly will be confirmed by analyzing the peptides with transmission, electron microscopy (TEM), circular dichroism, and other methods. If these molecules do not self-assemble quickly enough for clinical applications (within three minutes), the Q may be disrupting the hydrophobicity of the tail, in which case the A sequence of the tail will be changed to the more hydrophobic V or L. Additionally, the position of the TG sites could be varied: more Q and/or K sites may be added, or the current sites may be moved.

I have included TG sites in my peptide because this family of enzymes is found in fluids and extracellular matrix (ECM) throughout the body, and components of cartilage ECM cross-link with TG, enabling the scaffolds to integrate with native tissue. Sperinde and Griffith[7] have shown that poly(ethylene glycol) can be cross-linked with a lysine-containing polypeptide by the use of TG, thereby improving mechanical properties. This combination can form a hydrogel network that can be injected into the body.

Since TG is dependent upon Ca, the eventual goal will be to deliver Ca to the body by the use of vesicles that release their contents upon exposure to a light source of a certain wavelength and intensity. But first, I will test the ability of my peptides to crosslink by adding different concentrations of CaCla and animal-derived TG to a solution of peptides *in vitro*. Once cross-linking has been optimized, I will then advance to testing my system with Ca-containing vesicles *in vitro*. Finally, the possibility of adding the growth factors TGFb and bFGF to phototriggerable vesicles will be explored. These growth factors are important for stimulating chondrocyte activity and also for decreasing cartilage degradation.

Next, I will test the cell-binding capabilities of the RGD sequence by incubating assembled scaffolds with chondrocytes harvested from calves at the cell density of 15×10^6 cells/mL. After 3, 6, and 9 weeks, sections of scaffold will undergo histological examination in order to determine the amounts and kinds of collagen being produced by the embedded chondrocytes. Based on the results of these tests, the ratio of peptides with and without the cell-binding sequence in the peptide solution will be varied.

Finally, the *in* vivo properties of the scaffold and vesicles will be tested by injecting a solution into an animal model and triggering gelation with a light source. The scaffold's mechanical, immunological, and histological properties will be analyzed.

Long-term Goals: In the future, the incorporation of peptides with a variety of cell-signaling sequences will be investigated with the ultimate goal of injecting the scaffold into human subjects to repair damaged cartilage. This will potentially have a great impact on the treatment of osteoarthritis, a debilitating joint condition that affects millions of Americans each year. My career goal is to become a Professor of Bioengineering at a major research university concentrating in the area of tissue engineering and regenerative medicine. I look forward to sharing my research with the next generation of scientists and engineers in the classroom and in the surrounding community.

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Past Research Activities. *Question Summary: Describe any scientific research activities in which you have participated, such as experience in undergraduate research programs, or research experience gained through summer or part-time employment or in work-study programs, or other research activities, either academic or job-related. Explain the purpose of the research and your specific role in the research, including the extent to which you worked independently and/or as part of a team, and what you learned from your research. In your statement, distinguish between undergraduate and graduate research experience. If you have no direct research experience, describe any activities that you believe have prepared you to undertake research.*

Biomedical devices, ranging from catheters to ventricular assist devices, are used by the millions annually. Many novel coatings and materials have been developed for these applications, yet the ideal materials for these varied uses remain to be discovered.[1] In particular, for blood-contacting applications, the body's reaction to biomaterials continues to be plagued by two major problems: bleeding and thrombosis. [2,3] Thrombosis is usually the result of adverse interactions between the artificial material and the body. Bleeding becomes a problem when attempting to prevent thrombosis by administering excessive anti-coagulants. Therefore, without a better understanding of the process by which the body responds to foreign materials, promising technologies such as self-assembled nanomaterials cannot reach their full potential as hemocompatible materials.[4,5] I have been performing research towards my honors thesis since my sophomore year, under the guidance of Prof John Teacher at Mythic University. This research has focused on understanding how the body reacts to the introduction of foreign materials. In particular, I have concentrated on blood-surface interactions and the engineering of novel hemocompatible surfaces.

Blood coagulation occurs through a cascade of enzymatic reactions involving many plasma proteins, lipids, and ions resulting in the production of a fibrin clot. This cascade can be divided into the intrinsic, extrinsic, and common pathways. The intrinsic and extrinsic pathways are initiated by distinct events and converge into the common pathway. The intrinsic pathway is activated when blood interacts with an artificial surface, while a tissue injury activates the extrinsic pathway.[6] The intrinsic to common pathway can be conceptualized as occurring through linked sets of enzyme reactions, termed compartments. In this work, the intrinsic cascade has been modeled in terms of three such compartments: activation, transfer, and coagulation.

My research on blood-surface interactions seeks to quantify dose-response relationships, connecting surface properties of a biomaterial with the tendency to activate the intrinsic pathway of the blood coagulation cascade. In the various experimental assays used in my work, the "dose" results from applying a surface to human plasma or from adding an activating enzyme to human plasma. The "response" is the formation of a plasma clot as measured by coagulation time. Two primary questions raised by these experiments ask: How does dose propagate through the cascade to yield a response? What is the relationship between intensity of the dose and response?

Another aspect of my research, mathematical modeling, seeks to answer these questions. The model uses the compartmentalized cascade to treat the intrinsic pathway as a "black box" leading to the output of thrombin in the common pathway. This model allows me to apply derived equations to the experimental data to obtain rate parameters that will give quantitative information about the entire coagulation process. This information is expected to lead to a better understanding of how changing material properties affects hemocompatibility.

The effect of adding an amount of surface area to plasma is one example of a dose-response relationship explored in my research. I performed experiments in human plasma with beads made of two different materials: glass and silanized octadecyltrichlorosilane (OTS). Glass is a high-energy, hydrophilic surface, while OTS is a low-energy, hydrophobic surface. These experiments have shown that glass activates the coagulation cascade significantly more than OTS based on coagulation times. Mathematical modeling quantified this observation, showing that the activating potential of the surface scales exponentially with surface energy. Another interesting resuh is that both materials begin to saturate at the same amount of surface area. This observation has led to the hypothesis that thrombin is produced as a bolus in proportion to the amount of surface area added, instead of being slowly produced the entire time

until coagulation. This work is currently in press in *Biomateiials,* a leading peer-reviewed journal in the field.[7]

During the past two summers, I began work on engineering surfaces that have regions of one chemical functionality on the nanometer scale within a continuous matrix of a second functionality. The goal of this research is to test the hypothesis that nanoscopic organization of chemistry can influence the activation of blood coagulation. In order to create these nano-surfaces, I chose to use the method of forming self-assembled monolayers of organosilanes on glass substrates. Self-assembled monolayers (SAMs) are ordered assemblies that form spontaneously by the adsorption of a surfactant with a specific affinity of its headgroup to a substrate.[8]

In this work, I have used two organosilanes: 3-aminopropyltriethoxysilane (APTES) and n-butyltrichlorosilane (BTS). A monolayer of APTES has an intermediate surface energy, while a monolayer of BTS has a low surface energy similar to that of OTS. APTES and BTS molecules have nearly the same chain length. Therefore, the combination of these two silanes on the same substrate results in a smooth surface. First, I created partial monolayers, or "islands," of APTES on a clean glass surface. Next, I back-filled the surface with BTS. I then examined the surfaces using atomic force microscopy (AFM) in contact mode. Because the surfaces were smooth, with an average roughness of only 0.15 nm, I relied on fi-iction images to determine the make-up of these surfaces. Through this analysis, I determined that the islands of APTES had an average diameter of 500 nm and appeared in a regular arrangement across the substrate (Fig. 1). The next step was to create glass beads with APTES islands and back-fill with BTS in order to perform surface area titrations as described earlier. This allowed me to compare these new surfaces with previously characterized surfaces. The result of a surface area titration of the APTES/BTS beads showed that these beads activate the coagulation cascade less than beads made of purely APTES or purely BTS. To better understand these potentially positive results and to finalize them for publication, I am completing surface characterization by techniques such as atomic force microscopy, contact angle tensiometry, and x-ray photoelectron spectrometry.

Fig. 1

Solving the problem of how dose is propagated through the plasma coagulation cascade will contribute to the understanding of how a surface activates the blood coagulation process. Ultimately, this understanding will aid in the design of a hemocompatible material that results in the lowest activation of the cascade. This improved interaction with the body will enable patients to take less anti-coagulant medicine, producing better results following the use of biomedical devices.

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(Schall 140-19)

Comments

In this second set of sample essays, "discussions of previous and proposed research resemble formal literature reviews, each one citing numerous references from refereed journals and presenting figures generated by the author. The applications of the research, which has implications for rebuilding cartilage tissue and relieving musculoskeletal pain, are straightforward and beneficial to society. Meanwhile, we also get a sense of this writer's personal character, as she cites examples of tutoring other students and her role as captain of a women's soccer team sponsored by the Biomedical Engineering Society. In short, we meet both the scientist and the humanist—equal concerns for the NSF selectors." (Schall 131)

Truman Scholarship

Applicants for the Truman Scholarship answer 14 questions, some with lists and some with short essays, and write a detailed 2-page policy proposal to a government official that presents recommendations for addressing a controversial but well-known problem facing society. Following are three samples from Truman Scholarship applications. The first is a response to one of the essay questions, and the second and third are Policy Proposals. Comments follow samples 2 and 3.

Truman Sample 1: Short Personal Essay

Lessons from the Outdoors

The outdoors has always played a large role in my life, whether in Boy Scouts, on my own or with the military thus far. However, there is one outdoor experience of mine that did not involve my being in a club. I also did not get any awards for this experience, yet it has had a more profound impact on who I am than any other single event in my life, my "thru-hike" of the Appalachian Trail from Maine to Georgia.

I started my thru-hike when I was 17 years old, three weeks after I graduated from high school. It took me just over six months to complete. In those six months, I learned more about myself than in the previous 17 years or in the five years since. There is nothing with which it can compare.

I financed the hike with money that I saved during my last semester of high school, working 40 hours per week on top of my full-time student schedule. I was determined to reach Maine and hike south to Georgia. This was the first real goal that I had ever made for myself, and I reached it alone on a cold January morning.

The lessons from the trail are ones that have affected me in everything I have done since. Because of those six months, I see the world differently, in a way that is sometimes impossible to explain to someone else, though I might try.

My life was not difficult growing up, but I found a need to put myself through the difficulties of trail life. From this time, I gained an appreciation for the little things, like clean water to drink and a dry place to sleep (both of which were sometimes lacking). I met people from all

walks of life, as they crossed paths with my walk in life. From that experience I am better able to deal with those whose backgrounds do not resemble mine, a skill I have used often in the military.

Now I have turned my life 180 degrees. I no longer have hair to the middle of my back or a beard. I have traded my Birkenstock sandals for combat boots. Yet, somehow, everything I did on the trail applies to what I have done since. Whether it's suffering in a foxhole during field training, or sleeping in a cold, dank lean-to on my hike, the lessons are not all that different.

Though my journey in life has wandered back onto the beaten path, I know that if the nation needs me to lead soldiers into the brush or assist in providing humanitarian aid, I have my previous experience to draw from. Because I have been there, I have a common bond of suffering with millions throughout the world and another bond to all of my soldiers. I am still amazed at how my former life as a free-spirited wanderer has better prepared me for life as a disciplined soldier.

(From Tanabe, Gen S., and Kelly Y. Tanabe. *Money-Winning Scholarship Essays and Interviews*. Los Altos, CA: SuperCollege, 2002. 65-66. Print.)

Truman Sample 2: Policy Proposal

To: John Office
Office Held: United States Senator (R, state name)
Issue: Lesbian, Gay, Bisexual, and Transgender Civil Rights

Problem Statement

One of the most urgent problems within the United States is the discrimination faced by the Lesbian, Gay, Bisexual, and Transgender (LGBT) community, who are routinely denied equal civil rights protections. Discrimination against LGBT people is legal in thirty-four states (NGLTF, 2004). According to the American Psychological Association, over one-third of LGB African-Americans and more than one-half of LGB White Americans have experienced discrimination based on their sexual orientation.

Discrimination occurs in many arenas including public accommodations, housing, school and employment. For example, within medical settings, about one-third of LGB physicians and medical students surveyed reported that, because of their sexual orientation, they had been denied employment, refused medical services or a loan, denied a promotion or referrals from other physicians, or were fired from their positions (Schatz and O'Hanlan, 1994). Discrimination affects the mental health of LGBT individuals, their access to equal opportunity, and their job performance (Waldo 1999). It hurts the children who cannot access medical benefits from their LGB parents and creates an American culture that is exclusive and divisive (HRC 2003).

Proposed Solution

According to political scientist Alan Yang, people are most accepting of LGBT people when they have a relationship with a member of the LGBT community (1997). It is only when LGBT people feel comfortable coming out to their friends, family and employers that our society will truly become supportive of this population. This means that a comprehensive federal anti-discrimination bill including protection for LGBT people in employment, public accommodations, housing and education must be passed.

It is absolutely necessary that LGBT have a legal remedy for the discrimination they are faced with in the same way that people of color are protected under the Civil Rights Act of 1964. Research indicates that places of employment with anti-discrimination policies shower higher job satisfaction and commitment among LGB people (Burton, 2001). This is further supported by research showing that LGB people are more likely to report discrimination in places of employment that do not have policies against discrimination based on sexual orientation ("Support for END A," 2003). According to these findings, LGB people are also more likely to be comfortable in their academic and living environments when non-discrimination policies exist.

Your recent support of the Employment Non-Discrimination Act is commendable, but this bill is not sufficient. It only protects LGBT people against employment discrimination. A bill must be drafted that prohibits discrimination in employment, public accommodations, housing and education. LGBT people must be protected in all areas of society so that they are afforded equal access to all of the United States opportunities.

Major Obstacles/Implementation Challenges

Although a 2001 Gallup Poll indicates that eighty-five percent of respondents replied yes to the question, "In general, do you think homosexuals should or should not have equal rights in terms of opportunities?" there is a significant portion of Americans who believe that homosexuality is a sin ("Testimony," 2002), and members of this group actively fight legislation to promote their views. This group is well-organized and mobilizes its grassroots efforts efficiently and effectively. This group tends to misinterpret the idea that by seeking equal civil rights protections, LGBT people are asking for *special* rights.

There is also a strong possibility that employers may not support this bill because they will believe that it might require them to offer domestic partner benefits to their employees. This is an added cost that may challenge small businesses in particular.

Admittedly, this is not a policy that all of your constituents support, but it is one they can all benefit from. By working towards a society that is inclusive of all of its citizens, our community is strengthened and all people are afforded their constitutional right to equal opportunity.

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(Autumn, 1997), pp. 477-507.

(Schall 188-89)

Comments

"[This proposal] focuses on the controversial topic of discrimination faced by the Lesbian, Gay, Bisexual, and Transgender (LGBT) community. This writer analyzes how members of this community experience problems ranging from employment to physician referrals, and correlates how such individuals might be protected in the same way that persons of color are protected under the Civil Rights Act of 1964. The writer shows particular savvy as she reminds her target senator that he recently supported the Employment Non-Discrimination Act, but that she proposes a bill whose net of protection would be even wider. As we read the final section of the proposal, purposely even-handed in tone, we recognize that the writer is politically active, aware, and potentially persuasive. Indeed, this candidate did receive a Truman Scholarship." (Schall 187)

Truman Sample 3: Policy Proposal

To: Janet Office
Office Held: United States Secretary of Education
Issue: Fetal Alcohol Syndrome Awareness in Higher Education

Problem Statement

Every child born with Fetal Alcohol Syndrome (FAS) is unjustly handicapped by the alcohol consumption habits of his or her mother. The leading, preventable cause of birth defects in the US is alcohol, with FAS resulting in the most extreme cases (Floyd and Sidhu, 2004). Approximately half a million pregnant women report alcohol use each year, and 80,000 report binge drinking (Floyd and Sidhu, 2004).

Binge drinking among young women ages 18-44 is on the rise, increasing by 13 percent in a recent three-year period (Gardner, 2004). Binge drinking puts women at an increased risk for unintentional pregnancies and means they are more likely to drink while pregnant. These statistics are evidence of a major public health problem in the United States.

Low levels of FAS awareness in the nation ultimately contribute to the unwanted conception of FAS children. The 2002 National Health Interview Surveys found that 73% of women and only 55% of men have a measurable awareness of FAS (Nation et al., 2003), indicating that substantial numbers remain unaware of the dangers of alcohol consumption during pregnancy.

Proposed Solution

My proposed solution is to increase FAS awareness in higher education. Support would be sought from the US Department of Education's Policy and Program Studies Service, as its mission statement is in line with my project goals ("US Department of Education," 2004). Monies would be requested from the Fund for the Improvement of Post-Secondary Education (FIPSE), to be spent on prevention and intervention though education ("Office of Postsecondary Education," 2004). Prevention education would address both FAS and binge drinking in higher education and in future marital relations.

The awareness program would be delivered via First-Year Experience (FYE) classes, also known as First-Year Seminars (FYS). According to Bradley Cox of the National Resource Center for the First-Year Experience and Students and Transition, over 621 institutions of higher education host FYE/FYS programs (Cox, 2004), making them a standardized setting for the delivery of the FAS program. FIPSE monies would be promoted to higher education institutions across the country to thereby increase FAS awareness and decrease the future conception of FAS children.

If successful, this program could be adapted for future intervention in public high schools and community colleges.

Major Obstacles/Implementation Challenges

There exist three significant challenges to the implementation of this FAS program. A realistic proposal would be needed to promote the curricular addition of FAS into FYE/FYS classes across the country. FYE courses are highly variable, both in conception and credit hours, and therefore the program will need to be comprehensive and concise enough as to be a reasonable addition.

The second challenge would include the delivery of the program by a professor. One major reason for the failure of prevention programs to date has been poorly trained presenters (Nation et al., 2003). An efficient, comprehensive training program would be needed to maximize program effectiveness. Coordination with established on-campus groups such as residence life and counseling programs would be ideal.

Thirdly, the FAS program must be established in a way pertinent to the college student's life and so that students take it seriously. College students do not engage in risky drinking habits with the intention of getting pregnant. Therefore the connection of risky drinking habits to the birth of FAS children can be difficult to establish.

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(Schall 190-91)

Comments

"The second proposal focuses on Fetal Alcohol Syndrome (FAS), opening by noting the fate of the innocent victims, then branching into statistics about both binge drinking among women and low levels of FAS awareness. The writer's proposal is to deliver FAS awareness programs within colleges through increasingly popular first-year seminar classes, and the essay's end analyzes the considerable challenges involved in implementing this proposal. Some readers might find the proposal unpersuasive in that FAS problems themselves are not fleshed out and the relationship between cited data and proposed solution may be thin, but remember that the committee looks at this proposal in the context of the entire application…." (Schall 187)

Rhodes Scholarship

Applicants for the Rhodes Scholarship write a 1000-word essay about their personal goals and propose a plan for two years of academic study at Oxford University. Following are sample personal statements from three Rhodes Scholarship finalists. The first is from an Ohio Wesleyan University alumnus and is presented here without commentary. The second and third essays are followed by short commentaries from evaluators

Rhodes Sample 1

Standing on the rocking bow of the *Viking Princess* this past August, with the midnight moon overhead, I looked at the dark water of the English Channel. As the beam from the Cap Gris-Nez lighthouse rotated, the shifting surface became only slightly more discernable. I had just swum across the notorious French current, defying its efforts to sweep me into the Atlantic. Across miles of churning 60-degree water I had battled tides, fought nausea, navigated international shipping lanes, and even avoided several maliciously-minded jellyfish, and brought my channel-swimming relay team to within a quarter-mile of land. Yet the most challenging aspect of the swim had been the frigid water, which led several experienced Channel swimmers to predict I would "go hypo." But I had been prepared. My training regime included five-hour pool swims to competitive cold-showering - designed to see how long you could last under the frigid water. I studied biochemistry in a bathtub of 50-degree water and had the chilling experience of training amongst sharks in the Pacific. For months I had slept without sheets to help my body further acclimate to the cold.

I had planned to swim the Channel with my compatriot Usman, a Pakistani and my best friend. Swimming together, we were friends transcending the barriers of nationality, politics, religion, and culture. We named our venture the Channeling Peace Initiative and sought to increase both awareness and understanding between peoples, and publicity about our Initiative circled the globe. Articles about our endeavor appeared in newspapers in the United States, Pakistan, and even on CNN Europe. We partnered with Doctors Without Borders to raise thousands of dollars for Pakistani refugees, attracting supporters via the Internet from countries like Italy, China, and South Africa. So news that the British Border Agency denied Usman's visa application came like a punch in the gut. Desperate to salvage the Initiative, I managed to join

another relay team consisting of two Brits and a Kiwi. Adding in a young Yankee achieved the international teamwork Usman and I had initially envisioned.

I'm amazed how much my awareness of the world has grown over these last three years. I've gone from municipal park pools to the English Channel, from concern about playground bullies to the Tehrik e Taliban. Everything from the hospital I was born in, to the schools I attended since kindergarten, are all within a mile from my parents' house. Matriculating at Ohio Wesleyan University, I did not appear to be courting a global experience. Yet now I have a best friend from Pakistan and even find myself heading to the "Asia" section of *The Economist* before "Science and technology." While the world of this sheltered Ohio boy has expanded exponentially, conversely my interest in science has become more focused. Watching the *Magic School Bus* tour the human circulatory system on TV after elementary school was replaced by 14-hour days synthesizing immunogenic peptide happens at The Scripps Research Institute. There, I witnessed what it's like to be a part of a multi-year research project. I enjoyed working long days, returning to my apartment only to chow down on some cookie dough before collapsing onto my bed - sheetless, of course.

Despite enjoying my time at Scripps, my career goal is to become a "physician investigator," which is a medical doctor who also engages in clinical research. Research gives you the investigative tools needed to address unfamiliar situations, to ask the right questions and carry out the proper follow up. I was inspired while working for Dr. John Duldner, an assistant professor of emergency medicine at Akron General Medical Center. He helped dozens of people each day cope with everything from stomach pains to Amish-bam construction accidents. Yet he remains actively engaged in research, evident to me by the massive amounts of epidemiological work I conducted as his intern. Leaders in their field tend to maintain a balance between research and clinical practice.

The Integrated Immunology program at the University of Oxford bridges this divide between research and medical practice, allowing me to explore both the clinical aspects of immunology and the scientific principles behind them. My summer internship at Scripps, focused on catalytic antibodies, opened a route from my study of biochemistry to immunology. I was able to apply laboratory skills developed over previous years into a specific type of vaccinology. It would be easy for me to apply these same skills in additional immunological projects. The skills taught in the Integrated Immunology program go beyond just research, such as how to properly conduct clinical trials. This can help me evaluate the countless pharmaceutical industry sponsored "studies" I would encounter as a physician. Further, the work in statistics would facilitate my transition to a second program - Global Health Sciences. While that would be a leap from my biochemistry background, such a degree program would allow me to expand my understanding of and ability to address worldwide health issues. While many of the skills acquired in the course such as epidemiology and health economics are transferable to any community, they will take on special significance as I seek out opportunities to continue serving international organizations like Doctors Without Borders.

But alas, trying to gaze into my future is as difficult as was discerning the sparsely illuminated surface of the English Channel. However, just as the beam of the lighthouse periodically showed the surface, so too do these programs briefly illuminate possibilities in my own future. I can anticipate some of my activities at Oxford, but not my altered perspectives. Even within the confines of my hometown Delaware - often derisively called "Dela-nowhere" - my world has expanded by making friends and colleagues that surpass geographic borders, cultural barriers, and even religious boundaries. At Oxford, and amongst Rhodes colleagues, I

could continue to grow through multicultural collaboration. Perhaps it would be with an Indian economist, a Kenyan anthropologist, or an Australian philosopher. Assumptions fall, horizons expand, new views inspire.

I certify that this essay is my own work.

(Used by permission of the author.)

Rhodes Sample 2

Soaked in sweat, I sat deep in thought on the small mound of sand and broken rocks in northern Kenya, where 1.7 million years ago a desperately ill Homo erectus woman had died. Her death had entranced me for years. KNM-ER 1808 had died of Hypervitaminosis A, wherein an overdose of Vitamin A causes extensive hemorrhaging throughout the skeleton and excruciating pain. Yet a thick rind of diseased bone all over her skeleton—ossified blood clots—^tells that 1808 lived for weeks, even months, immobilized by pain and in the middle of the African bush. As noted in *The Wisdom of the Bones,* by Walker and Shipman, that means that someone had cared for her, brought her water, food, and kept away predators. At 1.7 million years of age, 1808's mere pile of bones is a breathtaking, poignant glimpse of how people have struggled with disease over the ages. Since that moment two summers ago, I've been fascinated by humans' relationship with disease. I want to research paleopathology, the study of ancient diseases, in relation to human culture, specifically sex and gender.

At first glance my education doesn't quite reflect my passion for paleopathology. I am often asked how bachelor's degrees in Women's Studies and Anthropology coadunate. Women's Studies and my related community service have honed my analytical skills, led me to the idea of studying sex and gender in relation to disease, and given my life and work a social conscience. I had participated in activism before college, yet my undergraduate experiences radically altered how I viewed the world and its potential for social change. Travel, conversation partnering, activism, and classes in Anthropology, African American, and Women's Studies taught me to think critically about human culture and behavior. Meanwhile, gender-equity organizing and assaults in the local community showed me the need for activism against sexual assault. I've focused on prevention, fueled by a strong personal need to make the world a less painful place. Most inspiring was organizing the "Outrage Rally against Sexual Assault," which attempted to raise awareness about and de-stigmatize assault in response to a series of assaults on the Mythic University campus. This rally had a positive impact in empowering survivors, evidenced by subsequent increased reporting of assault rates.

Organizing has also taught me successful leadership and teamwork skills, applicable to academic and social settings. I've learned the subtleties of integrating multiple perspectives into a shared vision and a success through networking with University administrators. Police Departments, nationally recognized activists, Congress persons, fellow students, and the general public. As head organizer for Mythic University's 20xx "Take Back the Night," attended by more than 500 people, I headed a seven-committee, twenty-person organizing team. In addition to recognition, as with the 20xx Service Award—Mythic University's highest undergraduate award for good citizenry and academics—organizing has honed my critical thinking skills and prepared me for performing innovative and multidisciplinary graduate research.

I want to study the relationship between human pathology and culture, looking specifically at disease in the context of sex and gender in non-modem European populations. My field of interest is new in paleopathology, so I will integrate paleoepidemiology and paleodemography—the studies of ancient disease processes and population dynamics—with gender and cultural studies and European history, contextualizing disease historically and culturally. My goal is to look at what health and disease can tell us macrocosmically and individually about social and sexual inequity, socioeconomic class, and gender-related quality of life.

Research experiences, such as working as a research assistant in a craniofacial morphometries lab, studying skulls, and doing field work in Pennsylvania, Kenya, the Orkney Islands, West Virginia, and South Dakota, have prepared me well for graduate school. I've conducted ethnographic, paleontological, demographic, archaeological, cultural, and osteological research. I am currently co-authoring an article on the implications of Forager's mating and marriage practices for sociobiological theory, while working on a research paper on craniofacial morphology in Medieval Denmark. I also completed a senior thesis on Amerindian women's culturally influenced reproductive health issues. With confidence, I want to proceed with graduate work at Oxford to gain a higher degree and greater research opportunities in the midst of British culture.

My work this year at the Smithsonian Institute's National Museum of Natural History has galvanized and confirmed my devotion to paleopathology. An anthropological fantasy realized: I am surrounded by invaluable research opportunities and constant, stimulating dialogue with future colleagues, and vast and exotic collections including cave bear skulls, dinosaurs, and the renowned Terry skeletal Collection. Volunteer work cataloguing the Bab edh-Dra skeletal collection and independent research exploring metabolic diseases' effects on the skull using CT imaging technology have taught me the reality of professional research. Concurrently, this year has allowed me to further realize my personal interests. I practice fine arts, read extensively, love to travel, and have a whirlwind tour of Western Europe planned for December. I am hiking and backpacking on the Appalachian Trail, playing rugby, running, and I am training my four-year-old horse for jumping and cross-country riding and competitions.

I believe that my personal interests, experiences, and social conscience would contribute as much as my research skills to Oxford's social and intellectual culture. Oxford offers me an opportunity to pursue a Master's in European Archaeology while taking supplementary courses in pathology, anatomy, modem European History, and social and cultural anthropology. Equally, I could have research guidance from staff in Biological Anthropology and the Human Sciences program, where human culture, biology, and behavior in response to disease are being actively studied. At Oxford, I could nurture and share a unique set of social experiences, nurture and explore my research interests, and contribute an innovative, informative, and multidisciplinary new approach to my field. Ensconcing myself in British culture, intellectual environment, and vigorous research at Oxford is the chance of a lifetime. I hope to be able to seize it.

(In Schall, Joe. *Writing Personal Statements and Scholarship Application Essays: A Student Handbook.* Eden Prairie, MN: Thomson-Brooks/Coe, 2006. 174-75. Print.)

Comments

"One of the most striking features of [this] sample is its introduction, in which the writer places herself soaked in sweat and deep in thought on a mound of rock in northern Kenya, contemplating

the fate of a Homo erectus woman who died 1.7 million years ago. This narrative leads the writer to an extensive explanation, including service-based examples, of the marriage between her degrees in Women's Studies and Anthropology. Her second page is devoted to her research, including work at the Smithsonian Institute's National Museum of Natural History. We also find details evidencing physical rigor and athletic competition." (Schall 173)

Rhodes Sample 3

I have found my mentor, and I'd like to tell you who it is and how this has come about. I have not yet met him face-to-face, but he has already taught me how to begin this essay with his words. Professor Anthony D. Nuttall, writing in his book *Openings,* tells us, "...All good openings are somehow naturally rooted, more or less remote, of an original creative act: *in medias res,* as against 'In the beginning'." Nuttall describes the importance of an opening by demonstrating the difference between the actual opening lines and the first sense of action, which will become the plot.

The "original creative act" to which he refers applies as well to young scholars. I recognize now that I am in the process of becoming the scholar I will always be becoming. This process currently involves research that is the basis for my senior honors thesis: investigating two British poets' incorporation of classical Greek and Roman mythology into their poetry. I have begun studying Geoffrey Chaucer and Alfred Lord Tennyson, both of whom make active use of myth in their works. The philosophy of intertextuality, a specific interest of Professor Nuttall's, is apparent in his research on the influence of Roman and Greek classics on British poets, the very topic I have chosen for my honors thesis. While I am learning from reading Professor Nuttall's books, specifically his *A Common Sky: Philosophy and the Literary Imagination,* the opportunity to work with him would inspire me to pursue further research in this field and enrich my understanding of literature and its critical theories.

My interest in British poets and their use of classical literature evolves from a paper I presented at the 20xx *Novus EtAntiquus* Conference. I had the privilege of being selected as one of five undergraduates to attend this faculty conference, where I presented my work on classical mythology's influence on the medieval author Geoffrey Chaucer's poems *The Knight's Tale* and *The Parliament of Fowls.* There Chaucer uses the Roman gods and goddesses to orchestrate the fates of the two female characters. Through the intervention of these deities, Chaucer shows compassion for women and grants mercy to both females. My experience as a college junior presenting a paper at a faculty conference proved gratifying on another level as well: I was pleased to receive guidance from the professors, and also to be complimented on my pronunciation of Middle English quotations.

I came to Chaucer only after reading Chretien de Troyes' *Lancelot* In this Arthurian romance, Chretien represents Lancelot as conflicted—the kind of chivalrous knight whom one expects to find only in myth, yet, in violation of the code of honor, desirous of his lord's queen. I began thinking of the tales of the Arthurian knights as more than legendary—as potentially credible historical accounts. I wrote a paper on Gawain's rhetoric as a means to elicit specific responses in *Sir Gawain and the Green Knight.* Gawain's rhetorical strategies and their manipulations ultimately led him to a deeper personal recognition and self-acceptance. This early exercise alerted me to strategies of language in the Middle Ages.

A post-graduate education at Oxford based on personal tutorials and independent research is precisely the type of program I now need to pursue. Through several independent study courses in my undergraduate curriculum, I have become even more self-motivated and have been gratified to discover that discussion between teacher and student has helped me develop my best work.

Professor Nuttall is a Fellow of Oxford's New College, the ideal place to continue my studies in medieval literature because it was built at the height of the medieval period, the era on which I plan to focus in my graduate study. I was pleased to discover that New College is also one of only four colleges that participate in the Oxford Access Scheme, a program that reaches out to inner-city students and encourages them to seek a higher education. This program provides all students with an equal opportunity to apply to a university as prestigious as Oxford, in participating in this program. New College seeks qualified students who may not have the socio-economic ability or confidence to apply to and attend Oxford. I would like to become involved in this program because I have worked with students in similar situations from the Boys and Girls Club near my hometown, and have found supporting these students to be very rewarding.

My reasons for applying for a Rhodes Scholarship to work with Professor Nuttall have roots in a study I undertook in 20xx. While reading Shakespeare's *The Tempest,* I found a single line in which the allegorical unicorn becomes a link between the medieval era and the Renaissance. I became interested in the villain Sebastian's professed disbelief in the unicorn, that imaginary animal symbolic of Jesus Christ in medieval bestiaries. My research on the historical symbolism of the unicorn in medieval literature led me to conclude that in rejecting the unicorn, Sebastian implies that he also rejects Christianity. An interesting aspect of *The Tempest that* I have not yet pursued is the masque, in which the Roman goddesses Iris, Ceres, and Juno descend upon the island in preparation for Miranda and Ferdinand's wedding. My earlier interest in Shakespeare's use of the allegorical unicorn will create a focus for study when combined with the masque of the Roman goddesses in *The Tempest* Shakespeare's integration of Christianity and classical mythology is yet another area I would like to explore with Professor Nuttall, for not only has he published on philosophy; he has also written *Two Concepts of Allegory: A Study of Shakespeare's* The Tempest and the *Logic of Allegorical Expression.*

The adventure of Sir Gawain—which leads him to a deeper understanding of self—is not unlike the journey I have undertaken, a journey I hope will lead me to Oxford University, its Bodleian Library, and study with Anthony Nuttall and other mentors. Oxford will provide me the opportunity to learn directly from authorities in my field who will help guide me in my quest to become a scholar. Like Gawain, I am striving to realize my potential through my own adventure.

(In Schall, Joe. *Writing Personal Statements and Schoarchip Application Essays: A Student Handbook.* Eden Prairie, MN: Thomson-Brooks/Coe, 2006. 176-77. Print.)

Comments

"In [this] sample, the writer opens with the simple phrase 'I have found my mentor,' then describes the very person she wishes to study with at Oxford, making further references to this professor in five of the essay's eight paragraphs. Amidst various literary references, we find examples of the student presenting a paper on Chaucer at a conference as a junior, and finally describing herself as one like Sir Gawain—an adventurer seeking a deeper understanding of self." (Schall 173)

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