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Contributors

• *Core Competencies of a Successful Scientist* was prepared by the National Postdoctoral Association (www.nationalpostdoc.org).

• *Advice from Admissions Representatives* was obtained from Purdue University’s Online Writing Lab (https://owl.english.purdue.edu/owl/resource/642/03/)

• The *Graduate School Preparation Checklist* was prepared by Drs. Michele Shuster, Karen Peterson, Gloria Coronado, and Noah Espinoza and Jennifer Anderson.

• *How to Conduct a Literature Search* was prepared by Noah Espinoza and Jordan Cañas.

• The *Resumes and Cover Letters* document was prepared by University of Puget Sound Career and Employment Services (ces@ups.edu or (253) 879-3161).

• *Instructions for Creating a Poster to Presentation* was prepared by Noah Espinoza, Jordan Cañas, and Jennifer Anderson.

• *How to Deliver a Presentation with Confidence* was prepared by Noah Espinoza, Jordan Cañas, and Jennifer Anderson.

• The *Example Poster Format* was contributed by New Mexico State University.

• The *Poster Evaluation Form* was prepared by Dr. Michele Shuster.

• Abstract and poster examples are included with permission from the respective primary author.

• Personal statement examples were contributed by former interns, graduate students, and post-doctoral fellows at the Fred Hutchinson Cancer Research Center (FHCRC) or the University of Washington (UW). Writing samples featured in the Personal Statement Examples section feature 'XX' in place of personal identifiers to protect contributors’ identity. All names and institutional references for writing samples featured in the Appendices were altered to maintain author confidentiality.

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DISCLAIMER

This Manual was created as a resource for students participating in the Summer Undergraduate Research Program (SURP) sponsored by the Fred Hutchinson Cancer Research Center (FHCRC) and is supported in parts by NCI grants: U54 CA132381-07 (FHCRC), U54 CA132383-07 (NMSU) and P30 CA015704-39 (CCSG CURE Supplement). No part of this Manual may be replicated or distributed without express permission from the contributors.

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For questions regarding the content of this Manual, please send an email to: SURP@fhcrc.org.
Core Competencies of a Successful Scientist

These are the skills that a scientist should have by the end of his/her training. These skills will allow the scientist to more successfully pursue and obtain permanent employment.

Scientific Knowledge
Acquired during graduate and postdoctoral training via coursework, mentoring and performing research

- Analytical approach to defining scientific questions
- Design of scientifically testable hypotheses
- Broad-based knowledge acquisition
- Interpretation and analysis of data

Research Skill Development
Acquired during graduate and postdoctoral training via performing research, mentoring and coursework

- Laboratory techniques and safety
- Experimental Design
- Data analysis and interpretation
- Statistical analysis
- Effective search strategies and critical evaluation of the scientific literature
- Principles of the peer review process

Communication Skills

Writing
- Publications
- Grants/applications
- Career
  - CV and resume
  - Cover letters
  - Research and teaching statements

Speaking
- Presenting your research
  - Posters
  - Conferences/seminars
  - PowerPoint presentations
- The job interview
  - Interviewing skills/overall presentation
  - Job talks
- Teaching
  - Classroom
  - Public
Interpersonal Skills

• Style, tone and nonverbal cues
• Negotiation
• Performance reviews/feedback
• Difficult conversations/minimizing conflict

Networking

Leadership and Management Skills

Leadership Skills

• Creating a vision and setting goals
• Running meetings
• Delegating responsibilities
• Motivating/inspiring others
• Mentoring/serving as a role model
• Diversity-working with individuals with diverse gender, ethnic, cultural and religious backgrounds
• Conflict management/resolution

Project Management

• Time management
  - Establishing priorities
  - Planning the project timeline
• Collaborative Science
  - Types of collaboration
  - Project goals
  - Expectations of collaborators
Advice from Admissions Representatives
Lee Cunningham  
**Director of Admissions and Aid**  
The University of Chicago Graduate School of Business

The mistake people make most often is not to look at what the questions are asking. Some people prepare generic statements because they’re applying to more than one school and it’s a lot of work to do a personal essay for each school. On the other hand, generic statements detract from the applicant when we realize that we’re one of six schools and the applicant is saying the same thing to each and every school despite the fact that there are critical differences between the kinds of schools they may be applying to. They don’t take the time. They underestimate the kind of attention that is paid to these essays. Take a look at what the essay asks and deal with those issues articulately and honestly.

At least 2, and sometimes 3, people read each essay. I read them to make the final decision. Our process works so that each person who reads the application does a written evaluation of what he or she has read and the written evaluations are not seen by the other reader. *(adapted from Stelzer, p. 49)*

Steven DeKrey  
**Director of Admissions and Financial Aid**  
**J. L. Kellogg Graduate School of Management (Northwestern University)**

We’re looking for a well-written, detailed essay that responds directly to the question. The questions are about extracurricular activities, motivation, challenges, commitment to the school that kind of thing. We see a variety and that’s fine. Our approach is very individualized. The way the applicant devises the answer, determines the length, develops the response, is all part of the answer. The level of effort applicants put into essays varies considerably, which sends messages to the admissions committee as well. Over-involved, elaborate essays send one message, while very brief and superficial essays send another message.

Trying to second-guess what we are looking for is a common mistake — which we can sense.

We can tell when applicants use answers to other schools’ questions for our essays; we’re sensitive to this. Poorly written essays are a bad reflection on the applicant.

Don’t over-elaborate; we’re reading a lot of these kinds of essays. Also, don’t be too brief or superficial. We like to have major ideas presented well. *(adapted from Stelzer, p. 55)*

Michael D. Rappaport  
**Assistant Dean of Admissions**  
**UCLA School of Law**

Applicants should take the time to look at what the law school is asking them to write about. At UCLA, we say, "we know you have lots of extracurricular activities—we want to know how you differ, what makes you unique? What can you bring to the first year class that’s going to make you distinctive from the other 99 people who are already there?" The fact that you were active in your fraternity or sorority is really not going to do it. What we’re looking for is somebody who, in their personal statement, stands out as being so unusual, so diverse, that they’re extremely
attractive as a law student for the first-year class. Maybe what's going to make them distinctive is the fact they spent six months living in a log cabin in Alaska. You try to give the law school some justification for admitting you. With a lot of people, there's nothing that's going to make them distinctive. If that's the case, they've got to recognize that, indeed, the essay is not going to make that much difference here at UCLA.

We're also asking if there's any reason their LSAT or grades are not predictive. You'd be amazed at the number of people who completely ignore this—they don't take advantage of the opportunity.

Most law schools operate fairly similarly. There's a certain group of applicants whose grades and LSAT scores are so high that the presumption is that the applicants are going to be admitted unless they do something terribly stupid to keep themselves out. I have seen applicants whose personal statement has done that, but it's extremely rare. At the other extreme is another group of applicants who, no matter what they write, are not going to get in.

The applicant has to realize, first of all, where he or she stands. If you have a straight-A grade point average and a perfect LSAT score, you don't have to spend a lot of time worrying about your personal statement. On the other hand, if you know you're in the borderline area, that's where the personal statement becomes very, very important.

The applicant should take the time to read the application to see what the schools are asking for. Sometimes the school will ask for a general description of why you want to go to law school, or why they should admit you, something of that nature. In such case you can be fairly sure that the school is just interested in the essay to see how well you write. So what you say isn't as important as how you say it. On the other hand, some schools are more specific — UCLA being a very good example of that.

Make sure the essay is grammatically and technically correct and well written. Avoid sloppy essays, coffee stained essays, or ones that are handwritten so you can't read them. You'd be amazed at what we get! (Stelzer, pp. 70-71)

Beth O'Neil  
Director of Admissions and Financial Aid  
University of California at Berkeley School of Law (Boalt Hall)

We're trying to gauge the potential for a student's success in law school, and we determine that, principally, on the basis of what the student has done in the past. The personal statement carries the responsibility of presenting the student's life experiences.

Applicants make a mistake by doing a lot of speculation about what they're going to do in the future rather than telling us about what they've done in the past. It is our job to speculate, and we are experienced at that.

Applicants also tend to state and not evaluate. They give a recitation of their experience but no evaluation of what effect that particular experience had on them, no assessment of what certain experiences or honors meant.

They also fail to explain errors or weaknesses in their background. Even though we might wish to admit a student, sometimes we can't in view of a weakness that they haven't made any effort to explain. For example, perhaps they haven't told us that they were ill on the day that they took the LSAT or had an automobile accident on the way. Such things are legitimate reasons for poor performance. I mean, we understand that life is tough sometimes. We need to know what happened, for example, to cause a sudden drop in the GPA.

Another mistake is that everyone tries to make himself or herself the perfect law school applicant who, of course, does not exist and is not nearly as interesting as a real human being.

Between 1 and 5 people read each application. (Stelzer, p. 72)
Dr. Daniel R. Alonso
Associate Dean for Admissions
Cornell University Medical College

We look for some originality because nine out of ten essays leave you with a big yawn. "I like science, I like to help people and that's why I want to be a doctor." The common, uninteresting, and unoriginal statement is one that recounts the applicant's academic pursuits and basically repeats what is elsewhere in the application. You look for something different, something that will pique your interest and provide some very unique insight that will make you pay some notice to this person who is among so many other qualified applicants. If you're screening 5,500 applications over a four- or six-month period, you want to see something that's really interesting.

I would simply say: Do it yourself, be careful, edit it, go through as many drafts as necessary. And more important than anything: be yourself. Really show your personality. Tell us why you are unique, why we should admit you. The premise is that 9 out of 10 people who apply to medical school are very qualified. Don't under any circumstances insert handwritten work or an unfinished piece of writing. Do a professional job. I would consider it a mistake to attempt to cram in too much information, too many words. Use the space as judiciously as possible. Don't submit additional pages or use only 1/20th of the space provided. (Stelzer, p.81)

John Herweg
Chairman, Committee on Admissions
Washington University School of Medicine

We are looking for a clear statement that indicates that the applicant can use the English language in a meaningful and effective fashion. We frankly look at spelling as well as typing (for errors both in grammar and composition). Most applicants use the statement to indicate their motivation for medicine, the duration of that motivation, extracurricular activities, and work experience. So those are some of the general things we are looking for in the Personal Comments section.

We also want applicants to personalize the statement, to tell us something about themselves that they think is worthy of sharing with us, something that makes them unique, different, and the type of medical student and future physician that we're all looking for. What they have done in working with individuals—whether it's serving as a checker or bagger at a grocery store or working with handicapped individuals or tutoring inner city kids—that shows they can relate to people and have they done it in an effective fashion? What the applicant should do in all respects is to depict why he or she is a unique individual and should be sought after. Of course, if they start every sentence on a whole page with "I," it gets to be a little bit too much. (Stelzer, p. 82)


The book has guidelines for writing, examples of successful statements, and advice from admissions officers.
Personal Statement Examples
Graduate School Personal Statement Examples

Graduate School Personal Statement #1

Growing fruits and vegetables, cooking nutritious food, and eating meals as a family are memories I value. As a child, I remember putting on my blue-striped apron and helping my parents prepare dinner. It was fun and later I realized my parents were teaching me healthy eating habits and creating life-long passions through delicious, nutritious food! These values ultimately led to the important career choice I am making now.

A love for science and a desire to help people is what attracted me to prepare for medical school. I love learning about the complexity of the human body and its metabolic pathways. Working with doctors gave me an in-depth view of chronic diseases such as type II diabetes mellitus and obesity that plague our nation. I came to realize that my efforts would be more focused on working to eliminate the source of the problems, which in many cases would be proper diet and activity, rather than treating symptoms with prescriptions. I sensed I could have a positive role in transformative education. In the summer of 2010, I was invited to intern in XXX. There, I worked in a human biology laboratory with Dr. XXX and Dr. XXX analyzing the role of specific protein expression levels within human cancer cell lines and how this protein impacted the onset of breast cancer. I also attended a lecture by Dr. XXX concerning cellular breakdown and how proper nutrition and exercise affect aging and the development of cancer by reducing mitochondrial damage. Considering my own personal emphasis on health, these experiences opened my eyes to the potential of preventive treatment and also showed me how I can serve as a motivation to those who want to improve their health. After much thought, research and speaking with dietitians I decided to pursue a career in nutrition to learn and implement the powerful prevention tools it provides.

Receiving a master’s degree in Nutrition and becoming a registered dietitian will allow me to have a strong foundation in nutritional science, which I believe is crucial when advising clients concerning their health. While participating in the nutrition graduate program, I plan to take electives in culinary arts so as to further my knowledge in preparation of health-supportive food that aids with digestion, enhances the immune system, promotes disease prevention and encourages the incorporation of whole foods derived from sustainable agricultural and farming practices. My knowledge of nutrition combined with food preparation will allow me to open a wellness center which will offer nutritional advising and healthy cooking classes. As a result, I will be teaching the short and long-term benefits of healthy eating as well as how to attain this lifestyle. I will lead community-based events that promote families cooking together and parents-to-be classes that emphasize the importance of prenatal and pediatric nutrition. In my cooking classes I will teach basic skills such as canning and freezing fruits and vegetables, easy menu preparation as well as how to economically eat healthfully on a budget. I will also provide the service of group nutritional advising sessions that will provide clients with a risk-free environment where they can be part of a health community that extends the wellness model. These services will begin to reformulate the fundamental relationship between people and food by instilling healthy eating habits that will thus possibly prevent many health problems later. Moreover, I am currently writing a cookbook that contains plant-based recipes with simple explanations that address what role certain foods play within the body. I will be able to finish this book after receiving nutrition and culinary arts instruction at XXX. I plan to publish this book because literature incorporating healthy recipes with easy explanations to complex scientific material will help people to educate themselves and take control of their life. Michael J. Fox stated, “Medical science has proven time and again that when the resources are provided, great progress in the treatment, cure, and prevention of disease can occur.” I agree with this statement and will help make these food resources available in a way that is inviting and informational.

Many would consider my decision to enter this health profession as a career change but I view it as a career extension. As an educator, I worked hard to guide people toward success and I appreciate the importance of educating people in conjunction with the patience involved in this process—all of which I will continue as a dietitian. I prepared for medical school because I have always strived for excellence, possessed a love of science and desired to make a difference. The distinction exists within my interest in preventive care, personal importance I place on environmental conservation, and my continuous love affair with creative, healthy cooking. According to Forum for the Future, “Sustainable development is a dynamic process which enables all people to realize their potential, and to
improve their quality of life, in ways which simultaneously protect and enhance the Earth's life support systems.” By combining my interests and values I believe I have found a niche that will allow me to aid in proactively changing the face of health and wellness for many people while at the same time advocating practices that eradicate poverty and hunger, begin to reverse personal and societal costs to human health due to current eating habits, and promote responsible and compassionate practices toward all living beings.

As a candidate I have much to offer your program. Being of first generation XXX and XXX descent, I come from a modest background and work hard to succeed. Moreover, I acclimate well to my surroundings. I grew up on a small farm but was able to adapt well to urban life when living in XXX and XXX. This ease of transition makes me an excellent candidate for the learning environment your program provides. I believe my experiences and circuitous path to this field will benefit your program. In return, I feel it would be a true gift to learn from the best and brightest at XXX and be one of the many “trail-blazers” in this field to graduate from your university. Primarily, I chose XXX because I need a strong, renowned program in order to make my goals a reality. Exploring the programs offered, research projects taking place, and speaking with alumni have only enhanced my appreciation of and interest in attending XXX. The advantage of being able to receive instruction in nutrition and whole food culinary arts is unique and useful in achieving my career objectives. Secondly, I am attracted to the overall mission of XXX and how it coincides with my own value system. XXX values the interconnectedness of medicine and nature, mind and spirit—both of which are aspects of life people constantly separate. However, in order to care for one another and our planet we must learn how these pieces are woven together. I believe being educated at XXX will allow me to pursue a career that will help educate people in taking the first steps in truly helping themselves as well as the world around them. Lastly, XXX’s location in XXX State is something that compliments its appeal. Being able to live and work in XXX last year allowed me to explore and become acquainted with the cadence of a bustling city alongside glorious nature. XXX appreciates this fusion and works hard to conserve our environment. This appreciation was shown in its cleanliness, public transportation and waste management systems that far exceed other places I have lived and visited. All of the aforementioned reasons have made me see not only what a precise fit XXX’s Nutrition program is for me but also what an asset I will be to your school and the global health and wellness community.
Graduate School Personal Statement #2

From an early age, I was intrigued by a quote from the well-known scholar, Lewis Thomas: “The capacity to blunder slightly is the real marvel of DNA. Without this special attribute, we would still be anaerobic bacteria and there would be no music.” This statement piqued my curiosity in science by making me realize that many species evolve from a single cell. At that time, science seemed like a miracle to me and I wanted to understand more as I grew older. When I was a child, I would often go to the nearby woods and lakes to observe fish, squirrels and collect bird feathers. Their tranquil and free life raised my interest in biology. As I become older, I became more interested in cancer biology and the mystery behind it, which has led me to pursue a career in cancer research. I feel that I should utilize my passion for cancer research to help millions of people who suffer and die from various types of cancer each year.

After completing my college education XXX, I came to the United States to continue my education in Genetics at XXX, which helped foster a sense of personal responsibility. Over the last three years at XXX, I have worked in various research labs to get hands-on experience in molecular biology.

During my tenure as an undergraduate research assistant in Dr XXX’s lab at XXX (20XX), I gained experience in GUS staining of mutant plants, specifically gene transformations of Arabidopsis thaliana plants using Agrobacterium, plant genomic DNA extractions using the CTAB method, and plasmid extractions. The year I worked in that lab laid the foundation for future lab positions I held while at XXX. At the beginning of this year (20XX), I worked as a lab assistant in Dr. XXX’s lab, which exposed me to entirely new lab techniques such as gel electrophoreses, bacterial plasmid extractions, and making dsRNA using an Ambion® RNAi kit. These experiences and the enormous amount of knowledge gained about molecular biology techniques continues to fuel my pursuit of cancer research.

In the spring of 20XX, I had the opportunity to do an independent research study on genomic rearrangements induced by transposable elements in maize under principal investigator Dr. XXX at XXX. In the study, I used transgenic construct that contains markers (maize c1 and p1 genes) for detection of both I/dSpm transposition and Ac induced deletions to understand possible genomic rearrangements. As a result, I was able to recover and map ten new I/Sdpm transposition sites in the maize genome. Together with previous studies, results of the research could lead to new approaches for using transposable elements as a tool to enhance crop productivity.

Recently, I worked as a summer intern in Dr. XXX’s lab at the XXX, which has exposed me to cutting-edge research in the field of cancer metabolism. Concordant with my summer research project, I am tested ten different breast cancer cell lines against different metabolic inhibitors to identify possible differences in bioenergetic metabolism between breast cancer subtypes. I have gained new insight into mammalian cell culture as a result of this project and trained use novel instruments like the Extracellular Flux Analyzer. Also, weekly lectures in different areas of cancer research helped me gain a better understanding about research fields other than that of breast cancer. I believe the training and experience gained through this internship program will prepared me well for future research projects.

Currently, I am working as a Research Associate in XXX, startup biotech company in XXX. Since XXX provides research and diagnostic tools for drug discovery and therapeutic development for treatment of Parkinson’s disease and other neurodegenerative diseases, this position gives me enormous experience on drug discovery research. My work is involve with mammalian tissue culture, western blots, Florescence Microscopy work, and testing novel target cell signaling molecules involved in apoptotic cell death. Since, this company is associate with XXX; I have opportunity to use research facilities in Department of Biomedical Sciences at XXX too. As an undergraduate student, I am glad that I work with them because I can learn lot of new research techniques from my work and I also certain that these experience will be helpful for me as a graduate student in near future.

In addition to my research experiences at XXX, XXX and the XXX, I have taken part in various extracurricular activities at XXX. I was President of the XXX Students Association at XXX (20XX) and during my presidency, I was able to organize a number of cultural events through which we were able to share our rich XXX culture with the rest of the XXX community. I also served as a Peer Mentor for the “Secret of Life” learning community
for genetics undergraduates at XXX, where I shared my educational and personal experiences with freshmen students to help them succeed in their studies. Together with the other peer mentors; we formed a weekly “help room” session to offer assistance with math, chemistry and biology.

I believe that my experiences gained both inside and outside the classroom, have prepared me to advance academically and professionally. My goal is obtain a Ph.D. in cancer biology and conduct further studies in the field of breast cancer research. I am certain that the Molecular and Cell Biology (MCB) Ph.D. program offered at XXX will provide the education and experience I wish to acquire. I also believe that the diversity of the coursework, world-class research opportunities, and rich social and cultural framework at XXX will provide the necessary foundation to be not only a scientist, but also a good citizen to the world. I believe that the valuable experience and knowledge I have accumulated, make me a great fit for the program. The diversity of my experiences is my biggest asset and I guarantee that it will assist me in succeeding in the future. XXX, I wish to continue my journey to a career in biological sciences which I first envisioned as a child in XXX.
Graduate School Personal Statement #3

I want to pursue graduate studies in Molecular Microbiology and Immunology because I am fascinated by the interaction between host and pathogen, the idiosyncrasies of each relationship, and how knowledge of this interaction can be used to develop effective therapeutic interventions.

My interest in infectious disease began with a high school field trip XXX, a non-profit organization dedicated to improving global health by finding solutions to the world’s most devastating diseases. I was impressed by their altruistic intentions, but mostly inspired to pursue a career as a physician-scientist on the cutting-edge of biomedical research. It was only after observing and talking to physicians specializing in infectious disease at the XXX Medical Center that I realized infectious disease was my calling. As a result of this experience, I applied to several summer undergraduate research programs, and was invited to join two competitive programs, at XXX and at the XXX. I elected to participate as a summer undergraduate intern at XXX, where I studied antifungal immunity in the lab of Dr. XXX. My experience working in an immunology lab full-time led to my current decision to study cellular and molecular immunology and host-pathogen interactions en route to a doctorate degree.

Upon completion of my degree, I plan to pursue post-doctoral work to gain specialized experience in parasitology. Drawing from my undergraduate background in neuroscience, I am particularly interested in pathogens that are able to breach the blood-brain barrier, such as Toxoplasma gondii and Trypanosoma brucei. I find T. gondii to be especially interesting, as it is known to manipulate rat predator-evasion behavior in order to complete its life cycle, and more recently has been linked schizophrenia as an etiological factor. This microbe infects a substantial portion of the global population and is known to lead to fatal encephalitis in immunocompromised individuals; what could it be doing as it lies ‘dormant’ in a healthy host? As parasites and other infectious disease-causing agents are frequently an issue in developing nations, I want to work for a non-profit institute engaged in the development of affordable therapeutics and preventatives meant to be dispersed globally. Eventually, I want to teach at a university where I can offer undergraduate students the opportunity to engage in cutting-edge research, just as my mentors did for me.

Over the past three years, I have been fortunate to work in two labs: Dr. XXX’ lab [XXX] on inhalant abuse and Dr. XXX’s lab [XXX] on antifungal immunity. I started in Dr. XXX; lab in February 20XX and ended in December 20XX. Dr. XXX has a very unique approach to the undergraduate lab set-up: instead of having students work on a single project, she assigns students to one of five student-led research ‘pods.’ With this configuration, her lab maintains a wide-ranging research focus. I led the research group investigating the potential use of Caenorhabditis elegans to study the effects of toluene, a common solvent in abused inhalants. We began with a behavioral study, measuring the effects of toluene exposure on worm locomotive behavior. We found that brief exposure to toluene decreased locomotive behavior, which led us to our next experiment where we compared levels of vesicular transporters before and after toluene exposure. In this phase of the project, I had the unique opportunity to learn how to operate a confocal microscope, which is capable of capturing very clear images of fluorescent transgenic worms. Although the learning curve was initially steep, we eventually found a significant effect of exposure on protein expression levels. The innovation and creativity behind this project earned us an internally-funded undergraduate grant from XXX, which allowed us to purchase primers for the third phase of our experiment, using quantitative realtime PCR to measure changes in expression of vesicular transporters and receptors. Earlier this year, I also had the chance to present our research at the Northwest Regional Worm Meeting as a short talk. Although working in the lab was daunting at first, I believe the experience contributed to my confidence and resilience as a researcher, and I am grateful that my first introduction to the lab setting was so comprehensive.

As a result of the training I received in Dr. XXX’ lab, I was invited to work with Drs. XXX and XXX as part of XXX’s Summer Research Program [SRP] for nine weeks of last summer. My project was an extension of Dr. XXX’s, addressing the ability of mouse neutrophils to engage Aspergillus fumigatus spores in an in vitro model. We used leukocytes derived from the bones of mice with specific knockouts in proteins implicated in pathogen recognition and killing via Dectin-1 and Toll-like receptors [MyD88 and Dectin-1], and incubated them with Aspergillus. After incubation, we analyzed the cells with flow cytometry, using size, granularity, and surface
antigens to specifically gate for neutrophils. My results indicated that leukocytes with a double knockout of pathogen recognition receptor Dectin-1 and adaptor protein MyD88 are less effective at recognizing and binding to *Aspergillus*. My results were corroborated by an *in vivo* experiment conducted by Dr. XXX. Following several *in vitro* and *in vivo* experiments in which Dectin-1/MyD88 double knockout cells were better able to engage *Aspergillus* after coincubation with their wild-type counterparts, we hypothesized that Dectin-1 and/or MyD88 may be responsible for production of a soluble opsonin. At the end of the program, I presented our research endeavors and accomplishments at a competitive poster session. Upon the conclusion of this internship, Dr. XXX invited me back to the XXX to investigate the potential for pentraxin-3 to be the opsonin in question; although my results were inconclusive, Dr. XXX informed me that I will be included as an author when he and Dr. XXX submit for publication. I gained a better understanding of innate immunity by working in Dr. XXX's lab, and additionally a strong appreciation for working as a full-time researcher.

When I asked Dr. XXX about graduate programs that he would recommend, XXX University was one of the first schools that he named. He cited XXX’s Immunology program as one of the top in the nation, a statement that immediately spurred my interest. After researching the basic science program and watching ‘The Inward Eye,’ I discovered that there were many reasons to be attracted to XXX. The core curriculum, integrative approach to research, and friendly yet intense academic environment, are a few of the reasons why I chose to apply. My main reason for applying is the cutting-edge research. I am most interested in Dr. XXX’s work on innate immune responses to *Toxoplasma gondii*, as his work completely overlaps with my personal research interests. I also find the work in Dr. XXX’s lab on the complex relationship of gut microbes and host immunity and the work in Dr. XXX’s lab on the interaction of bacterial toxins and human signaling events to be absolutely fascinating. Lastly, I am attracted by the vibrant culture of XXX, especially the emphasis on food, live music and entertainment, and the arts. I’ve never been to XXX before, but after talking with several friends who have, I know I will love living in XXX. The combination of so many positive factors- strong reputation, great environment, exciting research, and lively city life- make XXX University undoubtedly my top choice for graduate studies.
Graduate School Personal Statement #4

If nothing else, my undergraduate experience has taught me that failures will almost always precede successes. Academically I’ve crashed midterms before acing finals. Athletically I’ve lost scrimmages against schools I hadn’t known existed before winning a national title against the best-ranked team in the country. In research I’ve broken gels, mislabeled tubes, forgotten to feed cells fresh media, and mixed up PCR primers, all in route to finding meaningful results. To paraphrase, I’ve learned the lesson of “try, try again” quite thoroughly and, in the process, discovered a deep personal store of perseverance that is especially well-suited to an aspiring scientist.

Completing my undergraduate bioengineering degree in the College of Engineering at XXX has equipped me with a strong quantitative reference frame with which to approach scientific questions. Core bioengineering courses such as Stem Cell Technology, Cell and Tissue Engineering, and BioMEMS (Biological Microelectromechanical Systems) underline the value of using first principles to understand complicated cellular processes and rational design to successfully intervene when they founder. I have also completed molecular and cell biology courses to supplement my understanding of basic eukaryotic biology. Tumor Biology, Systems Biology, and Molecular Immunology especially captured my interest in the molecular machines and precise interactions which govern either protection from or entry into disease states. A marriage of academic experience in engineering and biological science uniquely qualifies me to contribute to innovative biomedical research at the graduate level.

Compelled to start sooner rather than later, I have participated in both basic science and translational research projects as an undergraduate. As a member of XXX’s laboratory in the bioengineering department at XXX, I focused primarily on trying to understand and predict protein folding, particularly in relation to aggregation phenomena. Many neurodegenerative diseases, including Alzheimer’s, Huntington’s, and Parkinson’s disease, are characterized by mistimed aggregation in β-rich proteins, so I set out to understand if increased propensity for aggregation is exclusively restricted to disease states or rather a general property of all β-rich proteins. Working with postdoctoral researcher XXX (now a senior biochemist at XXX Laboratories), I performed dynamic protein folding simulations and in vitro kinetic experiments to characterize the tendency of a β-rich but non-disease related protein to aggregate under various conditions. However, even under favorable conditions, I found aggregation in the non-disease protein to be extremely fragile and rare. These results indicated that, unlike in disease state conformations, wildtype β-rich proteins are protected from aggregating. Dr. XXX, Professor XXX, and I have submitted a publication describing our findings to which I contributed experimental design, execution, data analysis, figure generation, and original text. My experience in the XXX laboratory was particularly valuable because it provided me with my first opportunity to conduct independent investigation and to participate in the publication phase of scientific research.

In addition to research in the bioengineering department at XXX, I spent the recent summer working as a research intern in XXX’s laboratory at the XXX in XXX. While there I was mentored by research associate XXX and contributed to a drug delivery project in which we characterized the specificity and efficacy of a novel vehicle called the “polyplex.” The polyplex uses RNA interference to help overcome a major problem in conventional cancer treatment, which is the innate resistance many cancers have to chemotherapy. We hypothesized that delivering pro-apoptotic small interfering RNA (siRNA) to cancer cells would help sensitize those cells and potentially allow loser-dose chemotherapies to be prescribed in the clinic with equal therapeutic benefit. My involvement entailed performing assays to quantify drug uptake, target RNA transcript knockdown, and cytotoxicity in human breast and ovarian cancer cell lines. I found that the polyplex successfully delivers siRNA into the cytosol of cells expressing targeted surface receptors and, furthermore, initiates degradation of sequence-specific RNA transcripts without a widespread effect on gene expression. At the conclusion of the summer program I presented my results in both a XXX laboratory meeting and a competitive poster symposium at the XXX, where I was awarded “XXX” by a panel of graduate and postdoctoral researchers.

Cancer Biology is my first-choice home program at XXX. More specifically, the research fields that I’m most interested in pursuing are cancer stem cell biology and tumor immunology. Cancer stem cells are rare in both solid and hematopoietic tumors but are believed to act as the engines for cancer tissue ontogeny and metastasis.
They are, however, extremely difficult to target with conventional chemotherapy or radiation treatments because, analogous to normal stem cells, they are often quiescent and possess protection mechanisms from cytotoxic chemicals. I aspire to help advance the understanding of cancer stem cell biology in order to ultimately develop novel cancer stem cell-targeted therapies which minimize the risk of patient relapse and avoid deleterious side effects in healthy tissues. XXX faculty currently researching cancer stem cells who especially interest me are Drs. XXX, Herb XXX, and XXX. The prospect of joining Dr. XXX’s group particularly intrigues me because he is a pioneer of the cancer stem cell hypothesis and his laboratory routinely contributes to some of the most groundbreaking discoveries in the field, including the first ever identification of cancer stem cells in a solid tumor. I am also strongly interested in immune-tumor surveillance and cancer immunotherapy development. Interference with immune function has been recognized in multiple cancer subtypes, and it is now known that many tumors develop anti-immunogenic mechanisms such as reduced expression of major histocompatibility proteins or secretion of anti-inflammatory cytokines. I want to help generate a wholistic understanding of way immune cells interact with malignant ones as to allow immunoengineered cancer treatments which breakdown tumor protection strategies. Tumor immunology researchers at XXX who especially interest me are Drs. XXX, XXX, and XXX. XXX’s strong commitments to cancer stem cell biology and tumor immunology make it a great fit for my aspirations as a cancer researcher.

Besides having an impressive research base in the specific cancer biology fields that interest me most, XXX is also an attractive institution because of its uniquely creative and collaborative research environment. I greatly admire that XXX promotes collaborative research, with a strong example being the Bio-X Program, designed to encourage innovation through increased interaction between researchers on campus. I would love to work with molecular biologists, cell biologists, and translational researchers in order to gain novel perspective and learn from both basic biology and biomedical experts. Because of my background in bioengineering, I can also contribute in a valuable way by helping to translate cutting-edge technologies developed by engineers into improved cancer research strategies. I welcome the opportunity to contribute to the collaborative and cutting-edge research environment that XXX Biosciences is renowned for.

Lifelong struggles in academia, athletics, and research have prepared me with a special understanding of the intense perseverance that laboratory research requires. I’m well-schooled in losing, one could say, but for me past failures are less barriers than they are propellants to the recent successes I’ve enjoyed as a student, as an athlete, and as a researcher. As an undergraduate I’ve tasted both the frustration of scientific method and the gratification of scientific discovery, and as a graduate student I hope to continue learning how to construct meaningful ideas from experimental data. It is my long-term goal to become a principal investigator with the responsibility of leading my own cancer research group, and completion of the doctoral program in Cancer Biology at XXX would serve as an extraordinary step forward in that direction.
The average human adult has approximately ten billion cortical pyramidal neurons. I have one extra: the tattooed soma rests in the hollow of my back, stretching spiny dendrites out towards my hips, and a single axon reaches up my spine, its collaterals curving up my neck and over my shoulders. The black—inked composition is reminiscent of the intricate drawings of Santiago Ramón y Cajal, one of the fathers of neuroscience. The tattoo is symbolic of my dedication to investigating the many exciting questions neuroscience has to offer, but I was not always sure enough of my career choice to etch it on my skin.

My childhood was spent trying on many hats and each birthday brought a new goal: first artist, then veterinarian, then astronaut, writer, theatrical lighting designer, and finally “I don’t know.” It wasn’t until I had the opportunity to participate in biological research that a lasting preference began to emerge in my mind. I spent my final high school semester investigating single nucleotide polymorphism (SNP) frequencies in lettuce cultivars at the XX Genome Center. I was immediately hooked; I loved the process of scientific problem solving as well as the idea that I could uncover a previously hidden corner of the universe.

After several summers working in agricultural biology research labs, I enrolled in an introductory neuroscience class taught by Dr. XX XXX at XXX State University. I was utterly fascinated by this field and I quickly asked to join the XX lab, which uses zebrafish as a model to study the hormonal glucocorticoid system. My research partner and I found that a mutant with defective glucocorticoid receptors displayed decreased spontaneous swimming activity combined with increased stress responses. In addition, the phenotype could be rescued with the anti—depressant Prozac, suggesting that the glucocorticoid system may play an important role in modulating behavioral stress disorders. I presented preliminary findings at the XX XX (XXX) meeting in 20XX, which gave me a tantalizing taste of what it is like to participate in the greater scientific community.

It was only after immersing myself in research for a year that I knew I had found my place. Dissecting behaviors down to the molecular and cellular components of neural networks thrilled my analytical brain. I sensed I had only just scratched the surface, and that was not enough—I wanted to understand how all of the pieces interact to give rise to a functioning nervous system. Once I came to that realization, the neuron tattoo seemed a natural display of my interest in the field, and now serves as a visual reminder of my intent to contribute to neuroscience research.

To that end, I applied and was accepted to the XXXXX (XXXXX) XXXX (XXXX), where I worked in Dr. XX XXX’s lab, studying the formation of electrical synapses. I spent the summer characterizing a mutant line of zebrafish from a forward genetic screen looking for defects in synaptogenesis. I found that there seemed to be a loss of two key proteins at the site of the synapse, though the general neural circuitry remained intact, suggesting that the mutation was in a gene critical for electrical synapse formation. Throughout this investigation I retained a sense of excitement every time I turned on the microscope to look at my results; watching individual neurons glowing against the dark background of their unstained neighbors still gives me pause. In addition to studying these mutants at the level of individual synapses, my mentor and I also created a behavior recording apparatus out of a cardboard box, a petri dish rack, a roll of packaging tape, a small laptop speaker, and a camera. Though assembled of random parts and garnering many amused reactions from my lab—mates, I used this equipment to discover that the loss of electrical synapses correlated with a decrease in auditory startle behavior. The entire summer was incredibly rewarding and I emerged feeling well—prepared and exceptionally motivated to pursue a PhD.

In the year since completing the XXXX internship, I have further developed my professional goals. I was asked to be a supplemental instructor for the XXX Chemistry department and in that capacity, I prepared and taught lessons for students who wanted additional help in their first semester chemistry course. While this was one of the most challenging things I have done, the rewards of seeing my students succeed sparked a desire to become a professor in addition to conducting research. I have since been invited back to the XXX lab as a technician, where I continue to study the molecular underpinnings of electrical synapse formation. This has only enhanced my interest in the cellular and molecular mechanisms underlying circuit building. I want to understand how a finely—tuned nervous system develops time and time again from a handful of unspecified cells. The human brain, with its trillions of synaptic connections, is the most complex set of machinery known to humankind. It is
able to accept environmental stimuli, learn, and then in turn influence its environment. In order to become that fully functioning system, neurons must determine their cellular fate, guide axons, identify synaptic partners, and create connections before organizing electrical and chemical information. There are an incredible number of opportunities for these processes to go wrong, and yet in most instances it does not. Development from that first neural stem cell to a mature brain is an amazing feat of nature and the sheer amount that is not known about it both frustrates and excites me. That combination of emotion is what fuels my drive to continue on this path.

The resources available through the XX Neurobiology and Behavior program will put me in an ideal position to investigate the fundamental questions about neural circuit building. The program offers several courses that I am eager to take, especially NEUBEH 502: Sensory and Motor Systems and BIOEN 498B: Neural Engineering, as I feel these courses offer information and tools I need to study how meaningful circuits form. I am interested in working with Dr. XX XXX, with whom I would use microfluidic devices to engineer my own artificial circuits and thereby learn what the system requires to do so. I could also see myself succeeding in Dr. XX XXX's lab where investigating the genetics underlying simple sensory networks would give similar insight. I expect to be challenged by graduate school, and am prepared to take advantage of the numerous opportunities to better my scientific intellect in order to become an academic researcher at a top university. I expect to succeed and earn a place in the scientific community that will enable me to collaborate with the foremost scientists in my field as I work to explore the many unasked questions in neuroscience.
Medical School Personal Statement Examples

Medical School Personal Statement #1

“Morphine! Give me morphine!” screamed the little girl sitting in the hospital bed across from mine. Despite just awakening from surgery to remove a benign tumor in my left hip, my immediate concern was to help that little girl. The nurse came around to see how I was feeling and I asked if she could tend to the other girl’s pain before mine. While looking around the recovery room, questions started flooding my mind. Every experience I had during my diagnosis and treatment at XX Hospital enhanced my curiosity. I wanted to ask the other children what diseases they were battling, understand their feelings, comfort other patients like the medical staff did for me and be able to answer the thousands of questions just like Dr. XXX answered mine. But, at that moment, I was simply the patient needing treatment. However, I knew I wanted to fill those shoes and one day be the doctor myself.

As a fifteen year old, my experience at XX Hospital was really the defining moment of what I wanted for my future. Before this time, I did what was expected of me, but not what I expected of myself. The impact of this experience encouraged me to create my destiny and be accountable for my own goals. My determination to become a doctor also challenged me to explore different avenues and define the direction I wanted to pursue in the medical profession. At that point, nothing could circumvent me from my dream.

Consequently, throughout my college experience, I researched opportunities that would align with my goals. The University of XX chapter of the Foundation of International Medical Relief of Children (FIMRC) appealed to me as a unique opportunity to not only gain first hand experiences in the medical field, but also to serve underprivileged children around the world. During my sophomore year, I embarked on a medical mission trip with FIMRC to the Andes Mountains of Peru. After a bumpy ride up the mountain to the village, we found ourselves surrounded with the most beautifully unified community. Each individual was in complete awe of our presence since this was their first exposure with others outside their village. They were curious, yet a bit intimidated. To ease the children’s concern, I taught them how to play “Duck Duck Goose.” Their hesitation quickly subsided as they laughed while chasing me around the circle.

The time I spent with this community went beyond teaching proper health education; it was also about forming relationships of trust and working within a team. At the conclusion of my mission, the community leaders thanked me for providing them attentive care and medical supplies, despite their limited resources. I expressed to them my mutual gratitude for the opportunity to share in their untainted happiness. My experience in Peru solidified my ultimate vision to practice medicine with compassion. Due to my commitment to FIMRC, I was elected president in 2008. Since then, I have successfully increased awareness about FIMRC and have personally sent over fifty students on medical mission trips to Uganda, Peru, El Salvador, and Costa Rica.

Keeping alive the desire to define my passions, I pursued my fascination with molecular biology. Even at the start of college, I was proactive in exploring molecular biology beyond the traditional text book knowledge. For example, I often consulted with professors to discuss my interests, as well as, studied biology journals to stay abreast of current research trends. Aspiring to become an activist and not just an enthusiast, I was selected to join Dr. XXX’s research group at the University of XXX. My research project is on the study of splicesomal proteins whose regulation is critical in maintaining correct
gene expression. The level of detail and knowledge needed to sustain my project encouraged me to concentrate my undergraduate degree in the area of developmental biology. Because my niche focused on the complexities of cellular regulation, I began to focus on cancer, a disease that was heavily influenced by such mechanisms. Furthermore, to advance my learning of cancer research, I have the honor of working with Dr. XXX at the XX XXX XXXX Research Center in Seattle, Washington, this summer. With Dr. XXX and his research team, I will work towards uncovering the molecular networks that regulate stem cell identity in order to discover strategies for implementing targeted cancer therapies.

In retrospect, it was only five years ago that I would have been intimidated to even attempt overcoming situations that seemed beyond my realm of comfort. Now, I am invigorated by challenges that expand my knowledge and motivate me to achieve my future goals. Because of my passion and determination for medicine, I have found confidence in myself to become a highly respected physician. I have created a path that has led me from the recovery room at XX Hospital, to the remote villages of the Peruvian people and to my highly accredited research positions. Most importantly, along my journey, I have learned that there is no limit to my aspired destination and the shoes that looked so big to fill as a child are becoming my perfect fit.
Medical School Personal Statement #2

I was lying on the floor of a homeless shelter, attempting to fall asleep, when I kept asking myself, “What am I doing here?”

Unlike many of the individuals around me, I was there completely by choice. It was the first of seven nights I would spend in CASPAR, a shelter in Boston that provides a variety of stabilization, aftercare, and education services for those affected by substance abuse disorders. As a junior at the University of XXX, I had elected to go on an alternative spring break and chose to volunteer in a homeless shelter in order to gain a broader perspective of health care delivery among individuals living with chronic disease. I had volunteered at hospitals prior to this occasion, but had limited exposure to the full spectrum of health care. Although I felt adequately prepared for the trip, the reality of the experience was not what I anticipated.

During the week, whether it was while handing out blankets or serving meals, I witnessed the power of addiction firsthand. While watching one of the residents drinking out of a straw because body tremors prevented him from bringing the cup to his mouth, I recognized that beyond psychological want lies biological need. I also became aware of how physiology can be influenced through psychosocial factors. The most vital and yet simplest contribution I made was through my presence. As my stay in CASPAR lengthened, I experienced the remarkable benefit of human interaction and compassion in relation to helping patients adhere to treatment. I have since come to realize that attributes such as understanding and acceptance are crucial as a means of delivering quality health care.

My intention to practice medicine is rooted in my upbringing. As the daughter of two psychologists, I could never escape the question, “How does that make you feel?” and, as a result, I began exploring the influence that emotions have on physiology. Through research, I assisted in identifying protective factors for
patients undergoing bone marrow transplants and investigated how exam stress affected students’ immune systems. This acute awareness of others’ mental and emotional disposition has been of tremendous benefit and will undoubtedly help me when interacting with patients in the future.

My mental fortitude developed as I learned adaptability and resiliency through years spent on the soccer field. When I was cut from my select soccer team at the age of 11, I was devastated, but I refused to quit. I spent hours outside of practice working on my footwork so that I could return to playing competitive soccer. When tryouts for my old team were held in the fall, I excelled in practice and was invited back. However, simply being back on the squad was not satisfactory. Having been previously cut from the team motivated me to continually enhance my skills. As a result, I made the Olympic Development Program state team, traveled to regional camp where the best players from each state competed, and was recruited to play soccer for several Division I colleges. My ability to quickly adapt, maintain a resilient attitude and a psychological awareness has propelled me into a number of leadership roles, such as captain on my soccer teams and working as a teaching assistant at the UY.

I intend to apply the same drive, commitment, and determination from my soccer career towards becoming a physician. After graduating college and realizing that my first time applying to medical school did not result in an acceptance, I spent time assessing my strengths and weaknesses. This self-reflection led me to strengthened convictions and I began to work on areas that I felt needed improvement. I joined Toastmasters to improve my verbal communication skills and accepted a position with AmeriCorps in the Public Health Department, where I contribute to the promotion and improvement of basic health care access among underserved communities within the Seattle area. In this position, I have had the opportunity to organize free clinics where immigrants, homeless, and under-insured individuals are able to receive preventative care, such as blood sugar screenings and foot care.
My adaptability, tenacity, and psychological insight have been challenged and consequently strengthened as a result of experiences such as living in the homeless shelter, getting cut from my select soccer team, and facilitating a college class curriculum. My sensitivity towards others’ feelings has helped me to effectively communicate across populations. AmeriCorps has enhanced my awareness of the health needs of underserved populations, while shadowing physicians has validated my commitment to the field of medicine. In the end, when I am accepted to medical school and I find myself lying on the floor of the on-call room wondering, “What am I doing here?” I know I will find the answer in the privilege of serving the people that surround me.
Medical School Personal Statement #3

"This is how you welcome friends in Sudan." We had reached the end of the interview, and XXX--placing his hand firmly on my shoulder--was offering a lesson in Sudanese greetings in his attic apartment. Over the past hour we had listened to X's story--translated from Arabic by XXX--of lost family, a tortured past, and a treacherous journey that had begun in Darfur and ended with a narrow escape from gunfire at the Egypt-Israel border. The narrative was difficult for X to recount and for us to hear, but it provided valuable testimony to present to members of the Israeli Knesset. Our group, XX for XXX, supports Sudanese refugees in Israel so that they can, as XXX maintains, "be treated as human beings." XXX's simple appeal embodies the reason why I want to join the medical profession.

I have actively sought to advocate for basic human rights, especially healthcare, throughout my undergraduate career. I joined Activists for Asylum during my semester abroad at XX University to help realize XXX's desire: to empower individuals to further their human rights. I am the granddaughter of Holocaust survivors, and I saw pieces of my family's story in XXX's and others' struggle for recognition and security. Recording and editing refugee testimonials were small but important steps towards helping the Sudanese find work, education, and decent healthcare after the unimaginable ordeals and losses they endured.

I look forward to the day when I can apply medical skills to improve XXX's and others' situations, but until then, I have used what skills I have towards improving basic rights, especially healthcare. After hearing about the hurricane-battered town of La Guacamaya, Honduras, for example, I joined the student group, XXX for XXX XXXX. We held bi-weekly meetings to prepare and send a group of students and physicians to provide proper medical education and resources to the region, which had minimal access to healthcare. I have brought many of these pressing issues at the forefront of scientific advancement to the XXX community as Editor-in-Chief of The XXX journal, an international organization that addresses contemporary issues at the junction of science, society, and law. Working closely with writers, editors, and the XX campus, I raised awareness about the implications of vital scientific and societal advancements, holding discussions on topics such as global hunger, Parkinson's disease, and healthcare reform.

I pursued many of these initiatives largely because my family's example has taught me the values of compassion and reciprocity, and I hope to incorporate the lessons I have learned from them into a career in medicine. I recently accompanied my father, an internist, as he oversaw medical students at XX XXX homeless shelter in XXXX, XX. A first-year medical student noticed a patient's yellow sclera, and before long, the patient had shared her history of alcohol abuse. My father encouraged the patient that her commitment to stop drinking would improve her health dramatically. Despite her difficult ordeal, the patient expressed gratitude and genuine
kindness towards the doctor and students who were providing hope. I soon saw how the role of a physician was not just to perform a scientific and technical task, but also to reassure a fearful patient, and I want to fulfill this supportive role.

After experiences like this, I sought more opportunities to interact with clinicians, and I witnessed the difficult decisions that are a daily part of the physician's life. During an internship that involved not only hydrocephalus research but also spending time with a neurosurgeon in the operating room, I donned green scrubs one morning ready to observe a case. The gravity of the surgery struck me when a six-year-old boy entered the operating room, clinging to his mother's white gown and overwhelmed by the masked nurses, bright lights, and tangled tubing. The surgeons removed the tumor successfully, but it was still hard to imagine the continued difficulties that family would endure through chemotherapy and possible future recurrences. The parents even asked if they could send a specimen of the boy's tumor for research; clearly they were desperate to do anything within their power to end this terrible ordeal. These images were difficult to forget, but the experience strengthened my desire to learn more about the patient and the entirety of his disease--from lab bench, to patient care, to emotional support.

I continue to embrace opportunities to reach out to my surrounding community and offer support, spending dinners with XXX as an advocate and a friend. Much closer to home, I volunteer weekly at the local X soup kitchen, X and X, where I enjoy sharing meals and interacting with local residents. These relationships provide me an opportunity to learn from others' hardships, and their stories motivate me to dedicate myself towards rectifying such inequalities. Stories of survival, like XXX's, bring into sharp focus the sanctity and the fragility of human life, and these narratives will resonate with me as I enter the medical field.
Medical School Personal Statement #4

As I walked into the XXX Hospital in Eastern India, it was evident immediately that the standards of care were far inferior to those found in hospitals in the United States. The cracked and peeling green walls separated the patients by gender into open wards. The patients laid on colorful blankets and linens brought by their families while loved ones crowded around their beds, often performing the role of nurse. Intravenous fluid bags were nonexistent, leaving dehydration unaddressed; only small bottles of medicine hung from the canopies of the iron beds. Most of the patients and their families wore masks due to the prevalence of Tuberculosis in this poverty-stricken community and hospital. Although I was told that this hospital provides better care than many other hospitals in India, it was still beyond what I had envisioned from reading or watching the news, and it affected me deeply.

I was not in India to work at the hospital, but this provided one of the most profound and lasting memories I have from my experience at the XX XXX last January. Along with 18 other XXXX College students, I traveled from Tanson to this small school in the foothills of the Himalayas. In the space of only 26 days, I absorbed the culture of this foreign region and gained an introduction to the true meaning of "poverty." Above all else, I gained a better understanding of my desire to become a doctor.

The XX XXX was founded to educate children from the lowest economic class in this rural area of Eastern India. The XX XXX provides children a unique opportunity to learn English for free. Also, the students are taught to play the violin, allowing them to acquire a special talent and link with music. The XX XXX curriculum is designed to assist the children who are otherwise disadvantaged by their birthright to continue their education and go to college. At the XX XXX, we educated fourth through eighth graders in subjects ranging from English to a cappella to dance to math. I taught two of my passions—dance and science.

Dance, specifically ballet, has been a significant part of my life since I was three. Ballet taught me discipline, dedication and responsibility, all qualities that have contributed to many of my successes in daily and college life. Through dance, I increasingly became interested in the human body. I always have been amazed by the many ways the body can move, be controlled, and respond to injury. My awe of the body has intensified my desire to learn more about how human beings use medicine or other means to adjust and heal. Although my experience teaching the "Waka Waka" dance to fourth graders at the Ashram may not convey fully the influence that dance has had on me, I recognize that the knowledge I have gained during my many years of dance training will continue to assist me as I work in medical school and as a medical doctor to understand the intricacies, mysteries and capabilities of the human body.

The science class I taught in XXX was comprised of biology, chemistry and physics. Although science did not hold quite the same appeal as dance to some of the students, I was able to spark the interest of sixth graders in the digestive system by having them act out how food is digested. My experience helped me realize I can communicate effectively, even with children who speak English as their second language. Understandably, they had difficulties pronouncing “esophagus,” but they clearly learned where the esophagus is and its function and purpose in the body. Additionally, this experience reminded me that I enjoy the challenge of stepping into an unknown situation and working to develop a plan to address challenges presented.

My many hours conducting cancer related research at XXXX, XXX and now at the XXX XX Research Center this summer also have taught me how to identify problems, outline and execute experiments, and analyze the outcomes. Executing any plan requires communication skills and teamwork or project management responsibilities. From my experiences shadowing physicians at the Veterans Affairs Medical Center and in an orthopedic clinic, I have come to perceive a physician's role as being quite similar: taking a history, making a diagnosis, forming a treatment plan, coordinating with a team of providers, and communicating with the patient and family.

Beyond teaching, I experienced a priceless cultural exchange with the Ashram students. The students taught me traditional Indian and Nepali dances, took me to their homes to meet their families, and brought me gifts, including a huge papaya one boy carried on his two-mile hike to the school. Visiting the hospital was, however, the most memorable part of this exchange. And while I became aware of the acute medical needs in XXX, I also recognize the ongoing need for doctors, especially primary care physicians, in the United States. My experiences in India, lessons learned through dance, and my hours spent in research labs and in shadowing physicians have all infused me with the desire, and provided me with the practical skills, to pursue medicine, and to eventually contribute to a need that only will continue to rise in the United States and around the world.
From an early age, I have been comfortable and enjoyed interacting with the elderly. The love, admiration, and respect I have for my grandparents likely contributes to the ease with which I am able to establish a congenial rapport with the elderly. When I was in elementary school, I was thrilled to spend Valentine's Day with residents of a local retirement home as an after school activity. When the opportunity arose years later to volunteer at XXXX XXXXX, an adult care service that specifically caters to those suffering from degenerative brain disorders, I agreed without hesitation. As a volunteer at XXXX XXXXX, I witnessed the demoralizing effects of dementia and Alzheimer's disease among the residents. This eye-opening experience inspired me to alleviate suffering, restore the dignity of the elderly and ultimately solidified my decision to pursue a career in medicine, specifically geriatrics.

On my first day at XXXX XXXXX, the program director handed me a nametag and a pamphlet entitled Interacting with Those Affected by Dementia. As I reviewed the content, the challenges posed by this condition became painfully clear to me. Walking into the art room, where three of the members were beading necklaces, I was greeted with skeptical stares as I introduced myself; this would become the daily routine. It was initially hard to accept that the people I had spent hours with the day before had no recollection of me the following day; it quickly became apparent why everyone wore a nametag. I had naively assumed that my ability to connect with the elderly would defy the effects of their disease and leave a lasting impression on their lives; ironically, it is they who left a permanent imprint on mine.

XXX is a member that I particularly admired. During the hour designated for stretching exercises, I watched helplessly as XXX attempted to keep up with the exercise routine; her eyes welled with tears and her feeble arms trembled with arthritic pain. She glanced at me and smiled; at ninety-four years of age, XXX was the epitome of a fighter. The physical pain and mental failure XXX endured frustrated me. As the life expectancy rate increases, others like XXX are living longer while their quality of life diminishes because of physical and mental waning. Quality health care and preventative measures are imperative to limit the degree of mental degradation faced among the elderly and I believe the ability to establish and maintain a functional state of wellbeing is a reasonable goal. Aging can and should be a venerable process. Ensuring an optimal quality of life is a fundamental role of health care providers and a responsibility that I am eager to fulfill.

Working with the members of XXXX XXXXX exposed me to a myriad of health conditions that become prevalent with advanced age and made me realize the active role I want to play in preventing and treating such ailments. In addition to working with the elderly, my childhood summers were spent in the rural community of XXX, XX XXX, where I was introduced to a number of conditions compromising the health of individuals. The prevalence of diabetes as a result of reduced physical activity and poor diet was readily apparent and oftentimes magnified by a life-long smoking habit or alcohol addiction. This ultimately spurred my intention to help those in need and shaped my view of medical care, demonstrating the importance of promoting and disseminating preventative health care measures. I witnessed a constant struggle among members of the community to sustain an adequate state of being with limited health care access and even fewer medical resources; circumstances such as these are common, but no less unacceptable.

I understand the profound influence physicians can have on the health and wellbeing of their patients. My health care providers demonstrated that the complexity of human existence is not simply biological, but involves physiological and sentimental consideration, all of which ignited my intention to pursue medicine as a career. Being a doctor takes more than intellect; it requires the ability to listen carefully while demonstrating compassion, dedication, leadership, and integrity. My goal is simple; I want to be an empathetic doctor who utilizes my knowledge, skills, and resources to improve the health and wellbeing of others. I am determined to succeed, eager to learn, and possess an infinite desire to help others.
“How can I live a life of service?” is a question I routinely pondered as an undergraduate. The answer arrived one evening during my freshman year at an “interest meeting” for the National Association for the XXXX of XXX (XXXX). The lights were dimmed and a video began playing. In the video was a physician in Madagascar, compassionately providing treatment to those who had no one else to turn to. Unfortunately, due to a lack of sufficient medical personnel, she had to turn many of the desperate patients away. Despondently, she said, as if speaking directly to me, “We need more physicians out here. I can’t see them all by myself.” That poignant statement initiated my desire to live a life of service as a doctor; one that involves providing medical care, comfort, and thereby, empowerment to those assailed by illness.

While growing up in XXX, I remember witnessing several victims to diseases such as malaria, cholera, or AIDS, many of which are preventable. Millions, everyday, continue to suffer with such conditions both abroad and in underserved communities here in the United States. I am saddened when I realize that I have been privileged with so many opportunities, such as gaining an education, while they continue to suffer. Accordingly, I must use what I have to alleviate their conditions and those of other suffering individuals around the world.

My interest in medicine escalated as my love for science grew stronger. During my freshman year, I enjoyed studying General Biology and assisting my colleagues during our study sessions. In doing so, I was astonished, for example, that the human brain could form a perception of reality from heaps of electrical impulses and somehow accomplish this task while monitoring all other bodily functions. My acquaintance with the human body during this class, and other classes thereafter, solidified my desire to be involved with science in my career.

At the end of my sophomore year, I pursued an opportunity to observe the doctor-patient relationship at a XXXX XXXX clinic at the XXX hospital. While at the clinic, I followed Nurse XXX into a small room where I saw a young boy sitting in a wheelchair, somberly waiting to have his stitches removed after a surgical shunt replacement. I expected her to simply go through the mechanics of stitch-removal and then proceed to the next patient. However, during the process, she asked the young patient about his favorite kind of dessert and casually joked with his family, all while wearing a contagious smile. The whole family seemed so at ease. I admired her ability to calm the distress that so often accompanies illnesses. From the time I spent at the clinic, I noticed that a health care provider must value the individuality of each patient and always seek to alleviate the burden of disease in whatever way they can. After this experience, I determined to be a doctor, not only in the academic sense, but also, in the very essence of the word, a care-giver.

I further pursued my interest in neurobiology at the XXX XXX XXXX (XXXX) as a participant in the XXX XXXX XXXX. While working in Dr. XX XXX’s lab, I researched the neural architecture of the emotional response of fear. Due to the very basic nature of my project, I noticed that research required a greatly narrowed concentration and meticulous study to eventually make an impact on a person’s life. Although I was fascinated by the stimulating study, I felt that I was missing the holistic beauty of the machinery behind the human body and more importantly, I yearned for an opportunity to have a direct impact on people’s lives. One of my more memorable experiences from my summer at the XXXXX was cooking dinner for patients and caregivers at the XXX XXX XXXX (XXXX) House. After preparing and serving pizza, salad, and angel food cake, I took advantage of the opportunity to find out more about the patients over a shared meal. As I talked to a patient in her mid-twenties, I learned that she had lived in XXX, XX, where I currently reside. Her face beamed as she referenced different streets and stores of which I was familiar. After further inquiring about her interests, she excitedly told me about the places she had traveled to and a book that she hopes to publish soon. Although this patient was actively battling cancer, she was smiling despite her fears. I gave her a warm “Southern hug” to say goodbye, and returned home thrilled that I was able to produce a moment where her mind was not focused on cancer.

I entered XXXX University searching for a way to live a life of service, and I will leave having obtained the answer. Once puzzled by the dizzying array of ways to live a life of service, I now find myself at the crossroads of science and offering medical care among the underserved. Medical school will equip me with the crucial skills needed to respond to that physician’s plea. I am committed to live this life as a life-long learner and to view each patient through a set of lenses that will see the invaluable even when certain life experiences may say otherwise.
Medical School Personal Statement #7

I can feel it, hear it, my heart palpitating at a rapid speed. A crowd of fifty or more anticipating underclassmen engineers stares as I move to the front of the lecture hall. Although I am excited to prepare the students for their upcoming differential equations/linear algebra midterm, as their engineering fellow, I must hide my intrinsic timidity behind a confident façade. Even as a child, I feared not only public speaking, but also social interaction and independence from my parents. Over the years, I have successfully reduced my weaknesses by attempting activities beyond my level of comfort. Seemingly, these very experiences shaped my current endeavor to attend medical school and obtain a degree in pediatric surgery. Now a habit, I seek opportunities to challenge my personality that also incorporate my strengths. And so I begin the review session with a passion for mathematics, in mind, and my notes on manipulating matrices, in hand.

The inverse of the matrix is used to solve linear equations, \( Ax = b \), but can be calculated only if the solution is unique. The elements of my matrix were once devoted to basketball. I dreamed of playing in college as one of the most skilled point guards. Beyond team practice, I dribbled the basketball for hours on the kitchen's hardwood flooring, my right hand finishing a set of math problems, and my left hand occupied by the constant bouncing ball. By eighth grade, college coaches began to notice my abilities. Unfortunately, my dreams abruptly halted when, during my fourth game of the night, I tore my right anterior cruciate ligament (ACL) and menisci. Over the course of two years, I tore my ACL and menisci two more times and underwent reconstructive surgery twice. From then on, my own matrix underwent repair to resemble its inverse.

I wanted to maintain basketball, and competitive athletics, within the brackets of my life, but I could no longer be the same player. Rather, I inverted my position to become a coach. I volunteered as a dribbling skills coach for a competitive team and worked as an assistant coach for a recreational team. I stressed the importance of extra practice. For many, this unique solution required a new motivation, an internal determination to realize their weaknesses and invert their habits; even I continue to struggle with the same unique solution. As they trusted my advice, their skills improved. As I trusted my advice, I became more confident to lead other teams: recreational track and field, and Special Olympics swimming and water aerobics.

Furthermore, my confidence led me to join the NCAA Division I cross country/track and field teams at the University of XX. Coach XX XXX regularly emphasizes, "hard runs stress the body and the body learns to adapt. If we never stress our bodies, we can never improve." Not only does competitive running mentally and physically stress my body, but also does my participation in authoritative positions. Yet I continue to improve by undergoing such stresses. These challenges allow me to pursue a difficult career in medicine with the outlook of improving others. Long before coaching, I learned the importance of practice by challenging limits, a unique and essential solution. I now understand the necessity for flexibility. A single event can invert the matrix to find that simple, single solution to generate a substantial impact.

“And thus, the p-value is significantly large to fail to reject the null. We can conclude that any deviations from the expected value are solely due to random chance,” concludes Dr. XX’s lecture on genetic statistical testing. I sit mesmerized by the integration of mathematics and biology. It surrounds me. At the end of my first year, I formed my own 33 team with Drs. XX XXX and XX XXX, professors in the Departments of XX and XX, respectively. While conducting research in the novel field of biological nonlinear dynamics, I act as liaison between two experts in their respective fields, each of whom continue to commend my efforts. Then, last summer, my mentor, Dr. XX XXX at XX’s Hospital XX, thanked me for majoring in mathematics while pursuing medicine. Until recently, I realized how my prior choices continue to mold my unique matrix. While I seek new opportunities to improve others’ lives, they impact mine just as greatly. And my path in mathematics has formed a unique perspective for a promising career in medicine.

Walking out of the Biology auditorium, a student in the back row stops me. When he compliments Dr. XX’s use of statistics in lecture, I recognize him as a fellow engineer. He goes on to thank me for his fondness of math, but I can’t quite understand his connection to me. Then he explains how my Differential Equations/Linear Algebra reviews motivated him to pursue a minor in the applied mathematics department. I’m shocked. I didn’t realize
that the small intersection of our lives could have such an effect. It seems that while all of our matrices differ in various forms, we still exist in the same space. They can be implicitly added or inverted at any moment, from any event, to result in a new formation that defines our lives.

The matrix does not lack a memory; it maintains a strong sense of self. Mathematicians use it to describe chaotic systems, such as mapping the trajectory of the human body as it progresses through the running motion. Without the involvement of random elements, the future behavior is determined by the initial conditions. However, it mimics chaos: one small change can send the system into disorder. The rapid beating heart, the sweaty palms, the pulsating nerves persist as I stand in front of the large lecture hall of awaiting students. The matrix of my life, filled with the elements of my past, describes a chaotic system. It may continue along some laid-out path, but it can easily be disrupted to travel in a new direction. I want to challenge my matrix. So, as I begin to delve into the properties of linear algebra, the small perturbations on my shy personality happen to not only interrupt my own life, but also affect others living in the same space.
“Bie jin ta de fang jian (Do NOT enter his room)!” my grandmother warned me against entering my uncle’s seemingly ordinary room every time I peeked inside. Uncle XX worked a regular job, interacted with friends and neighbors without maintaining an unusual distance, and showed no physical signs of illness. Yet during the four years I lived in Beijing, China, my grandmother denied me direct contact and minimized any indirect contact I had with him. He had his own sink, tableware, stool, and used a tissue to handle shared household appliances.

These once puzzling behaviors now drive my commitment to combine my intrigue with the sciences and the cultural sensitivity I gained from living in China, Japan, and the United States to train as a culturally competent physician in the field of global health and infectious disease. I understand now that my grandmother’s caution stemmed from her desire to protect me from contracting hepatitis B and the ensuing discrimination. China still bears one third of the world’s hepatitis B burden and social stigmatization against hepatitis B-positive individuals remains widespread. Even though my grandmother knew from her experience in pharmaceutical research that hepatitis B is not transmitted through casual contact, she still felt it necessary to limit my interaction with my hepatitis B-positive uncle.

My aptitude as a trilingual, culturally-aware physician who can promote mutual understanding, facilitate a collaborative, trustin physician-patient relationship, and provide appropriate and effective care also draws from the diligence and dedication I gained from playing the piano. As a pianist, I spend hours analyzing how the notes and rests interact with each other and experiment with the different tones a key can produce depending on how fast it is pressed and released and how much force is applied. These details often keep me in the practice rooms until late at night. Yet I continue to practice because piano challenges me to experiment, interpret, and present a musical work from what some people may perceive as merely black dots on paper. Physicians face a similar challenge in presenting their repertoire of black dots, or medical knowledge, in ways that patients of diverse backgrounds can understand.

Pianists and physicians also practice adaptability. Pianos are not easily transported and I have performed on many unfamiliar pianos in my 17-year musical career. Before each performance, I methodically test the firmness, tone, responsiveness, and projection of the unfamiliar keys and adjust my play accordingly. My medical observerships at the XX XX Family Medical Center and the XX Children’s Hospital demonstrated that the physician-patient interaction is much like a musical performance; physicians cannot choose patients or completely control a patient’s health and thus, must also strategize to prepare for multiple methods of healthcare delivery and unexpected outcomes.

Finally, musicians and physicians must see the big picture while working with the details. On the piano, I integrate the different voices represented by my ten fingers to create a comprehensive performance. As a XX/XXX scholar participating in the XXXX at the XXXXX, I tested the correlation between bacterial burden and seminal HIV load in Dr. XXX’s lab. While performing biomedical research with the goal of providing new interventions to lower sexual transmission of HIV-1, I reminded myself that the HIV pandemic also suffers from poverty, poor infrastructure, stigma, and denial. I learned from preparing my high school’s global health curriculum that in poverty-stricken communities, the struggle with immediate survival often overshadows the concern with HIV prevention. Some people hesitate to test for HIV because the act of seeking a test can raise unwanted suspicion and a positive test could result in disownment from family and community. As a physician, I will integrate a patient’s medical and non-medical history and provide effective and culturally acceptable care for patients of various backgrounds.

This past fall, I designed my own global health undergraduate independent study to further explore the intersection of culture and medicine. As a part of my study, I heard May Ying Ly, the translator for the Lee family in The Spirit Catches You and You Fall Down, share the challenges she faced in promoting cancer awareness in a Hmong community whose native language does not have a word for “cancer.” I hope to use my fluency in Chinese, Japanese, and English in my practice of medicine, but I also realize that common language does not always guarantee effective communication.

In addition to developing my medical knowledge, as well as my investigation and communication skills, I plan to educate myself about the different perceptions of illness and disease to better serve patients with whom I may or may not share a language or culture. I will apply the lessons I learned as a pianist and train with dedication, diligence, and adaptability. Through medical school, I intend to become a physician who can bridge cultural differences, use results as a springboard for new possibilities, and share my knowledge with others.
Mary/DPhD Personal Statement Examples

Mary/DPhD Personal Statement #1

Raised on ten acres of open land in XXX, XX, I spent much of my youth exploring the woods and building forts in the ponderosa pines with my twin sister. I was healthy, energetic and conscious of my body in relation to nature. Just as I learned to recognize the environmental changes that are inherent with the cycle of seasons, I developed an intrinsic awareness of my personal wellbeing.

This awareness may have saved my life. When I was eleven, I noticed my vision blurring and I developed a constant feeling of fatigue, thirst, and hunger. I recalled learning about diabetes in a science class and made a tentative connection between my symptoms and the disease. I was eventually diagnosed with Type I diabetes. Two months later, I was diagnosed with Celiac disease and began a strict gluten-free diet to prevent possible long-term complications, including nutrient deficiencies and cancers. Before I had finished my first year of middle school, I was responsible for monitoring my blood sugars, carbohydrate intake, exercise, and insulin requirements in order to establish a sustainable quality of life.

After my diagnosis, I discovered almost immediately that there is no owner’s manual for the human body. Controlling my blood sugar requires experimentation, evaluation, and analysis, all in real time, without the controls of a laboratory. In the absence of formal instruction, I have to determine how to optimize the way my body feels and functions through an exhaustive process of trial and error.

I started running recreationally the year after my diagnoses. What began as a way to spend time with my family and enjoy the XX of XX became a mental and physical outlet. I do not let my autoimmune disorders prevent me from being an athlete. I have competed in crosscountry, swimming, track and field, mountain ascents, winter and summer triathlons, snowshoe races, and cross-country ski races, including two ski marathons. Today, I am captain of the XX’s XXX club team at XX University.

Like two creeks that merge into a river, the challenges of having diabetes and being an athlete have run together to dominate my stream of consciousness. Every day I test my blood sugar and every day I train. Both endeavors absorb every ounce of effort that I put in and offer small rewards in return; these minuscule accomplishments can only be celebrated on the most personal level. Setbacks are unavoidable, which require redirecting my analysis and focus in order to get it right next time, tomorrow, next year. To be a diabetic athlete is a unique challenge; consequently, I review research literature about diabetes, endocrinology, metabolism, exercise science, and nutrition to better understand my body and optimize my athletic performance.

The maintenance that my body demands drew me to Professor XX XXX’s laboratory at XX University. Dr. XXX’s research focuses on using techniques in inorganic chemistry and biology to orally deliver proteins, such as insulin, as well as target tumors for the early detection of cancer. The attributes that have helped me improve my diabetes control—curiosity, organization, and persistence—have also proven beneficial in the lab. Measuring and evaluating my blood sugars and adjusting my insulin have proven applicable to projects that require my ability to critically analyze data, isolate variables, and identify meaningful patterns.

Over time, my zest for science grew beyond learning the laboratory techniques and into a desire to apply those insights into tangible implications for human health. I realized that my desire to interact at the human level would not be satisfied by a career rooted solely in the lab. I satisfied this drive by immersing myself in a clinical setting where I could interact with patients. In XX, I spend Sunday mornings on the recreational therapy floor at the XX Medical Center, where I help coordinate weekly entertainment activities for elderly patients. Having diabetes connects me to a shared patient experience that spans all demographic barriers and I have also benefitted from the opportunity to interact with patients at the XX Diabetes Center as part of the clinical research team led by Dr. XX XXX, MD/PhD. This summer, Dr. XX XXX opened my eyes to an entirely different patient community as I shadow her in patient consults for clinical trials with the sickest and most critical patients.
Through careful listening and thoughtful observation, I have developed an appreciation for patients’ shared and individual needs and my own ability to form positive and trustworthy relationships.

The complexity of the human body is an astounding challenge and I intend to thoroughly investigate and understand it to realize my potential as a scientist and humanitarian. Being a trusted source of knowledge is not enough; I want to offer compassionate care to help the members of my community achieve optimal health and performance. My own experiences as a patient, athlete, and scientist have given me a distinct insight into research and its applications to overall health. The hybrid energy of these experiences propels me toward each of the roles that a doctor plays: detective, healer, and educator.
One of my earliest memories is standing on the steps late at night, watching an ambulance retrieve my mother from our front gate to take her to work. I was four and already, this was a common occurrence. My mother was frequently on call because she was an anesthesiologist at the XX Hospital in XX XXX. These memories of my childhood in XX XXX are scattered on the backdrop of the Civil War between the ethnic majority, the XX and the minority, the XX. I was born to a XX family in a year that the war took a particularly violent turn, during a time my parents settled in XX, a predominantly XX city where my mother miraculously practiced medicine for almost a decade. Yet, by the time I was seven, the tensions from the war forced my parents to emigrate to XX, where my mother went through the grueling and often frustrating process of getting certified to practice medicine. Supporting my mother through this period made me understand the commitment and tenacity required to become a physician. When I began college, I was unsure of my resolve to become a doctor. However, I fell into medicine again through my experiences with working with low-income XXs and in research and then finally by visiting the hospital.

Because of the generosity of the friends and strangers who helped us make the move to XX, my parents always valued service to others and encouraged me to volunteer. During my freshman year of college, I began volunteering at the XX Café, which provides made-to-order breakfasts for underprivileged people in the community. As a waitress, I befriended the Café’s regulars, who generously allowed me into their lives, sharing their own histories of triumph and defeat. The people I served provided an important perspective on working with individuals who are seen as outcasts by society. Moreover, the experience clarified my desire to work in a field that directly benefits people in need and allows for people to cultivate rich relationships.

When I started college, medical school was not on the horizon, but I enjoyed science and research seemed a natural extension of this interest. In the lab, I found an unexpected passion for discovery. Research challenged me to persevere through failed experiments and revised hypotheses, contribute to a scientific team, and push boundaries. My first independent research project was to rescue lethality of a mutant fly despite literature that described this type of rescue as impossible. To my surprise, after eight weeks, I successfully performed the rescue. This experience made me view limitations in not only research but also in medicine differently.

With this new perspective, I began shadowing in the XX XXX Unit at the XX XXX Medical Center in XX, XX. While what I saw in the clinic reaffirmed the notion that research is critical for the new insights that advance medicine, I also learned at the XX the importance of the nuanced interaction between physician and patient. When medications failed, I saw that the watchful eye and constant encouragement of a doctor is often treatment in itself. Physicians face limitations intrinsic to the practice of medicine and the imperfections of the approaches and technologies available to 39 them. Yet, the best doctors are not stayed by these boundaries. Surely, one of the ultimate rewards of a physician’s training is the power to heal and provide comfort.

In this sense, my rediscovery of medicine started with waitressing at the Café and in the laboratory. Through science, I learned how to pursue a problem, apply the theory I learned in the classroom, and hone my critical thinking skills. Research also showed me that sometimes, even the most elegant hypotheses and experiments fail. Through my experience in the clinic, I found that doctors too, face a similar fundamental challenge: Sometimes, despite the most accurate diagnoses, patients do not get better. In research, these failures, although disheartening, do not diminish the excitement of discovery and in medicine, the failures are reconciled through astonishing recoveries and the power of the storied human connection between patient and physician. I also began to see how medicine might allow me to combine this interest in the sciences with those interactions I came to value through my work at the XX Café.

In the span of sixteen years, my view of medicine has evolved. As a child, I considered medicine to be a perfect practice that could transcend war. As I matured, I learned that medicine, while in many ways powerful, is a taxing and trying profession, inherently as imperfect as those who practice it and those who seek healing. I also saw that it is the humanity of medicine combined with the science that strengthens it that makes it so miraculous, leaving room for the extraordinary discoveries and connections between people. It is this possibility for the incredible that draws me to medicine.
I re-read the message, took a deep breath, and pressed “send.” In one brief email, I had enrolled in a BA/MD program at XX XXX and XX XXX Medical School, committing myself to attending medical school before even having graduated from high school. In the month preceding this choice, I had struggled with my decision, somewhat unsure of what the role of a doctor entailed. Hoping that direct exposure to this field would help facilitate this important decision, I shadowed Dr. XX XXX, a private practice internist at XX XXX XXX. I admired Dr. XXX’s ability to easily connect with his patients and the reciprocal trust and confidence they had in him. Excited about the prospect of interacting with people on such a personal level and determined to provide patients with the thorough, empathetic care that I had observed when shadowing, I decided that I wanted to become a physician and committed myself to the program. Reflecting on this choice now, I do not believe that I was ready or informed enough to make the monumental decision to pursue a career in medicine at that point in my life. Ultimately, however, my participation in the program has led to the discovery that medical school is a commitment I truly want to make.

When I began my freshman year at XX XXX, my enrollment in the program allowed me to explore a variety of extracurricular activities without feeling obligated to participate in specific clubs. One of the organizations I joined was XX XXX (XX XXX). At the first meeting, the chief asked attendees to share their most memorable experiences as first responders, prompting a number of members to recall truly poignant, life-changing experiences they had while on duty. Inspired, I became certified in CPR and first aid and began responding to calls later that year. Riding with XX XXX’s EMS has been instrumental in shaping my career trajectory by giving me the opportunity to observe and participate in patient interactions. Between convincing a girl with an intense fear of hospitals to seek proper treatment for her head wound and reassuring a near-hysterical patient with a broken clavicle, I have learned to remain calm, composed, and comfortable when confronting the unexpected and discovered how helpful simply taking the time to explain a situation to a patient can be. I have come to value the inherent trust placed in us by the patients that we serve and find tremendous fulfillment in addressing a patient’s physical ailment as well as their emotional needs. As a future physician, I intend to provide this type of compassionate care to my patients and believe that I will find it even more rewarding to be directly involved in the diagnosis, treatment, and healing process.

While I gained valuable patient interaction experience through my participation in XX XXX’s EMS, my coursework exposed me to the vast and intricate world of biology and I became increasingly interested in exploring the many unknowns within the field. The summer after my freshman year, I accepted an opportunity to investigate the correlation between histone variant H3.3 enrichment and gene expression in growth hormone gene promoter regions at the XX XXX School of Medicine under the guidance of Dr. XX XXX. I found that I loved the way that research pushed me to think in new and creative ways in order to solve problems and search for answers. Eager to spend more time exploring the forefront of biological knowledge, I pursued another intensive research experience the following summer at the XX XXX, where I studied the ability of glioblastoma stem cells to generate vascular pericytes in Dr. XX XXX’s lab. I found this research particularly compelling because of its direct applications to the treatment of human disease and concluded that I would like to conduct clinically-relevant lab research in conjunction with practicing medicine. This newfound career goal has added a new dimension to my motivation to pursue a medical degree. The opportunity to see patients and directly observe any problems with the treatments they receive will provide me with insight, direction, and motivation as I conduct medical research in an effort to improve patient health outcomes.

Though, as a high school senior, my choice to participate in a BA/MD program was tenuous and driven by only a vague understanding of what being a doctor might entail, this decision has given me the freedom to discover my true interests in science, research, and medical care without the pressures of medical or graduate school applications influencing my choices. It has also provided me with time and an environment in which I could reflect on and learn more about myself and my motivations. As a result of this growth and self-discovery, I am now able to say, with certainty and conviction, that I am fully committed to earning a medical degree.
“I’m normal. Yes, I am. At least, I want to believe that.” After enduring repeated verbal insults and shunning from classmates, it was understandable that XXX burst out in tears. She suffered her entire life from cerebral palsy due to a neonatal stroke. While her intellect was normal, she walked with a spastic gait and had severe weakness on one side of her body. People openly stared at her with disapproval. Over time, I realized that her outward appearance was in no way a reflection of who she was as a person. I carried her bags and helped her to get around until I graduated from junior high school in XXXX. While my classmates were initially distant with her, their attitudes began to change when they saw how I treated her. Many soon joined with me in empathizing with her circumstances. My friendship with XXX broadened my view of people with disabilities and cultivated my interest in brain function. I saw how a neurological disease permeated every aspect of her life and I was determined to learn more to help those affected by similar disorders. Little did I know that a devastating neurodegenerative disease would soon affect one of my own family members.

Shortly after immigrating to the United States at the age of 15, my father was diagnosed with Alzheimer’s disease (AD). As his symptoms worsened, he began to suffer from hallucinations. One time, he brutally attacked my mother, thinking she was a XX XX soldier. I was frustrated and helpless, knowing that AD is incurable. I knew that better treatments for this disease were necessary, which led me to major in neuroscience at the University of XX and consequently join Dr. XXX’s lab, which investigates the molecular mechanisms of neurodegeneration. During my three and-a-half year tenure in the lab, I studied the role of the microtubule protein tau in the development of AD and the role oxidative stress-associated mitochondrial dysfunction plays in Huntington’s disease. As an undergraduate research assistant, I applied the scientific concepts I learned in the classroom in the lab, which underscored and reinforced my appreciation for the complex nature of neurological disorders.

Research is a diligent pursuit of knowledge that can have direct implications for clinical care; therefore I sought to observe how research translates to improved patient health outcomes. By shadowing Dr. XXX, director of the memory care program at XXX Hospital, I was able to gain exposure to the clinical aspects of neurodegenerative medicine. During this five-month shadowing opportunity, I observed patients who had been diagnosed with essential tremor, dementia, and Parkinson’s disease. During one visit, Dr. XXX performed an exam on a patient with tremor who had undergone Deep Brain Stimulation (DBS). When the DBS was turned off, the tremor dramatically returned. When the DBS was turned on, his tremor almost disappeared, as if a light switch was turned off. I wished that there were a treatment for Alzheimer’s disease this effective. Nevertheless, this shadowing experience allowed me to correlate how neurological research can have the potential to directly impact patient outcomes. From Dr. XXX, I gained an appreciation that individualized care and a “caring touch” can help when treating the elderly. With this clinical experience invigorating my medical aspirations, I headed back to the lab in order to investigate potential translational therapies for neurological disease.

In the lab of Dr. XXX, XXX Medical School, I was responsible for a project that developed nervous system-related gene knock-out lines in zebrafish. Using these genetically modified organisms, we were able to track how a loss of specific gene function affects the organism’s phenotype. Searching for new genome editing tools that are efficient, affordable, and easy to use within the scientific community, our group utilized a bacterial immune system called CRISPR/Cas Type II systems to induce targeted genetic modification in vivo in zebrafish. We successfully reprogrammed the CRISPR/Cas system to create a site-specific mutation on eight different genes and detected germ line transmitted mutations in progeny as well. Our findings using the CRISPR/Cas system have resulted in a publication in XX, for which I am first author. This technology has a potential therapeutic application in gene therapy and I would like to pursue further development of this in the future.

Neurological disease is a challenging area of medicine that I am passionate about. Through my interactions with XXX and my father, as well as clinical shadowing experiences, I have learned that a genuine, caring relationship is just as important as understanding aberrant molecular pathways. As a future physician scientist, I look forward to treating patients’ with an armamentarium of clinical knowledge, compassion, and an unquenchable desire to better understand the basis of their disease.
Jeweled in salt crystals, my legs hammered the concrete in rapid succession as I raced the sun’s final rays to my dorm at XX State University (XSU) one stifling summer evening. Perhaps it was appropriate that I spent my days in the XX Lab studying body fluid regulation in exercising rats, followed by evening runs in which I methodically plotted water stops along each route and estimated fluid loss with every sweat-soaked mile. Despite my swift acclimation to the XX heat as a participant in the XX XX XX XXX at XSU, no reward compared to the satisfaction of a cold glass of water following a long run in triple-digit temperatures. A few weeks of training at 80 miles per week, however, eventually took a toll on my feet. Plantar fasciitis made an unwelcome appearance for the third time in my running career, yet I was determined to fight it off with aggressive cross-training. Too much enthusiasm on the bike caused subsequent knee injuries, and a premature return to running resulted in a bunion, sore Achilles tendon, and calf strain. That fall, I watched the NCAA Division III Cross Country National Championships from my laptop and shivered with joy as a friend—met at the previous year’s race—crossed the finish line with an 11-second margin of victory.

In many ways, it is the challenge of athletic competition that has drawn me to a career in medicine. Rising before the sun to train on the hills of the XX XX with my teammates empowered me to place 19th in the NCAA Division III Cross Country National Championships in 20XX and built my mental fortitude to earn All-American honors for the second time in NCAA Division III cross country at XX years old. I believe my ability to flourish in athletic competition and scientific inquiry despite the myriad of challenges faced will enable me to be successful as a doctor. In the running community, we celebrate our ability to exceed physical challenges. Through injury we learn the limits of our bodies that we test each day. Moreover, the incapacitation that comes with injury, while disabling to an athlete, has made me reflect upon the value of good health as well as the power of a doctor who recognizes both the physically and psychologically crippling facets of illness. A significant part of treatment for an injured athlete involves reducing the anxiety associated with the uncertainty of complete rehabilitation by offering a diagnosis, outlining an effective treatment plan, and preparing a schedule for returning to exercise. It is the synchronized ability of a doctor to relieve disease symptoms while bringing comfort to a patient—an elegant balance between exercising caution and taking into account a patient’s concerns—that I aspire to achieve in a career in medicine.

Exposure to medicine at an early age has given me intimate familiarity with some of the challenges physicians face. At an age when I could not spell ‘anesthesia’, the important role my father played as an obstetric anesthesiologist in the genesis of new families was revealed to me in trips to the hospital as a child. These visits which were typically marked by events shrouded in medical mystery as if by blue sheets. Most vivid to me were the bustle of hospital life, the harmony among a team of doctors and nurses, and the relief and security felt by women in labor under the care of my father. Some of my earliest childhood memories belong to quiet afternoons awaiting my father’s awakening after 24-hour shifts; I remember late nights when three starving children would jump at the sound of the door and drag our father to dinner, which was filled with humorous and riveting stories from a tireless, heroic father. As a child, I was intensely curious about medicine but also acutely aware of the job stress, long hours, and rewards of a career in healthcare.

Seeking academic challenge, I began my undergraduate education at the age of XX in the XX for the XX XX at XX XX College (XXC). I will remain a X year at XXC to complete majors in biology, psychology, and chemistry and participate in summer research at the XX XX XX XX XX in preparation of a dual career in medicine and biomedical research with a molecular focus. A small xx’s liberal arts college, XXC inspires xx to become pioneers and leaders in science. Research opportunities early in my undergraduate career lured me into the world of scientific discovery, and I thrived with new problems to solve in research that could not be found in the classroom.

In an effort to gain exposure to diverse fields of medicine, I spent the summer following my sophomore year shadowing physicians at XX Hospital in XX. Hours in the clinic and operating room exposed me to the diversity in medical careers, but the valued patient-doctor relationship was common to all. Watching aortic valve surgery, I recall my amazement like a wave of cold air as the patient’s chest cavity was opened, revealing layers of marbled fat and smooth lungs inflating with each breath; but I also recall the dexterity and stamina required for a 6-hour procedure, the
marriage of leadership and teamwork, and the surgeon’s ability to make rapid decisions and communicate effectively. Perhaps less visible to those outside the OR were the good humor the surgeon used to encourage the surgery team, his patience with excited student observers and trainees, and the follow-up with patients.

At XX Hospital, I learned valuable lessons from doctors and patients alike. A physician explained to me that he treats not the condition, but the patient. Remarkably, each doctor I shadowed seldom neglected to inquire about children by name or use light humor while checking patient charts. Patients, in turn, trusted their doctors and developed lasting relationships. Women and men in old age, fighting cardiovascular disease or cancer, demonstrated the importance of a positive outlook and the influence of a doctor’s care on patient outcomes. An underappreciated responsibility of physicians is to address the psychology and general well-being of patients as a professional caregiver, which made a significant impression upon me throughout this experience.

A career in medicine is both a celebration of life and health and a commitment to restoring those faced with illness or injury. As a runner, I have an appreciation for the vulnerability of the human body and recognize the need for physicians who do not shy away from making difficult decisions in patient care. I have learned to cherish the gift of health and admire the compassion demonstrated by the doctors I have interacted with, and I intend to emulate that empathy when treating patients in the future. Invigorated by the goal of medicine to preserve health while bringing relief to patients, I am prepared for the challenge.
MD/PhD Personal Statement #6

I am an XX, XX, XX and I want to become a physician. There are some astounding facts that resonate with me when researching the amount of minorities who pursue advanced education and the rate at which minorities are acquiring HIV. According to the American Association of Medical Colleges, in 2012, a mere 7.3% of all applicants identified as being XX. Recent statistics from the Centers for Disease Control and Prevention show that new HIV infection rate among gay/bisexual men are highest in the XX population. These statistics have contributed to my ambition to become a practicing physician. I want to serve underrepresented communities by tending to their health and wellbeing, in addition to educating and empowering members of these communities to prevent disease and thereby live healthier lives. My pediatrician, Dr. XX, was a pillar in my community. Not only did s/he treat patient’s medical ailments, s/he hosted holiday parties at which s/he educated community members about living healthily and getting regular checkups. I aspire to practice in the field of oncology or infectious disease and in that role, I too wish to be a pillar in my community.

The lack of diverse healthcare providers contrasted with the prevalence of health disparities among minority communities is actually not my primary reason for pursuing a career in healthcare. Rather the culmination of my scientific research and clinical shadowing experiences have demonstrated that practicing medicine will enable me to utilize skillsets that are important to me in a career, such as scientific and clinical collaboration, problem-solving, patient interaction and empowerment, and the opportunity to be a perpetual scholar. As a rising senior, I was one of twenty-five students selected to participate in the XXX (XXX) at the XXXX (XXX) out of two-hundred and fifty applicants nationwide. I was an intern in the clinical research department in Dr. XX XXX’s laboratory that studies the cell cycle of cancer cells.

My project was to determine a subunit of a phosphatase (PP2A) that targets cell cycle regulator cyclin E in a phosphatase assay. Optimization, troubleshooting, and learning from each outcome were just some of the skills that I learned from this experience and will apply in my practice of medicine. I was fortunate to be surrounded by physician-scientists and medical doctors who embraced the opportunity for continued learning and impressed upon me the fact that learning does not stop once you have achieved your intended career goal. Diseases are not static and this fact requires bench-to-bedside research to continually evolve. It requires a commitment to being a perpetual scholar and this continual challenge is what intrigues and inspires me about practicing medicine.

I currently work in Dr. XX XXXX’s lab at XX XX XX, where I contribute to a project that aims to identify children with antibodies that recognize surface proteins expressed by malaria infected red blood cells. Optimal organization is required to achieve the correct analysis for this project. Physicians obtaining the blood samples from infected children must record the type of infection, age, whether the mother was infected, and how many times they were exposed and collect this information in a longitudinal study over the course of 148 weeks. Dr. XX has entrusted me with the organization and generation of the materials for this project and this experience has taught me how to analyze the multiple variables that affect the phenotype of a disease. Being that my interests are in oncology and infectious disease, I will partner with other clinicians and scientists in order to test new treatments and after-care pharmaceuticals and I will be able to communicate more effectively with scientists due to the analytical and organization skills I acquired during my experience as a laboratory assistant.

Research has provided me with an insight on the development of medicine and the studies that take place before pharmaceuticals enter clinical trials. However, it is the physician that must teach the patient about different medical options and my shadowing experience with Dr. XX, OBGYN, at XX XXX General Hospital taught me how to establish trusting patient-doctor relationships. Dr. XX was readily familiar with his/her patients’ medical history and during appointments s/he inquired about their family members, latest vacations and assumed the role of confidant as well as doctor. The ability to engage and evoke trust from individuals is a skill I use while coaching girls basketball for XX High School. Being knowledgeable about a particular topic area, sport, or hobby is not enough to elicit trust; however the ability to communicate in a manner appropriate for the intended audience in an empathetic and empowering style is a quality that Dr. XX and I both share. I am confident in my preparation for medical school and look forward to sharing my background and knowledge with my peers and later, my colleagues and patients, meanwhile embracing all that they have to teach me.
Why MD/PhD Essay Example #1

I saw the Large Hadron Collider at CERN long before the Higgs Boson was discovered, when it was just a mess of defeated wires and metal, in repair only nine days after it came online in 20XX. Fortunately, I met the researchers at CERN at their best: hopeful and determined. Paradoxically, it was during my time here that I became interested in the biology because I was most excited by the implications of the work in physics for microbiology and nuclear medicine. At CERN, I also realized the increasingly interdisciplinary nature of science and its power as a unifying force that transcends national boundaries and language.

Once I entered college, I joined a lab to further explore this nascent interest in biology. I began conducting research thinking that, as an undergraduate, I could not possibly discover anything new. But, after a summer in the lab, I presented a poster that changed the way the nuclear protein I studied was viewed. Yet, I also found the limitations of research. Because my in vivo experiments in Drosophila contradicted published in vitro predictions, I saw firsthand the limits of these kinds of approaches. As a result, I began to think about the implications of taking an overly simplified approach to understanding human disease. Indeed, this shortcoming can be especially problematic in the field that I am most interested in—the molecular and genetic mechanisms underlying developmental disorders.

This interest arose in elementary school when I read June Wood’s series of books about a man named Punky, a character with Down syndrome. I subsequently began volunteering at a center for the developmentally disabled in 20XX. It was here that I began to realize that sometimes, physicians lack the tools to ease human suffering because interventions for developmental disorders are too often analgesic and not truly curative or preventative. After I began conducting research, I considered these deficiencies in medicine as opportunities for the integration of scientific research with clinical care. It is this synthesis of basic science and medicine that draws me to a career as a physician-scientist.

I see the duality of this approach to medicine and research as an incredible asset for both the patient and the provider. Physician-scientists are equipped with the mindset of a clinician when working in the laboratory, as well as equally can understand the practical limitations of treatment for patients and appreciate the breadth of human biology. As a physician-scientist, I hope to advance medicine through the combination of the components that first drew me into research and clinical medicine—innovative interdisciplinary approaches and collaboration.
Why MD/PhD Essay Example #2

Research has rewired my way of thinking. Entering a research lab has been the most exciting catalyst of my college career; it has deepened and broadened my conception of science and strengthened my understanding of my role in the academic and medical communities.

One of the turning points of my research career occurred when my mentor, Dr. XX, asked me to lead a collaboration with XX College in photochemistry. Tasked with the responsibility of representing our lab and meeting a hard deadline, I traveled to XX to bring back both vital compounds and skills I needed to complete the project at my home institution. The disappointments and successes allowed me to recognize the culture in which I excel: one infused with the spirit of collaborative investigation and discovery.

As I stretched my thinking to attack concepts from the level of the human to the molecule in order to predict the effects of my compounds, I realized that my commitment to research stems from an appreciation for both molecular science and its clinical applications. My personal and professional experiences have revealed to me the complexities and frustrations commonly experienced among patients and the physicians, and I am intrigued by the relationship between laboratory science and medicine and the current gaps in practicing bench to bedside research.

On the surface, my prior experiences as a research scientist and a physician seem incongruent. Upheld by the rigor of the scientific method, research operates on a level greater than the individual. Scientific discoveries have a global impact, and I am excited by the potential of laboratory science to affect an entire population. Yet, as a young adult with diabetes, I rely on the expertise of my endocrinologist to lead a normal life, and, as a result, I recognize the power of the human connection between doctor and patient. While I am depending on scientists to find a cure for the disease that affects me, I need my doctor to provide reassurance when I am anxious, impart knowledge when I am uncertain, and offer additional resources when prospective solutions fail. To be a physician is to be an active caregiver. This, too, is a role that I aspire to fill.

I once believed that science and medicine were separate and distinct realms; similarly, I assumed my professional career was limited to one occupation that suppressed all the integrated questions I have. Yet, beneath the juxtaposition of bench scientist and practicing physician, I believe that there exists an underlying motivation and energy that are conjoined. By transcending the rigid professional boundaries, my studies as an MD/PhD student will allow me to translate and cross-link language, data, and solutions. The distinctive cross-training and remarkable intellectual resources offered by the MD/PhD program will allow me to combine two deeply connected realms and resonate with my firm commitment to contribute in both the scholarly and clinical realms.
Why MD/PhD Essay Example #3

Research presents many exciting challenges, from answering the multitude of questions that accompany an unexpected result to learning how to manipulate a system in the exact way needed to obtain results. There is one such challenge that I am particularly interested in addressing—bridging the disconnect that often exists between research and its application. With each of my research experiences, I have reflected upon the vast distance that separates my project’s specific findings from its analogue in the human body. As an MD/PhD, I will endeavor to conduct research that will help traverse the gap between discoveries pioneered in a research setting and their clinical applications.

Earning a PhD will help me develop the knowledge and skillset needed to conduct well-designed, effective scientific research. However, this degree alone does not offer the broad, multidisciplinary range of skills and insight that I wish to acquire. Obtaining an MD will expose me to a unique set of experiences that will enhance my PhD and make me a better biomedical researcher. The medical knowledge and first-hand involvement with patient care that an MD will grant me will directly inform my decisions in the lab, directing the focus of my work. A medical degree will also help me identify and address any issues that may arise as the project’s findings are taken from an experimental context and implemented in a medical setting. By treating patients that have the disease or disorder that I study in the lab, I will become better equipped to anticipate the needs of the patients that my scientific discoveries ultimately hope to benefit; this skill cannot be readily gleaned from a PhD alone.

I gained valuable exposure to the rewards and challenges of a clinical career during my time as an undergraduate student. Seeing the limitations of modern medicine frustrate and dishearten both doctors and patients has inspired me to search for answers in a research setting so that I might contribute to the resolution of some of these issues. Being actively involved in scientific investigations will help me remain thoroughly informed and optimistic about the progress of the field as I experience some of these obstacles firsthand. A dual career in research and medicine will also make me a better physician by instilling in me comprehensive scientific knowledge and understanding about a number of the diseases or conditions that I will encounter. Having a direct connection to the rapidly evolving world of research will keep me up-to-date with new discoveries that may hold promise for the treatment of a disease or elucidate the biology that drives it. This increased awareness of progress being made at the basic science and clinical levels of a disease and a thorough understanding of the science behind these findings will make me a more well-rounded physician with the ability to better diagnose and recommend treatment options to best suit the needs of my patients.

Though research and medicine are independently challenging, fascinating, and rewarding careers, it is their intersection that appeals most to me. I am determined to combine these two fields into a single career and immerse myself in basic scientific research as well as the human biology that underlies its clinical applications, learn to think analytically about the design and execution of scientific studies and practically and empathetically about patients’ needs, and combine these capabilities to perform more effective, holistic biomedical research as a physician-scientist. This will allow me to experience the positive aspects of each occupation while using my involvement in one area to address the difficulties associated with the other. In my future career, I will be able to balance the highly focused, gradual, analytical work of a lab scientist with the more diverse, fast-paced, patient-interaction-based work of a physician. While treating patients will provide my research with continuous direction and motivation, working as a scientist actively involved in finding solutions for the problems that I encounter as a physician will be equally fulfilling and informative. An MD/PhD would provide me with the optimal academic background and research and clinical training needed to meet my goal of becoming a consummate physician-scientist who is able to apply and integrate skills and insights from these two independent fields to improve patients’ lives.
During the summer of my senior year in college, I participated in a research program at the XX XXX that inspired me to pursue a career as a physician scientist. Under the mentorship of XXX, MD, PhD I contributed to the testing of a clinically relevant drug that targets the mitotic spindle assembly checkpoint in glioblastoma. I was also able to shadow my mentor on rounds at the XX XXX Hospital. This opportunity allowed me to witness how closely research and clinical care are intertwined. One of the projects in Dr. XXX’s lab that particularly inspired me to pursue an MD-PhD was generating patient-specific tumor xenograft mouse models and cultured cell lines as tools for developing drug therapies. Given that brain tumors vary greatly from individual to individual, this project aims to develop specific drug therapies for each patient. The data gathered from this project could potentially help physicians make better clinical decisions when treating patients with brain tumors. This type of research is best accomplished by an individual that can generate and understand pre-clinical data and apply it patient care and research in humans. I strive to emulate my mentor, Dr. XXX, in using basic science to directly answer questions seen in patients.

Although there are many areas of medicine that I am interested in, one that I have had the most experience and enthusiasm for is developing personalized treatments in patient care. I am particularly interested in the therapeutic application of genome editing technology as a form of gene therapy. By using customizable nucleases, one can target almost any site in a complex genome and in theory, correct the underlying cause of diseases with precise genome modifications. In order to achieve the full potential of this technology, a few important challenges must be addressed. First, the usefulness of this technology is largely dependent on achieving single site specificity because any toxicity, presumably due to off-target cleavage, could be detrimental to patients. Second, questions still remain about the most optimal ways to deliver these nucleases into cells. Third, given that these tools were originally found from bacteria and plants, it is not known if these proteins are compatible in human patients.

While research is typified by diligent pursuit of new knowledge through a long and exhaustive investigation of basic science questions, patient care demands hands-on knowledge that can be effectively translated into effective treatments. I believe that as a physician scientist with expertise in both research and clinical medicine, I will have a unique opportunity to contribute to patient outcomes by formulating and investigating hypotheses that are not readily achieved by someone without dual training.
Why MD/PhD Essay Example #5

Recently, I was invited to participate in the One Book One Community project at the XX County Library to discuss The Immortal Life of Henrietta Lacks, a novel which chronicles the history of HeLa cell culture, and offer the student perspective on research using human cell lines. At this program, expertise was sought from a panel of scientists and medical doctors who shared research-oriented and clinical perspectives on HeLa research. From the advent of cell culture, the continuum between biomedical research and healthcare has emphasized the need for physician-scientists who bridge research at the bench with clinical bedside practice.

Clinical relevance propels and orients the directions for my research projects with Dr. XX XX, Associate Professor of Biology. In prostate cancer patients, an alarmingly high rate of recurrence following androgen deprivation therapy raises an obvious question: why? One answer appears to be increased incidence of neuroendocrine (NE) cells within the tumor. Our research aims to study chemoresistance in NE cells, examine the tumorigenic role of secreted factors, and, ultimately, find cancer therapies that also target NE cells to reduce relapse, facilitating the efforts of oncologists to provide more effective treatments. I constantly seek discussion and clinical expertise from my father, a physician, whose interest in the clinical significance of NE cells has stimulated interesting discussions as well as new research questions.

While assisting with clinical trials at XX XX Hospital in XX, XX, I grew excited about the applications of innovative scientific discoveries in medicine and the fruition of these efforts in the development of novel therapeutics. The tools for approaching questions as a scientist can be gained through PhD training, but training in medicine enables physician-researchers to address major problems facing human health in a clinical setting. Integrating research into translational medicine is a challenge that is met by the physician-scientist, who acts as a mediator of scientific advancement at the frontiers of both research and medicine. It is my strong desire to solve problems in healthcare coupled with an insatiable curiosity that drives my pursuit of a career as a physician-investigator.

I have chosen to pursue joint MD/PhD degrees in anticipation of a career in medical neurology and biomedical neurobiology research. My research career will have a strong focus on translational medicine, and medical training will provide a valuable clinical perspective in my approach to research questions with the objective to translate research into patient care. I am committed to returning knowledge to the scientific community in order to contribute to biomedical research efforts that will improve human health. My ultimate goal is to combine a medical career with a productive and engaging research career focused on the integration of biomedical research into clinical practice.
Why MD/PhD Essay Example #6

As an undergraduate student, the question I often pondered was, “How can I be my best possible self?” As a result of my clinical shadowing, patient interaction, and research experiences, I have come to the definitive conclusion that being my best possible self involves four key factors: a career that will enable me to offer medical care, contribute to biomedical research, serve as a role model, and mentor aspiring doctors and clinicians.

During the summer of 20XX, I obtained clinical and lab experiences that indelibly shaped my academic and career ambitions. At the beginning of the summer, I shadowed Dr. XX XXX an OBGYN, at XX XXX Hospital. I really enjoyed the patient interaction aspect of being a physician, including the responsibility of guiding people to better health and serving as a confidant for patients, their family, and friends. However, I was unwilling to cease my research efforts and had not yet been introduced to the possibility of practicing medicine and contributing to clinical research as a physician scientist. During the course of my summer internship at the XX XX XX, I met Dr. XX, a MD/PhD practicing oncologist. During the internship, Dr. XX worked in the clinic, vacationed with his family, and mentored a high school student in the lab, all while trying to develop a new mouse model of colorectal cancer. This exposure helped me conceptualize how I could be my best possible self.

On one occasion during the internship, my fellow interns and I volunteered to make dinner for patients and family members residing at the XX XX XXX (XXXX), a residential facility for individuals undergoing cancer treatment. I observed interns, cancer patients, and their family members interacting and in spite of the difficult circumstances, there was joy that filled the room. Anyone can fall victim to cancer, but the opportunity to receive treatment at facilities like the XXXX and XXXX gives people hope for survival. I am seeking a career that will enable me to offer hope to individuals battling life-threatening illness.

Being an MD/PhD provides an optimal opportunity to combine the application of clinical training to treat patients, meanwhile contributing to the development of improved treatments through research. In addition, this role will enable me to educate and mentor both aspiring clinicians and scientists and spend time with my family. To serve my community through healthcare and education while offering hope to individuals suffering from illness will allow me to be my best possible self and ultimately, be a productive and positive contributing member to society.
Writing Workshop Assignment

a) Draft your personal statement for graduate/medical school using the criteria provided;

b) Email draft personal statement and resume to your peer review group by the designated deadline.
Applying for Graduate School
The following checklist was created to guide undergraduate students of junior standing through the graduate school application process. This timeline is designed for students who wish begin graduate studies full-time in the Fall quarter/semester and are seeking an assistantship and/or fellowship. Keep in mind that you can certainly apply to graduate school at any time before the application deadline!

**June**

**Graduate School Research**

Think about what graduate program(s) you would like to pursue. Remember that attending graduate school should lead you toward your ultimate career goal, not just to avoid getting a job and going to work.

Consider what you’re looking for in a graduate program and what you’d like to do with a masters or doctoral degree. Research and compare your options. Factors to consider include:

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<th>Time commitment (e.g. 2 year program vs. 4-6 year program)</th>
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<td>Placement success of program graduates</td>
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<td>Program approaches/specializations</td>
<td>Housing/living expenses</td>
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- **Make a list of what you’re looking for in a graduate program and what you’d like to do with a masters or doctoral degree.**

- **Create a list of potential schools/programs to which you are interested in applying.**

- **Contact the colleges/universities of interest and ask them to mail/email you information about the college/program, financial aid, and assistantships and to request a graduate catalog. Look for programs that have several potential faculty**
June

Graduate School Research

mentors and take note of any faculty members whose work interests you (at this point).

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June/July

Plan Ahead for the Graduate School Admission Test

Determine if you are required to take a graduate school admission test [GRE (general test), GRE subject tests, LSAT (for law school), MCAT (for medical school), GMAT (for business school)]. Plan to take the required Graduate School Admission Test(s) the summer before your senior year. Many students will re-take the test and this will give you nearly three months to study the sections for which you need to improve your score(s).

Sign up to take any required graduate admission test.

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July

Take the necessary Graduate School Admission Test(s)

Things to remember:

- Consult test prep books to reference strategies for successful test-taking.
- Be sure to give yourself enough time before the exam date to sufficiently study for the test.
- Get plenty of rest the night before (this includes taking a break from studying).
- Get to the test facility at least 20 minutes early.
- Check test taking policies (rules about what you can/cannot bring into the test area).
### July
**Take the necessary Graduate School Admission Test(s)**
- Eat a good breakfast (something that’ll last for several hours).
- Remember to write down your score(s) (if allowed).

### August
**Narrow the Field**

Review all of the graduate schools that offer a program in your field of choice. Consider 5 - 10 program possibilities, and narrow your list to down to 3 - 4. Keep in mind that the average graduate school application fee is $50 and that fee is typically non-refundable.

To help narrow the list, you may wish to:
- Consult with professors and professionals in the field to discuss program highlights and their experiences in graduate school.
- Plan campus visits, and schedule meetings with program faculty members or current students who can answer your questions. You may want to email potential faculty mentors per program to see if they are accepting students in the following year.

**Determine which programs you plan to apply to and begin the application process.**

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### August
**Registering for Spring Semester**

If all goes well, you will have several interviews in the spring semester. You may want to schedule Tuesday/Thursday courses, and/or have a lighter schedule in your final semester. This will enable you to participate in the interviews and maintain your course load during your last semester.
September  Re-take the Graduate School Admission Test(s)

Determine if you need to re-take a graduate school admission test [GRE (general test), GRE subject tests, LSAT (for law school), MCAT (for medical school), GMAT (for business school)].

Things to remember:
- Study the sections for which you need to improve your score(s).

☐  **Sign up to take any required graduate admission test.**

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September  Seek Letters of Recommendation

Approach faculty members, employers, etc. to write a recommendation letter on your behalf. Choose your reference(s) wisely – a letter(s) of recommendation from an individual(s) in a department or field similar to the program for which you are applying is viewed more favorably than a recommendation letter(s) from a former employer or professor in a non-related field.

Identify references per graduate school application. Be sure to give your references ample time [2 to 6 weeks is suggested] to work on your letter. You are encouraged to provide your references with a personalized folder containing the following information:
- Transcripts (NOTE: If it’s a professor, highlight the classes that you took with them so they can go into your records for that semester to see how you did compared to other students in the class).
- Personal statement (even in draft form).
- The name/description of the program.
- The deadline for the letter IN BOLD and an indication of how to submit the recommendation (online, printed letter, follow a link, etc.). If your reference(s) are required to submit a paper recommendation letter, be sure to provide a pre-addressed, stamped mailing envelope (and any forms that need to accompany the letter of recommendation).
- Include a resume or other information about what you have done that won’t be obvious from the transcript.
- Send your references a friendly reminder one week prior to the due date for your recommendation letter.
- Be sure to send your references a handwritten thank you note!

☐  **Identify your references.**

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September | Re-take the Graduate School Admission Test(s)

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September | Getting Started

Draft your personal statement(s) or essay(s) for each university and have your statement/essay reviewed by a faculty member or your university’s Writing Center.

Things to remember:

- Plan on asking multiple individuals to review your personal statement(s) or essay(s). This ensures that your ideas are understood by a diverse audience. Be sure to give your reviewers ample time [2 to 3 weeks is suggested] to read and comment on your statement/essay. You should plan to revise your statement/essay at least three times given the feedback you will receive from multiple reviewers.

- Send your reviewers a friendly reminder one week prior to the date in which you would like their feedback.

- Be sure to send your reviewers a handwritten thank you note!

Draft personal statement(s) or essay(s).

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<th>Reviewer Name</th>
<th>Draft #3 Reviewed</th>
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October  | Compiling your Application(s)  
---|---
**Re-take the Graduate School Admission Test(s).**

Things to remember:
- By this time you should be comfortable with the test(s), i.e. had plenty of practice, are familiar with different types of questions, have a time allotment strategy.
- See suggestions offered in July: Take the necessary Graduate School Admission Test(s) for other tips.

☐ **Take Admission Test(s).**

October  | Compiling your Application(s)  
---|---
**Order transcripts from all post-secondary universities attended.**

Things to remember:
- If Fall term grades are expected, then indicate on the transcript request form to mail “after current term grades.”
- Be sure to ask the Registrar’s Office if the current term grades can be sent in time to meet the graduate school application deadline.
- Most schools charge a fee for ordering/sending your transcripts.

☐ **Order transcripts for all of the universities for which you are applying to.**

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<tr>
<th>University Department/Program</th>
<th>Address</th>
<th>Transcripts ordered?</th>
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<td>☐ Yes</td>
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<td>University Department/Program</td>
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October  | Compiling your Application(s)  
---|---
**Continue revising your personal statement(s) and/or essay(s).**
November  Wrapping it Up

This is the time to compile all of the parts of your application.

Things to note:

- You should be in “wrap-up” mode. This will include working on the final edits to your personal statement(s) or essay(s), resume, and/or any other documents, admissions test scores should be submitted, transcripts should be provided.
- Your letters of recommendation should either be sent or near completion.
- Aren’t you glad you started early?

- Complete your personal statement(s) or essay(s) and resume and/or any other documents.
- Admissions test(s) completed.
- Transcripts requested.
- Letters of recommendation submitted.

Dec./Jan.  Mail or Submit your Application(s)

Mail or submit your application(s) before the specified due date.

Things to note:

- Applying early will put you in line for the best assistantships, fellowships and/or financial aid packages. You can certainly apply later, but you may lessen your chances for receiving some form of financial aid.
- Many graduate schools send out acceptance letters as early as March for a Fall start date.

- Mail or submit application(s).
### Jan./Feb.  Post Application

**Request scholarship/fellowship/assistantship information from each university that you applied to.**

**Things to note:**
- You may have to do a lot of research to find out what positions are available.

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<th>University/Program</th>
<th>Date of Request</th>
<th>Materials Received</th>
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### Jan./Feb.  Post Application

**File your Federal Income Tax Return (required before you can complete the FASFA).**

**Things to remember:**
- Make sure to keep a copy of all tax documents for reference when you complete the FASFA.

**File federal income tax return.**

<table>
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<th>Date Filed</th>
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### Jan./Feb.  Post Application

**Complete the FASFA online.**

**Things to note:**
- You’ll need your own tax information as well as that of your parents.
- You’ll need to identify all of the universities who you want to have your FASFA to be made available to (visit the FASFA website [http://www.fafsa.ed.gov/] to find the appropriate school code).
- Make sure you have a PIN for electronic signature (should be the same as the one from last year).

**Complete the FASFA.**

| University/Program | School Code # |
### Jan./Feb. Post Application

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<th>University/Program</th>
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#### Start preparing for any admission/assistantship interviews by scheduling mock interview(s) with faculty/staff.

#### Things to note:
- You should ask your research mentor or other professor for a 30-minute appointment to do a mock interview or at least discuss the interview process and what to expect.

#### Schedule admission/assistantship interviews.

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<th>Name</th>
<th>Date of Mock Interview</th>
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#### Jan./Feb. Post Application

### Have a Plan-B, just in case.

#### Things to note:
- It is always a good idea to have a back-up plan, so begin exploring employment options. That way if graduate school is not an option for you at this time, you will have already begun a preliminary job search.

#### Make a list of possible backup plans.

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Mar.-May  Follow-up

By this time you should be hearing back from the universities that you have applied to.

Things to note:
- Visits as many schools as you can in order to meet faculty, get a sense for the city and culture of the area, and meet other students who were accepted.
- Put those practice interview skills to work.

Make your final decision.

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<th>University/Program</th>
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Submit commitment forms and/or fees to the institution you have chosen and register for classes (if applicable).

Things to note:
- Take time to celebrate getting into graduate/medical school!

Submit commitment forms.

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<tr>
<th>University/Program</th>
<th>All forms and fees sent</th>
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Send a handwritten thank-you note to everyone who helped/supported you during the application process and inform them of your success.

Things to note:
- You may want to include a small gift as a token of your appreciation, such as a Starbucks or Amazon gift card.

Send thank you notes.

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<td>Mar.-May</td>
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The Art of the (Recommendation Letter) Request

Letters of recommendation are an extremely important component of any training program or graduate school application. The information contained (or excluded) from a letter of recommendation has the ability to impact who gets interviewed, admitted, and in some cases, awarded financial support.

There is an art to requesting a letter of recommendation and your ability to incorporate these suggestions when requesting a letter of support from your references will likely result in an influential testimony that may be the difference between being accepted into the program of your choice versus being waitlisted or worse, rejected.

**Tip 1: Put it in writing!**

Sure, you can ask your references to submit a letter of recommendation on your behalf in-person, but the surest way to guarantee that it gets done is to submit your request in writing, whether that be via email or a handwritten note (you will inevitably earn a prompt and thoughtful recommendation letter by submitting your request with a Starbucks gift card or some other token of your appreciation).

**Tip 2: Make it easy.**

The best way to ensure your reference will submit a quality letter of recommendation on your behalf is to make it easy to do so. You can simplify this request by giving your references the following information: a) the name of the program to which you are applying and a brief description of what the program entails; b) the name of the sponsoring institution; c) a brief description of how the program fits in with your career goals; and d) a brief description of what you will contribute to the program and how you will benefit from participating. The last and possibly most important information to convey is: e) when the letter is due, to whom the letter should be addressed, and the options for submitting the letter, i.e. via email, fax, or mailing address.

**Tip 3: Be selective!**

Most training program and/or graduate school applications require a letter of recommendation from at least three individuals. Choose your references wisely - letters of recommendation that come from individuals in a department or field similar to the program for which you are applying are viewed more favorably by the selection committee than recommendation letters from a former employer or teacher in a non-related field.

**Tip 4: Send a reminder.**

The best way to leave a poor impression with the selection committee is to submit your application after the deadline. The surest way to guarantee that your recommendation letter is submitted on time? Send your reference a friendly reminder—preferably one week prior to the application deadline.

**Tip 5: Express your gratitude!**

The last and most important gesture to consider when requesting a recommendation letter is often the most overlooked. In short; send your references a handwritten NOTE OF THANKS! If you have not already given your references some token of your appreciation, i.e. a Starbucks gift card, a box of Girl Scout cookies, now may be the time to do so, especially if you learn that you were accepted into the program to which you applied.
Lesson from The Last Lecture

The Lost Art of Thank-You Notes

Dr. Randy Pausch substantiates the value of the handwritten thank you note on pages 150–153 of his book, The Last Lecture. SURP staff endorse this gesture as a means of expressing one's gratitude and highly recommend reading The Last Lecture in its entirety to reference other bits of wisdom that can be applied in your academic and/or career pursuits!

Source
**Lesson from The Last Lecture**

**Send Out Thin Mints**

Dr. Randy Pausch offers a unique strategy when seeking academic/professional feedback from mentors and/or colleagues on page 158 of his book, *The Last Lecture*. This strategy will inevitably endear oneself to others, not to mention, establish one’s reputation for being thoughtful. Please read *The Last Lecture* in its entirety to reference other bits of wisdom that can be applied in your academic and/or career pursuits!

**Source**

How to Write an Abstract
How to Conduct a Literature Search

Literature searches are most commonly done when writing abstracts, research papers, or scientific reviews. They are used to locate articles, citations, and other information to substantiate or refute a given topic. The internet offers a number of avenues from which to conduct literature searches, but here are some sources that have been found to be the most useful. Although literature searches are fairly straightforward, there are some techniques that you can use to access articles that would otherwise require a journal subscription. This protocol will guide you through the process of conducting a literature search and obtaining articles that may require a journal subscription.

**Technique #1:** Enter the entire title of the article in Google Scholar and try the “All [#] versions” link at the bottom of each result. Look for “PDF” and/or “HTML” links. Make sure to click all of the links available as some may contain a “full text pdf” option.

**Technique #2:** Enter the entire title of the article in Google. If you cannot find a full text article, try adding “PDF” to the search.

**Technique #3:** Enter the entire title of the article in Pubmed (Get Article Enabled) from the Arnold Library website:
http://www.fhcrc.org/science/shared_resources/library/

**Technique #4:** Request the article from the FHCRC’s Arnold Library. To do this, search for the title of the article in PubMed (Get Article Enabled) using the instructions outlined in Technique #3. Select the article from the choices (if there are multiple). You will see a “FHCRC Get Article” button in the top right corner of the screen. Press that button and you will be taken to an Arnold Library webpage. Click on the link “Request it from the Library’s Document Delivery/ILL Service”. NOTE: this technique requires that you fill out an order form and may take weeks for the article to be delivered, therefore it takes the longest and should be used as a last resort.
Evaluation of Home-Based Colorectal Cancer Education Methods among Hispanics
E.A. Moralez

Nearly 67% of Hispanics ages 50 and older reported they never had a screening colonoscopy. This study used an approach to increase screening rates among Hispanic populations. In Yakima Valley, Washington, Hispanics ages >49 (n=65) were surveyed on their general cancer knowledge, and then participated in “home health parties” designed to increase awareness, knowledge, and encourage colorectal screening. The participants were given a post-party survey to test effectiveness of the intervention. Twenty-five percent of the participants were screened after the intervention, and there was a 26% increase of knowledge of fecal occult blood test and 18% increase of knowledge about sigmoidoscopy/colonoscopy. Seventy-eight percent of the Hispanic males in the study (n=19) who participated in home health parties received colon screening. Increases in knowledge, screening consideration, and colorectal cancer screening proved home health parties to be an effective educational intervention.

Structural Study of Human Siderocalin and Iron Bound Siderophore, Vibriobactin
Natasha Yazzie¹, Matthew C. Clifton², and Roland K Strong²

¹Department of Chemistry and Biochemistry, New Mexico State University,
²Division of Basic Sciences, Fred Hutchinson Cancer Research Center

In all microorganisms, iron is an essential element for growth and survival. To acquire iron from their host and environment, bacteria and fungi release small organic molecules called siderophores, which are iron-chelators that bind to scarcely available iron III (Fe+3). One bacterium that utilizes this system of iron transport, Vibrio cholerae, is the causative agent of the severe diarrheal disease cholera. In order to acquire iron from its host, V. cholerae secretes the siderophore vibriobactin. In response to a bacterial infection, neutrophil granules from the human immune system secrete the bacteriostatic protein Siderocalin (Scn) that binds to iron bound siderophores. Studies have shown that Scn binds to siderophores vibriobactin and enterobactin (from Escherichia coli) despite their different chemical structures. To understand at the structural level how Scn interacts with iron bound siderophore vibriobactin, we have over-expressed and purified human Scn from E. coli. Scn was then loaded with Fe-vibriobactin and set into crystallization trials. Potential crystal formation from crystallization trials will be scaled up. Once crystals are obtained, we will perform crystallographic experiments to obtain details about the Scn Fe-Vibriobactin interaction.

Prophylactic Oophorectomy, Menopausal Symptoms, Anxiety and Quality of Life
Roxana M. Torres, Rachel M. Ceballos, Bonnie A. McGregor

Ovarian cancer is the leading cause of death among all gynecological cancers. Currently prophylactic oophorectomy (PO) is the most effective means to reduce lifetime risk of ovarian cancer among women at elevated risk for ovarian cancer. However, the effects of PO, such as menopausal symptoms on perceived quality of life, have not been well-studied. This present longitudinal study investigates changes in quality of life from before to after PO. In this study, women who have chosen to undergo PO are given surveys pre-operatively and at three time intervals post-operatively (2, 6, and 12 months) to assess levels of anxiety, menopausal symptoms, and perceived health status. It is hypothesized that women with an increased number of menopausal symptoms will report a decrease in perceived health status and an increase in general anxiety levels. It is also thought that women with high levels of self-reported satisfaction with their relationships will report fewer adverse sexual-related menopausal symptoms. These variables will be measured using the SF-1, a modified 16-item version of the Breast Cancer Prevention Trial (BCPT) checklist, the Spielberger State and Trait Anxiety Inventory (STAI), and a relationship satisfaction question. As this study is still in progress results are pending. It is anticipated that all three hypotheses will be supported and that statistical analysis will reveal significant relationships among the variables under investigation.
The Evaluation of Gene Expression Buccal Cells
Danielle Miranda¹, Irena King²

¹New Mexico State University, Las Cruces, NM 88003,
²Fred Hutchinson Cancer Research Center, Seattle, WA 98102

Introduction: Large scale studies use RNA expression for cancer prevention and progression. Non invasive sources of RNA are buccal cells; however, the quality of RNA may be compromised. This project investigates the quality and quantity of buccal RNA suitability for future studies on gene nutrient interactions.

Objective: The main goals are to compare different extraction methods to optimize total RNA yield for cytobrush collections, and to determine if ribosomal genes 18S&28S levels are stable in buccal RNA.

Methods: Buccal cells were obtained from volunteers and were either immediately preserved or left on bench for 5 days before freezing at -80°C. RNA is extracted with RNeasy (Qiagen, Valencia, CA) or QuantiGene Reagent System from Panomics (Fremont, CA). Total RNA is quantified with a RiboGreen fluorescent dye procedure. The quality of RNA will be analyzed by Agilent 2100 Bioanalyzer using the RNA 6000 Pico Lab Chip Kit.

Results: Extraction of RNA from cytology brushes is being used to assess gene expression patterns. The buccal RNA 28S&18S are expected to be of sufficient stability for RNA quality for gene expression studies. About 77,700 buccal cell specimens have been collected from the VITamins And Lifestyle (VITAL) Study. This method will be used in a grant proposal on gene-environmental interaction signatures by RNA profiling in exfoliated buccal mucosal cells.

Conclusion: Future research will be done on the VITAL study buccal cell samples using the RNA extraction method developed in this process that gives optimal RNA expression. The project is currently being conducted with promising results.

HIV Envelope Epitope Immunization
Will McClellan¹², Camille Bretz², Roland Strong²

¹New Mexico State University, Las Cruces, N.Mexico,
²Fred Hutchinson Cancer Research Center, Seattle, Wash.

In the development of the HIV vaccine, we are currently unable to elicit by immunization antibodies capable of neutralizing a wide variety of HIV strands. Neutralizing antibodies have been found which bind to various epitopes on the HIV envelope. These epitopes vary in prevalence among HIV strands. 4E10 and 447D are two envelope epitopes with high prevalence. The goal is to develop a protein scaffold which holds and presents the E410 and 447D epitope in such way that elicits a neutralizing immune response to that epitope. E. coli plasmids, which were encoded for specific epitope carrying scaffolds, were brought in from an outside lab. This plasmid was transformed via heat shock into E. coli and grown in medium. The E. coli was then induced to over express the scaffold sequence of the plasmid. The resulting scaffold was purified and concentrated. The scaffold expressed in a soluble form was tested in guinea pigs to check for an immune response. Out of the 52 scaffolds attempted, 25 were expressed and soluble, of which 8 were tested for immune response. Of the 8 tested, 2 bound sufficiently to antibodies; however this binding did not occur at the epitope region of the scaffold. Thus far, none of the scaffolds have elicited an immune response.
How to Write a Resume and Cover Letter
Sample Resumes
- Chronological
- Scannable
- Functional
- References

Sample Letters
Letter of Application •
Letter of Inquiry •
Thank You Letter •
Networking Letter •
This guide is designed to help you get started writing a quality resume and cover letter. If you need additional information, there are many books on the subject that may be checked out from the Career and Employment Services (CES) career resources library in Howarth Hall, Room 101. Once you have completed your resume, consider making an appointment with a career advisor, who can help you make a good resume great.

Resume Key Points

The purpose of a resume is to get you an interview.
Your interview should get you a job. If you're getting interviews from your resume, it's doing its job.

A resume is a marketing piece, not a history piece.
Decide carefully what to include and leave out. It's not your life story; it's your personal sales piece.

Your resume should be targeted to the job for which you are applying.
Be specific and particular in showing your interest and suitability.

If possible, keep your resume to one page.
Definitely use a clean, succinct style. Your resume may be judged in 10 seconds.

Read job descriptions and requirements carefully.
These tell you what to emphasize and what to de-emphasize on your resume.

Pretend you're the hiring manager when critiquing your resume.
Ask yourself, "Can this person do the job?"
Look objectively—use only what is written to make your determination.

Have your resume ready to go at all times.
It takes time to create one. Don't wait until the last minute.
If you're in the market for a job or internship market, create one now.

If you are asked for a Curriculum Vita or CV...
Check with an advisor or review one of our books on CVs. Often, a resume is truly what the employer wants.
Anatomy of a Resume
There is no official format for a resume. Please view the information on the left for some resume basics.

McIntyre Jones
1081 Wheelock Student Center                                    (253) 879-3161
Tacoma, WA 98416-1081                               mjones4@ups.edu

OBJECTIVE
To obtain a Member Services internship with the World Trade Center of Tacoma.

EDUCATION
Bachelor of Arts, University of Puget Sound, Tacoma, WA Expected: May 2009
Major: Politics and Government Minor: Business
GPA: 3.40 / 4.00 overall; 3.43 / 4.00 major; 3.33 / 4.00 minor

EXPERIENCE
Courier
June – August 2008
Robison Belaustegui Sharp and Low                       Reno, NV
• Interacted with attorneys and office managers on a daily basis
• Promptly delivered confidential materials pertaining to court decisions to three to five
  locations daily
• Retrieved documents from clients, attorneys, the courthouse, and the firm’s archives
• Conceptualized and designed map of basement for easier navigation

Library Assistant–Government Documents Department
September 2006 – May 2008
Collins Memorial Library                   Tacoma, WA
• Received and processed shipments of government documents
• Updated database to reflect current availability of in house resources
• As a team, coordinated the verification of articles and media delivered

Historian
September 2007 – May 2008
Phi Mu Alpha Sinfonia, Men’s Music Fraternity                 Tacoma, WA
• Maintained records of meetings and created a notebook to collect correspondence
  and materials from events to serve as tool for future events.

Promotions Intern
May – August 2006
KINK-FM 102                    Portland, OR
• Promoted radio station at booth at KINK-sponsored events
• Oversaw and participated in various office projects
• Conceptualized and implemented CD cataloging system

ACTIVITIES
• Praxis Imago (UPS’ filmmaking organization)

COMPUTER SKILLS
MS Office products: Word, Excel, PowerPoint, and Access.

Million
Between 2004 and 2014, the U.S. economy will produce about 22 million growth jobs.
Kristina B. Alder
(Local) 1202 North Lawrence, Sumner, Washington 98390 (253)555-5168 kba@ups.edu
(Permanent) 950 Smallwood Trail, Fairbanks, Alaska 99712 (907)488-1111

OBJECTIVE
To secure position #543-99, Editing Assistant.

EDUCATION
Bachelor of Arts in English
Emphasis in Writing, Rhetoric and Culture
University of Puget Sound, Tacoma, WA December 2008

Study Abroad, Fall 2007
University of Aberdeen, Scotland

RELATED EXPERIENCE
Writing Intern, January 2007 to present
University Relations, University of Puget Sound, Tacoma, WA
• Independently research, write and edit articles for Arches, an alumni magazine and the Open Line, university staff newsletter.
• Responsible for keeping up the integrity of the schedule in accordance with deadlines.
• Check facts and verify information with the media and public to obtain essential background for articles.
• File and organize material for future reference.

Editorial Assistant, September 2006 to May 2007
CrossCurrents Literary Magazine, Tacoma, WA
• Evaluated and edited more than 250 poems and short stories.
• Collaborated with photo/art editor to design layout for twice yearly magazine.

Staff Intern, Summer 2006
Norm Dicks Congressional Re-election Campaign, Tacoma, WA
• Wrote news briefs and designed campaign itineraries.
• Created and conducted phone and in-person questionnaires.
• Organized and implemented logistics for major fundraisers.
• Corresponded and communicated with members of the press and constituents on a daily basis via phone, e-mail and in person.

ADDITIONAL EXPERIENCE
Technician, Village Theatre April 2004 to present
Swim Instructor, Korum YMCA May 2005 to present

ACTIVITIES & HONORS
National Merit Scholar
Staff Writer of the Year, The Patriot, North Pole High School
Intramural sports - golf and volleyball
Member of church chorale group
Sample Chronological Resume

Brian E. Warner
111 North Grant
Tacoma, WA  98403
253-879-3161, bew@ups.edu

OBJECTIVE
To obtain a position as a Financial Analyst.

EDUCATION
Bachelor of Arts in Finance, Minor in Economics
University of Puget Sound, Tacoma, WA  May 2009
Cumulative GPA: 3.4 / 4.0 Major GPA: 3.7 / 4.0

RELATED EXPERIENCE
Phi Delta Theta Fraternity, University of Puget Sound, Tacoma, WA
Treasurer, August 2007-Present
• Manage a $65,000 annual budget.
• Collect and deposit dues. Record monthly membership dues in Excel.
• Authorize purchases and secure payments to outside vendors.
• Chair fund-review committee, which authorizes and distributes funds internally.
• Serve as liaison to Inter-Fraternity Council and Associated Student’s finance committees.

HH&M Landscaping, West Linn, OR
Co-Owner, August 2005-August 2006
• Recruited, hired and supervised a staff of 8 employees.
• Collected, deposited and recorded accounts receivable and payable.
• Coordinated advertising and customer service.
• Communicated with customers to provide bids on services.

PaineWebber, Portland, OR
Summer Intern, May-August 2005
• Worked as part of a team to create a system that efficiently calculated and organized cost basis information.
• Provided assistance to brokers and operations by performing tasks such as editing a trust establishment, answering client inquiries and establishing new accounts.
• Gained a thorough understanding of the essential functions within a securities and commodities firm.

ADDITIONAL EXPERIENCE
Office of the Registrar, University of Puget Sound, Tacoma, WA
Records Coordinator’s Assistant, May-August 2007

ACTIVITIES
Social chair on the executive staff of Phi Delta Theta Fraternity
University of Puget Sound varsity football team
Vice President of Future Business Leaders of America

SKILLS
Proficient in Microsoft Access, Excel, Word, and PowerPoint.
BELINDA K. PEYTON  
bkpeyton@ups.edu  
3810 North Jth Street  
Tacoma, WA 98416  
(253) 756-8888

OBJECTIVE  
A laboratory assistant position in a hospital or biological research institution.

EDUCATION  
Double Majors in Biology and Psychology GPA: 3.5 / 4.0  
University of Puget Sound, Tacoma, WA May, 2009

Honors: Dean's List, all semesters; Charles A. Dana Scholarship for academic achievement and leadership.

RELEVANT COURSEWORK  
Electron Microscopy Animal Physiology Organic Chemistry  
Cell Biology Genetics Physiological Psychology  
Biochemistry Mammalian Histology

LABORATORY SKILLS  

Organic Chemistry: extensive experience in wet chemistry, nuclear magnetic resonance, infrared spectroscopy, and gas chromatography.

Specimen Preparation: knowledge of critical point drying, sputter coating, vacuum evaporation, ultramicrotomy, and resin embedding.

Stereotaxic Surgical Procedures: experienced in anesthesia, suction ablation, and vascular perfusion.

RESEARCH EXPERIENCE  
Student Researcher  
University of Puget Sound, Spring 2007 and Fall 2008  
As part of a class, compared the renal structure of various stages in mouse development. Used corrosion casting and the Scanning Electron Microscope. Also conducted a neurohistological study of paraffin-embedded rat brain tissue.

SCIENCE TEACHING  
Course Assistant, Biology  
University of Puget Sound, Biology Department, Fall 2007-present  
Assisted students in the design and execution of experiments and assisted in grading tests. Helped mediate the team-work process and resolved student conflicts concerning design and distribution of work.

Laboratory Instructor  
University of Puget Sound, Psychology Department, Fall 2006-Spring 2007  
Prepared rats for stereotaxic suction and electrolytic brain lesions. Supervised laboratory activities and wrote detailed lab notes.

VOLUNTEER ACTIVITIES  
Science Tutor, Grant Middle School, Tacoma, WA Fall 2006 - present

Listing relevant coursework is an effective way to demonstrate core skills and knowledge. However, once you have gained related professional experience it should be the first section that you remove. Remember to only list classes that are relevant.

A skills section can supplement your experience and help you target your resume for a specific position.
Sample Chronological Resume

Eric Schiff
952 Union Ave
Tacoma, WA 98416
eschiff@ups.edu
(253)555-4525

OBJECTIVE
Looking for positions in the adventure travel industry that will use administrative skill set and outdoor expertise.

EDUCATION
Bachelor of Science degree in Exercise Science, Minor in French
University of Puget Sound, Tacoma, WA    Expected May 2009
WFA and CPR training, University of Puget Sound    August 2006

EXPERIENCE
Office Assistant, Student Development Office
University of Puget Sound, Tacoma, WA    September 2007-present
• Collect event evaluation data in excel and provide basic analyses in graphs and charts.
• Prepare correspondence and presentations for senior staff and represent office in a professional manner on the phone and in person.

Trip Leader
Backroads, Berkely, CA    June-August 2008
• Led a variety of trips (biking, hiking, and multisport) for groups averaging 18 people at a time.
• Planned and executed itineraries for 3-7 day trips, incorporating the needs of diverse age and ability ranges.
• Coordinated all aspects of the trips, including food and accommodations.
• Received multiple thank you letters from participants for providing enjoyable, trouble-free vacation experiences.

Passages Overnight Trip Leader
University of Puget Sound, Tacoma, WA    August 2006-2008
• Selected to lead groups of new students on 3-day outdoor adventures as part of award-winning university orientation program.
• Organized all aspects of trips for groups of 10 students: food, equipment, and trip planning.
• Facilitated group discussions, team building exercises, and trust activities to foster relationships between students new to campus.

OUTDOOR EXPERTISE
Led informal groups of less experienced outdoor enthusiasts since 2003.
Comfortable leading/teaching the following topics:
• Backpacking
• Hiking
• White-water Rafting
• Biking

LOCATIONS
Bulk of experience located in western states, particularly California, Washington, Oregon, and Montana.
Sample Functional (Skills) Resume

Dorothy Y. Wheelock
473 James Road, Tacoma, WA 98406 • (253)879-3333 • dyw@ups.edu

OBJECTIVE
To capitalize on my training, program development and marketing skills in any entry level Training and Development position.

EDUCATION
University of Puget Sound, Tacoma, WA, December 2008
Bachelor of Arts in Psychology, Minor in Theater Arts

SKILLS
Training
• Developed and presented 10 educational seminars/events for 126 residents of a campus residence hall.
• Instructed new employees regarding wait staff policies, procedures, and customer service techniques.
• Tutored students one-on-one for psychology and communication courses.

Program Development
• Planned and organized Community Involvement and Action Center (CIAC) events such as Winterfeast and Community Service Fair.
• Recruited and supervised 50 campus and community volunteers for a neighborhood cleanup campaign.
• Managed a programming budget of $15,000.

Marketing
• Communicated with local nonprofit groups and campus constituents.
• Created marketing and promotional materials for the CIAC and Mortar Board Events.
• Solicited articles for the CIAC Newsletter, edited submissions, and designed the layout using desktop publishing tools.

EXPERIENCE
Resident Advisor, University of Puget Sound, Tacoma, WA, August 2006-present
Server, East West Café, Tacoma, WA, June 2005-August 2006
Event Coordinator, Community Involvement and Action Center (CIAC), August 2004-May 2005

ACTIVITIES
National Association for Training and Development (Student Affiliate)
Tutor, Center for Writing, Learning and Teaching
Mortar Board (National Honor Society)
Spurs (Sophomore Honor Society)
Submitting a Resume Online?

A resume can be both attractive and in a format allowing for electronic scanning. Organizations use different scanning hardware and software, often making it challenging to know for sure how to format a resume. The best way to ensure that the document is formatted properly is to call the company’s Human Resources department and find out if they have specific guidelines. If you do not have this information, there are steps you can take to optimize scannability:

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**Tips for Creating a Scannable Resume**

by Kim Isaacs, Monster.com

- One of the most important factors is whether or not letters touch each other. Scanning systems have difficulty interpreting characters that are melded into one, so make sure that no characters touch each other. Italics and bold are both fine, as long as the letters do not touch.
- Choose a common, non-decorative sans serif font (such as Arial or Tahoma) and keep the font size between 10 and 14 points.
- Underlining and horizontal/vertical lines are okay, as long as the lines do not touch any of the letters.
- Avoid columns (the Optical Character Reader reads the text from left to right).
- Do not use round, hollow bullets (they may be interpreted as the letter o). Instead, choose round, solid bullets.
- Do not use ampersands, percent signs or foreign characters (they may not translate properly).
- Add a space in between slashes so that the slash doesn't touch the letters (e.g., IT / IS).
- Use light-colored paper (white is best) and avoid paper that contains dark speckles.
- Do not staple your resume.
- Mail your resume in a flat envelope. If you fold your resume and the crease lands on a line of text, the laser toner may flake off and render the entire line unreadable.
- Make sure you have keywords throughout your resume, so that you will be found in a database search.

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Fifty-three percent of all “internet hires” come through a company’s own website. Twenty-three percent come from job sites, like Monster.com or CareerBuilder.com. -CareerXroads
# Sample Scannable Resume

CYNTHIA F. KITTREDGE  
1302 North Lawrence, Tacoma, WA 98416 253-756-8996  
83 River Street, Naples, FL 37079 406-638-3299 cfyfe@ups.edu

## KEYWORD SUMMARY


## EDUCATION

Bachelor of Arts in Religion, Secondary Concentration in French  
University of Puget Sound, Tacoma, WA May 2008  
GPA: 3.6 / 4.0; GPA in Major 3.7 / 4.0

South India University, Madurai, India  
Intensive course work in Tamil culture, language, politics, and religion, including home stay, travel, and independent research, Fall 2006

## ARTS EXPERIENCE

Project Assistant, Percent for Art, New York City Department of Cultural Affairs  
New York, NY, May - August 2008  
Participated in all aspects of public arts administration and project development. Organized and conducted outreach to special-interest communities. Documented and photographed museum collection of contemporary Hispanic art. Maintained and updated largest artists’ registry in the U.S.

Curatorial Assistant, Tacoma Art Museum  
Tacoma, WA, August 2006 - May 2008  
Upgraded existing record system into computerized slide database and index. Produced and filed new slides; preserved existing collection of slides. Initiated and executed project to expand Asian collection utilizing student photographs.

## ADDITIONAL EXPERIENCE

Tutor, English as a Second Language Program, Tacoma, WA, October 2005-present  
Taught English vocabulary, grammar and composition to foreign school-aged students. Taught reading, writing, and comprehension skills to students of adult literacy program. Established instruction geared for individual students’ needs and abilities.

Wrote articles covering campus events, issues, and concerns. Interviewed and reviewed guest artists and performers. Met regularly with students and college officials to research news and views around the campus.

## SKILLS / INTERESTS

Skilled with Microsoft Word, Access, Excel, and PowerPoint. Advanced competency in French. Extensive international travel in India, Sri Lanka, France, and Italy.
Letters for your job search

There are several different types of letters you will use in your job search. The most common are application, inquiry, networking and thank you letters. Each type of letter is described below.

Letter of Application / Cover Letter
This letter is used to introduce your enclosed resume and to generate interviews. Use this type of letter in response to specific job advertisements and vacancy announcements. Demonstrate how your qualifications fit the requirements of the position. Study the position description carefully and decide on one or more themes – education, experience, interests, responsibility, etc.–that show persuasively how well you fit the needs of the position.

Letter of Inquiry
Also known as the prospecting letter, this letter is used to inquire about possible opportunities and vacancies. Target specific individuals in specific organizations. Structure this letter similarly to the application letter, but instead of using position information, focus on broader occupational and/or organizational dimensions to describe how your qualifications match the work environment. Because you are initiating this contact, suggest an action plan.

Networking Letter
This letter is designed to generate informational interviews—not job interviews. Informational interviewing involves meeting with individuals who can give you specific information about career fields or organizations that interest you. State your purpose clearly in your letter. If you were referred by someone, mention that in your first paragraph. Often, your resume is not attached to the networking letter, but may be provided during the informational interview.

Thank You Letter
Thank you letters are one of the most important, yet least used tools in a job search. These letters are used to establish goodwill, to express appreciation, and/or to strengthen your candidacy. The basic rule of thumb is that everyone who helps you in any way should get a thank you letter. When used to follow up on employment interviews, thank you letters should be sent within 24 hours. Also, be sure to send thank you letters to each of your contacts who granted you informational interviews and to people who provided references for you.

88%

Eighty-eight percent of employers surveyed said that “employee referrals” brought in the highest quality job applicants.
–Booze/Allen/Hamilton
Guidelines for Letters of Application (Cover Letter)
*_Used in response to specific job advertisements and vacancy announcements._

Your present address
City, State Zip Code

Date of Letter

Individual’s name
Title
Employer
Street address
City, State Zip Code

Dear _______________

First paragraph Come right to the point. Hook the reader and reveal your purpose and interest. Identify the position and your source of information. Introduce why you think you are qualified for the position.

Second paragraph Outline your strongest qualifications that match the position requirements. As much as possible, provide evidence of your related experiences and accomplishments. If necessary, break into two paragraphs and use the second paragraph to highlight academic accomplishments and experience. Both curricular and co-curricular involvement can be included.

Final paragraph Reiterate your interest in the position. Refer the reader to your enclosed resume. Include your phone number in the letter (and perhaps your e-mail address) and offer any assistance to help in a speedy response. Thank the reader for his or her time and consideration.

Sincerely,

(Your handwritten signature)

Type your name
January 5, 2008

Jennifer Wilson
Human Resources Director
Advantage Communication
457 Fowler Road
Seattle, WA 98102

Dear Ms. Wilson:

Please accept this letter as an application for the technical writer position. I was excited to learn via Advantage Communication’s homepage of this opening. I read about your recent merger with Edge Technology and am confident that I will make great contributions to your newly expanded team.

As a technical writing intern with Syntax, Inc., I collaborated on the development and revision of a manual for their new connectivity project. I wrote, edited and revised instructional materials for our clients. This work involved frequent team meetings and leading client focus groups.

As a summer customer service representative with Amazon.com, I quickly became adept at assessing customer needs and referring them to appropriate staff for service. In addition, my technical background includes working as a student computer lab supervisor. In this position, I installed new hardware and software, solved a variety of networking problems, and assisted students in all facets of their work in the lab. I am confident that this mix of skills will contribute to my success with Advantage Communication.

I am interested in discussing this internship opportunity with you at your earliest convenience. If you would like additional information or to arrange an interview, please call me at 253.879.3161. Thank you for your consideration.

Sincerely,

Sara Fieldhouse

Sara Fieldhouse
Guidelines for Letter of Inquiry

Your present address
City, State Zip Code

Date of letter

Individual’s name
Title
Employer
Street Address
City, State Zip Code

Dear ________________:

First paragraph Indicate your interest and reveal your source of information.

Second paragraph Present your strongest qualifications. Focus on how your skills match the occupation or organization. Indicate what you know about the organization. You may expand to a third paragraph to highlight academic experience that relates to the position.

Final paragraph Indicate what you would like to happen next. For example, “I will call you during the week of November 9th to inquire about the possibility of an interview. Please call me if you would like additional information or to schedule an interview.” Include your phone number and e-mail address and thank the reader for taking the time to review your resume.

Sincerely,

(your handwritten signature)

Type your name
508 South Warner  
Tacoma, WA  98407  

January 5, 2008  

Human Resources Director  
Tacoma General Hospital  
123 Tacoma Avenue South  
Tacoma, WA  98403  

Dear Human Resources Director:  

Beverly Jones, a Tacoma General staff member in the pediatrics department, suggested that I contact you. I am interested in learning about job opportunities as a **lab technician** at Tacoma General Hospital. As a senior at the University of Puget Sound pursuing a degree in Biology with a minor in Chemistry, I am interested in putting my technical and research skills to work.  

As an intern at Allenmore Hospital, I became familiar with medical terminology, participated in a one-week training on laboratory safety issues, and assisted with rotation and inventory control of supplies. In addition, I handled specimens and performed routine laboratory testing and analysis.  

While a student at Puget Sound, I completed extensive coursework in biology and served as a research assistant for Dr. Joe Jones. I assessed suitability of available methods for drug metabolism studies and assisted Dr. Jones in conducting his research and analyzing data. The culmination of this research effort was the presentation of a paper I wrote on the study to the American Biological Association National Conference.  

I will call you next week to inquire about the possibility of meeting with you to discuss possible opportunities. Please feel free to call me with any questions at (253) 555-5151. Thank you for your time and consideration.  

Sincerely,  

Karen Jones  

Karen Jones
234 West Pine Street
Tacoma, WA  98407

January 5, 2008

Cedric Thomas
Director of Development
Seattle Art Museum
1155 Spring Street
Seattle, WA  98105

Dear Mr. Thomas:

I located your name through the Alumni Sharing Knowledge Network at the University of Puget Sound and am writing to seek your professional advice. Currently, I am exploring opportunities in fundraising and development and am especially interested in organizations relating to the arts.

My goal is to learn more about the development profession. I am interested in talking with you regarding any suggestions you may have on how to prepare to enter this field.

I will contact you within the week to see about the possibility of arranging a brief meeting. Thank you very much for your time.

Sincerely,

José Wyatt

José Wyatt
Thank you letter etiquette…

The first step to writing an effective thank you letter is in reading the notes you took during the interview. If you didn’t actually take notes during the interview (and why not?!), then write down everything you can remember about the interview, including:

- Your interviewer's name (and correct spelling). If there was more than one interviewer, each should receive his or her own personalized thank you letter. Consider asking for a business card at the conclusion of your interview so you have the information.
- Key points discussed during the interview. These should include the objective of the position being targeted, the goals and missions of company or department, and any special concerns or considerations discussed.
- Any positive contributions you feel your particular skills and experience will bring to this particular company's goals and missions (including any that were actually discussed during the interview).

A thank you card, handwritten (if your writing is neat and legible), may be preferable to an actual letter, as it will provide a more personal and professional impression - over what could otherwise appear to be a standard form letter. Business letter format is always recommended for fields such as consulting and finance.

Send your thank you letter or note as soon after the interview as possible. The same day is not too soon.

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Dear Ms. Harned,

Thank you for taking the time to meet with me at the University of Puget Sound Career Fair today. I certainly appreciate your time and attention in the midst of so many students seeking jobs.

I look forward to an opportunity to visit Aerial's Portland office and speak to you further about the trainee program. I will contact you next week to arrange an appointment.

Thanks again!

Seward Wheelock

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Dear Mr. Howarth,

Thank you so much for your willingness to help me launch this next phase of my career. I especially appreciate your offer to introduce me to other professionals in your network, which will be extremely helpful in establishing myself. I will be sure to keep you informed of my progress. Please do not hesitate to contact me if you think of any additional suggestions for expanding my network.

Sincerely,

Langlow Jones
111 South J Street  
Tacoma, WA  98407  

January 5, 2008  

Celeste Owen  
Director of Marketing  
Amazon.com  
888 King Hill  
Seattle, WA  98105  

Dear Ms. Owen:  

Thank you for the opportunity to interview yesterday for the marketing analyst position. I appreciated your hospitality and enjoyed meeting you and the members of your staff. 

The interview confirmed my initial positive impression of Amazon.com and reinforced my strong interest in being associated with such an exciting organization. I was particularly pleased to learn about Amazon.com’s commitment to ongoing training and development programs and overall interest in creating a positive work environment. My prior experience as a marketing intern for Syntax, plus my educational background in business with an emphasis in marketing, would enable me to become a strong contributing member of your team.  

Please let me know if there is any information that I can provide that will help you in your decision-making. You may reach me at (253) 555-2222. Thank you for your consideration.  

Sincerely,  

Paul Smith
Choosing Your Best References

References are important resources for your job search. Not only can recommenders attest to the quality of your work performance, habits and skills, but they also can help you identify possible new employers – especially if you are looking for leads in their field. References often take a personal interest in your search.

Seek responsible people who know your work and who like you. Some examples of on-campus references might be supervisors for your on-campus job, teachers or professors, university staff members, and coaches. Off-campus recommenders might include your immediate supervisor from a current or past job, internship supervisor, managers of other departments, the heads of organizations for which you volunteer, and professionals of any type with whom you have worked on prior jobs. It is not a good idea to list friends or relatives, since employers won't expect them to be objective and will probably not contact them.

Ask for permission from your references before you include them. Because it is important to your future to assume that these people will write a positive recommendation, ask them if they have any reservations about giving you a good reference. If someone is at all hesitant, you might decide not to include him/her on your list.

Give your recommenders some details about the position for which you are applying. Tell them what kind of information you would like them to include in their reference. You can even provide them with a copy of the job description. If it has been a while since you worked with someone, give that person a summary of what you have been doing, your accomplishments, and your ambitions. One way to remind them about your accomplishments is to provide a copy of your resume.

Different organizations will ask for references in a variety of ways. Some organizations might want you to list names and addresses or phone numbers so they can contact the recommenders directly, or they might want you to attach letters of reference with your application. Keep in mind that some previous employers may not be able to give references out over the telephone because of company policy. In that case, you may ask them to write a letter in advance that you can then photocopy for your potential employer.

Because 51 percent of applicants falsify information on their resume or job application, hiring managers want to talk to three people who can vouch for you.
-Society for Human Resource Management
References

Mr. James Johnson
Admissions Counselor
University of Puget Sound
1500 North Warner
Tacoma, WA 98416
(253) 756-0000
jj@ups.edu

Ms. Susan Jones
Department Manager
National Marine Fisheries Service
1234 56th Street
San Diego, CA 11111
(708) 555-0000
sjones@marinefisheries.com

Dr. Bob Roberts
Professor of Biology
University of Puget Sound
1500 North Warner
Tacoma, WA 98416
(253) 756-0000
br@ups.edu
RESUME ACTION WORDS

augmented  authored  balanced  bolstered  brainstormed  broadened  brought  budgeted  built  calculated  catalogued  centralized  certified  directed  disbursed  discovered  dispatched  displayed  distributed  documented  doubled  drafted  earned  eased  eclipsed  educated  edited  elevated  elicited  eliminated  employed  empowered  enabled  encouraged  endorsed  enforced  engineered  enhanced  enlarged  enlisted  enriched  enumerated  envisioned  estimated  evaluated  examined  exceeded  excelled  executed  exercised  expanded  expedited  explained  extended  extracted  fabricated  facilitated  familiarized  fashioned  figured  finalized  financed  forecasted  formed  formulated  fostered  founded  fulfilled  generated  grew  guaranteed  guided  halved  handled  headed  helped  hired  identified  illustrated  implemented  improved  increased  indexed  indicated  inferred  influenced  informed  initiate  innovated  negotiated  nominated  obtained  officiated  operated  orchestrated  ordered  organized  originated  overcame  overhauled  oversaw  participated  performed  persuaded  pinpointed  pioneered  planned  polished  prepared  prescribed  presented  prevented  prioritized  processed  procured  produced  programmed  projected  promoted  proposed  proved  published  publicized  purchased  queried  questioned  raised  rated  re-established  reified  reduced  refused  refined  reformed  regarded  regulated  rehabilitated  reinforced  rejuvenated  related  relieved  remedied  remodeled  reorganized  repaired  reported  represented  researched  researched  reserved  resolved  restored  retrieved  revamped  reviewed  revised  revitalized  revived  sanctioned  satisfied  saved  scheduled  screened  scrutinized  secured  selected  served  set goals  set up  settled  shaped  showed  simplified  smoothed  sold  solicited  solved  sought  spearheaded  specified  specified  spoke  sponsored  staffed  standardized  started  stimulated  streamlined  strengthened  stretched  structured  studied  submitted  supported  sustained  synthesized  systematized  tabulated  tailored  taught  terminated  tested  traced  traded  trained  transacted  transferred  transformed  translated  transmitted  trimmed  tripled  uncovered  undertook  updated  upgraded  used  utilized  validated  valued  verified  visualized  widened  withdrew  weighed  won  worked  wrote  wrought
How to Create a Scientific Poster
Instructions for Creating a Poster for Presentation

The Importance of Posters

- Presenting a poster provides an opportunity to practice your networking skills and expand professional contacts.
- Poster presentations enable attendees to engage with others in the scientific community and gather feedback regarding their respective research.

Elements of a Poster

All of the following elements are essential to a scientific poster, perhaps with the exception of the abstract. The organization and flow is very important because it allows the audience to understand the research in a sequential order. Audience members should be able to look at any one part of a poster and get a clear idea of the research. A typical poster format includes the following sections:

Title

- An engaging title captures the story of your research and is the “hook” that lures people to your poster.
- Include the name(s) of the author(s) as well as the name(s) of the institution(s) represented by each author. The author’s name(s) should be denoted with a superscript number that corresponds to their respective institution (see section “How to Create a Poster Using PowerPoint,” item #9, for instructions on inserting superscript numbers). The names of the institutions should be denoted with a superscript number that corresponds to the respective author(s).
- The logo(s) for each institution that supports the research should also be included in the title section. Typically, this will include the presenter’s home institution and the primary mentor’s institutional affiliation.
- The order of the authorship is as follows: you (first), collaborator(s) (middle), mentor(s) (last).

Example 1: Poster Title Format

Jessie Thomas¹, ³, XXX XXXX², XXX XXXX³
¹Fred Hutchinson Cancer Research Center, Seattle, WA; ²University of Washington, Seattle, WA; ³The University of Texas at Austin, Austin, TX

Abstract (optional)

Introduction

- Provide key background information.
- Explain why your research is important.
- Capture your audience by keeping the content concise.

Objective(s)

- State the specific question or problem that the research addresses.
- Communicate what you are doing, and why it is important.
Materials and Methods

• Briefly outline how assays, experiments, surveys or other means of data collection were conducted.

• Schematics can be helpful to show the experimental design, (e.g. flow chart of your process), but it’s not necessary to include every step that occurred throughout the process.

Results

• Use appropriate visual figures such as graphs, charts, diagrams, images, tables, gels, etc.

• Present what was discovered as a result of the hypothesis or goal.

• Create a figure legend to clearly identify each visual element of the poster. Be sure to include the figure number and a brief title/description for each figure. It is important that the figure legend placement (whether above, below or beside) is consistent throughout your poster. The figure number and colon should be denoted in bold, followed by the brief title/description in regular text.

**Example 2: Figure Legend Format**

```
Info B
  ▶
Info A
  ◀
Info C
  ◀
  ▶
```

**Figure 1:** This figure represents XXX.

Summary/Conclusions

• Highlight the key finding(s) of the research.

• What do your results mean?

• Does the data support or refute the hypothesis?

• Keep the conclusion(s) interesting, but simple and relevant.

• What is the take-home message?

Discussion/Future Research

• Describe the next steps involved in the research.

• Discuss the importance of data that does not support the hypothesis/research/objectives; i.e. “failures.”

References (optional)

Acknowledgements

• Acknowledge your mentor(s), professor(s), institution(s), source(s) of funding for the research and/or training program, including grant number(s).

• Mention sources of support for materials such as reagents or supplies (optional).
How to Create a Poster Using PowerPoint

1. Open Microsoft PowerPoint.
2. Click on “File” and select “New.”
3. Click “Format” and select “Slide Layout.” On the right-hand side of the page, select “Blank.”
4. Reference the instructions for the required poster size; a common size is 4 ft. wide by 3 ft. high.
   - It is important to know in advance what paper size your institution’s/department’s printer uses. Many printers use a defined paper roll dimension; therefore you may need to identify another print source for your poster.
5. To set the poster size, click “File” and select “Page Setup.” Within “Page Setup,” select “Custom” and enter 48 inches wide and 36 inches high [for a 4’ x 3’ poster]. Select “Landscape” as the orientation.
6. Click “OK.” If you get an error message that says the document is bigger than your printer, click “OK;” you do NOT want to use the Fix option.
7. To ensure consistent formatting and spacing, apply a grid to the slide. To insert a grid, click “View,” select “Grid and Guides,” set the spacing to 1” and choose “Display Grid on Screen.” The grid lines will not show up when the poster is printed.
8. To enter data and text on the slide, click “Insert” and select “Text Box.”
   - Title fonts should be between 80 - 96 points.
   - Section headers should be between 45 - 50 points.
   - Text fonts should be between 24 - 28 points.
   - Figure legend fonts should be between 22 - 26 points.
9. To insert a superscript number(s), go to “Format” and select “Font.” Then select the “Superscript” option. Superscript numbers are necessary when denoting the authors’ respective institution(s) on the poster. The superscript number goes after the authors’ names and before the corresponding name(s) of the institution(s).
10. To insert images onto the slide, click “Insert” and mouse over “Picture” to select “From File.” You may also copy and paste images onto the slide or drag the item onto the slide from the original source. You should always edit the images (in a program like Photoshop®) before inserting or pasting onto the slide.
11. To add a chart, first create it in Excel (making sure all of the colors and fonts are the same as those on the slide) and then copy and paste it onto the PowerPoint slide. Another option is to create the chart in PowerPoint by clicking on “Insert” and selecting “Chart.”
12. Tables and/or graphs can be created in Word, Excel or in the PowerPoint slide. If it is a large table or graph, it may be easier to create it in Word or Excel and then copy and paste it onto the slide. The format, font, and text can be edited in PowerPoint after the table or graph has been inserted onto the slide.
   If the table and/or graph is created in Word or Excel with the colors and fonts that match the PowerPoint slide, the table or graph can be pasted onto the slide as an image. To do that, select the table or graph in Word or Excel and click “Edit” and select “Copy.” Then go to the slide, click “Edit,” then “Paste Special,” and select “Picture (Windows Metafile),” but do not paste it as a link. If pasted as an image (picture,) the table or graph can be made larger or smaller to fit the desired size, but the content of the table or graph cannot be edited on the slide. If edits are needed, it will need to be done in the original Word or Excel document and then copied and inserted using “Paste Special” again. This method is preferred when doing more complicated tables or graphs.
13. To add a figure legend, create a text box above, below or beside the image, chart, table, or graph, and write the figure number and a brief title/description of the figure in bold. It is important that the figure legend placement (whether above, below or beside) is consistent throughout your poster.
14. When inserting logo(s), make sure the background color is consistent with the poster. To create a consistent background color, insert the logo image(s) (see instruction #10 above) and a Picture Toolbar will appear near the logo(s). Place the mouse over the toolbar and click the image that looks like a pen and reads “Set Transparent Color.” Next, click the logo background that does not match the poster background and it will automatically match the background color of your poster.
Poster Design Considerations

A poster should describe interesting aspects of your project and tell a clear story. Most people spend **three to five minutes** (or less) looking at a poster; therefore the poster needs to **deliver your message quickly. Choose ONE essential concept to address in your poster.** Before you begin selecting charts, graphs, and photos to include, ask yourself this question:

*If the viewer remembers only one idea about my work, what do I want that idea to be?*

Your answer will determine the theme of your poster; therefore everything included on your poster needs to support this theme.

- **Tell your story with graphics as much as possible.** An efficient way to structure a poster is to choose the graphics first and then write the “story” and arrange the spatial flow of the poster around the graphics.
- **Make graphics large enough** so that viewers can read them from a distance.

Formatting Basics

Your poster should look **simple and uncluttered.** Someone standing three feet away should quickly understand what each component is and why it is there. Illustrations and photographs should be clear and properly proportioned. Use high-resolution (between 200 – 300 dpi) images – images with a higher resolution than that will only waste file size and slow down the printing process. TIFF or GIF images are best.

- Use **left justification**, which has been shown to be the easiest to read.
- Keep text to a **minimum**.
- **Diagrams and a bulleted list** are more efficient than words or paragraphs.
- Apply a **1.5 line spacing** to everything except the Acknowledgements and References (if included) sections.
- Viewers cannot read small type from a distance. Use the **appropriate font size** per section header (Title fonts should be between 80–96 points; section headers should be between 45–50 points; text fonts should be between 24–28 points).
Creating Design Unity

- White space (sometimes called negative space) refers to any area not covered by a design element such as a picture, word, or letter. **White space guides the eye and makes the other components stand out.** If you have too much white space, your viewer's eye may wander. If you have too little white space, your viewers may get confused.

- **Be font consistent!** Times New Roman, Helvetica, and Arial are recommended because of their readability.

- Color should be used for emphasis, but be aware of the connotations that certain colors and color combinations carry. For example, black and orange carry the connotation of Halloween. In most cases, the background of your poster should be a solid color rather than a pattern.

Some Final Tips
Throughout the entire process, we encourage you to discuss the content of your poster with your mentor(s), professor(s), and/or peer(s).

- Ask your mentor(s), professor(s) and/or peer(s) to review your poster. After you have gathered feedback and incorporated the final edits, be sure to run spell-check.

- Due to the high volume of print production that occurs shortly before a poster session or conference, the turnaround time for poster printing is usually three to five business days. Simply put; **don't procrastinate!**

- Always request and thoroughly review the contract proof [a model of your poster printed to scale] prior to having your poster printed in full-size.

- For additional tips on how to successfully present graphical data in your poster, see Jean-luc Doumont’s summary of his presentation: *Effective graphical displays.* [http://www.fhcrc.org/science/education/undergraduates/](http://www.fhcrc.org/science/education/undergraduates/)
The Title of This Poster is Printed at 96 Points, in a Shaded Text Box

Author 1, Author 2, Author 3, (the authors and addresses are in 80 point font)
Institution 1, City 1, State 1, Country; Institution 2, City 2, State 2, Country 2, ...

ABSTRACT (48 point, bold)

Or
INTRODUCTION

The abstract or introduction section often goes here. This text is often in 24 to 36 point.

You can use color in your font to make emphases, or color in text box shading relate topics.

This is where you state the Hypothesis

Significance of the research problem

Key work already done by you (your mentor's group) or others. Very, very brief background information.

RESULTS

The major results are often displayed in the center of the poster.

Data tables can be pasted in from work or Excel or created directly in presenter point

You can group text boxes or objects.

You can align them to appear as a single column: select the text box, or object and under format, then position, you can set it to be located at a precise distance from the edge of the poster. All of the elements in the column can be registered using this method, or by using guides or by using the rulers on the edges of the slide screen.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Data 1</th>
<th>Data 2</th>
<th>Data 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>control</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>11</td>
<td>9</td>
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<tr>
<td>C</td>
<td>42</td>
<td>48</td>
<td>44</td>
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<tr>
<td>D</td>
<td>11</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>E</td>
<td>9</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

RESULTS (con'td.)

Sometimes it's helpful to state the interpretation of the data image as it's heading:

Over-expression of gene b is correlated with faster clearance of compound Y.

CONCLUSIONS

- New method for measuring compound Y is faster and more accurate
- Gene B is crucial for process Z.
- Need to further analysis on……

ACKNOWLEDGEMENTS

It's always important to acknowledge the funding source of your research by grant number and agency; as well as anyone who helped on the project that is already included as an author.
PowerPoint Templates for Poster Presentation and Image Library

Below is a list of sites that have several free, downloadable PowerPoint templates.

**PosterPresentations.com**

**Poster Session.com**
http://www.postersession.com/templates.php

**Wake Forest University Creative Communications**
http://www1.wfubmc.edu/creative/Send+and+Receive+Files/Poster+Templates.htm

**Genigraphics**
http://www.genigraphics.com/other/poster_templates.asp

**The Medical Illustration Unit**
http://miu.med.unsw.edu.au/downloads.htm

**Image Library**
The FHCRC owns a library of images that are not subject to copyright restriction. You can access these images for free by visiting: http://images.cpit.org/
Synthesis Modification of Lanthanide Phosphates Nanoparticles as Radioimmunoconjugates for Acute Myeloid Leukemia

Derek P. Wong, Alexandre H. Hernandez, John M. Pagel

FRED HUTCHINSON CANCER RESEARCH CENTER

Background

- Acute myeloid leukemia (AML) is the most common type of blood cancer in adults.
- Over 50% of AML patients receive intensive chemotherapy, but failure occurs in 30%.
- Rare circulating tumor cells (CTCs) are known to lead to recurrence.

Hypotheses/Objectives

1. Increasing length of PEG linker
2. Decreasing PEG linker

Materials/Methods

- Synthesize PEGylated P-glycoprotein nanoparticles (NPs) for AML therapy.
- Evaluate the effect of PEG linker length on the stability and efficacy of the nanoparticles.

Conclusions/Future Work

- PEG linker length significantly affects the stability and efficacy of the nanoparticles.
- Future research will focus on optimizing the linker length for improved therapeutic outcomes.

Acknowledgments/References

- This research was supported by the National Institutes of Health (NIH).
- Further details can be found in the attached references.

Figure 1: Synthesis scheme of PEGylated P-glycoprotein nanoparticles.
A Reverse Genetic Screen in Zebrafish Identifies sec24b and Ipp as Genes Required for Convergent Extension

Sarah Debs*, Crystal Davey†, Dr. Cecilia Moens†
*Whitman College, †Fred Hutchinson Cancer Research Center, Division of Basic Sciences

The planar cell polarity pathway mediates several developmental processes in vertebrate embryos.

Problem: Each year, over 300,000 babies worldwide are born with neural tube defects (NTDs) that can lead to permanent nerve damage or death.

NTDs Causes: Mutations in the planar cell polarity pathway (PCP), the process by which cells are correctly oriented and localized during development.

PCP Pathway
- Zebrashif facial branchiomotor system (FBNs)
- Mouse stereocilia polarization
- Mouse NTD
- Zebrafish CE

Hypothesis: specific PCP genes will be required for distinct PCP processes.

Using the CRISPR/Cas9 system to conduct a reverse genetic screen in zebrafish.

1. Guide RNA (gRNA) binds DNA target
2. gRNA directs Cas9 to site
3. Cas9 cuts

Microinjection of gRNA & RNA encoding Cas9 enzyme into 1-cell embryo.

Candidate genes screened

<table>
<thead>
<tr>
<th>Gene of Interest</th>
<th>Link to core PCP pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>dact1, dact2</td>
<td>Binds vang2 and cdc11 independently</td>
</tr>
<tr>
<td>fuzzy</td>
<td>Downstream of cdc11, apical actin assembly</td>
</tr>
<tr>
<td>gpcp1, gpcp2</td>
<td>Binds vang2</td>
</tr>
<tr>
<td>lpp</td>
<td>Genetically interacts with vang2</td>
</tr>
<tr>
<td>mag2</td>
<td>Binds vang2</td>
</tr>
<tr>
<td>myo6a, myo6b</td>
<td>Part of gpc complex</td>
</tr>
<tr>
<td>nos1a, nos1apb</td>
<td>Co-localizes with vang2 and scrib</td>
</tr>
<tr>
<td>ngrp11, ngrp11</td>
<td>Stabilizes cdc11</td>
</tr>
<tr>
<td>sec24b</td>
<td>COPII involved in vang2 trafficking</td>
</tr>
<tr>
<td>testin</td>
<td>Genetically and physically interacts with vang2</td>
</tr>
</tbody>
</table>

Ipp and sec24b are required for convergent extension, but not FBMN migration.

Ipp is required for floor plate planar polarization.
- Core PCP components vang2, scrib, fzd3a are required for planar polarization of the zebrafish floor plate (fp).
- sec24b does not appear to be required for fp polarity.

qPCR confirms CRISPR injected vang2 & Ipp are successfully cut.

5' - 3'

Conclusions & Future Directions

Findings: sec24b disrupts CE and Ipp disrupts CE and fp polarity without disrupting FBMN migration.
- Therefore, while core genes are conserved, different phenotypic processes recruit specific genes.
- Confirm sec24b CRISPR cutting with sequencing and qPCR.
- Raise mutant fish to establish stable mutant lines to confirm phenotype.
- Continue reverse genetic screen to elucidate additional key genetic players in specific PCP phenotypic processes.

Acknowledgments & References

Investigating the Protective Role of the Peroxisome in Stress Response with C. elegans

Lauren Hillers* and Carissa Perez Osen*, Ph.D.
Hope College, Holland, MI, Fred Hutchinson Cancer Research Center, Seattle, WA

Background

The Peroxisome

Peroxisomes are organelles present in most eukaryotic organisms. They function in metabolism by carrying out oxidation of very long chain fatty acids. In addition, they are involved in the biosynthesis of ether-linked lipid which are proposed to play a key role in stress response.

Methods

Caenorhabditis elegans were fed bacteria expressing interfering RNA (RNAi) to inhibit expression of apr-5 and apr-13.

Stress assays were completed under several conditions. The assays exhibited a decreased survival for RNAi knockdowns after stress treatment. Abolition of peroxisome biogenesis hindered the worms ability to recover from stress.

Minor Reduction in Longevity

Mean lifespans of peroxisome biogenesis knockdowns were only slightly reduced. Disturbance of peroxisome function in adulthood does not seem to affect longevity.

Methods cont.

Stress Assay

Survival analysis

Broods

Results

Elevated C16:0 Abundance

Fatty Acid Abundance

Triacylglycerol:Phospholipid Ratio

Peroxisome biogenesis knockdowns resulted in increased C16:0 abundance and overall increased TAG:PL ratio signifying disrupted normal peroxisome function.

Increased Stress Sensitivity

0.5mM H2O2 Survival Graph

Importantly, the stress sensitivity of RNAi knockdowns was not relevant to the survival graph.

Minor Reduction in Longevity

Mean lifespans of peroxisome biogenesis knockdowns were only slightly reduced. Disturbance of peroxisome function in adulthood does not seem to affect longevity.

Future Work

• Targeting 3 oxidation and ether-linked lipid synthesis pathways to prove that ether-linked lipids are vital for stress response
• Using HPLCMS to quantify ether-linked lipids in prokine knockdowns
• Examining the phenotypic differences seen with various prokine knockdowns

Acknowledgements

I would like to thank the members of the Osen lab. Without their guidance and support, this project would not have been possible. I am also grateful to Dr. Covey and Dr. Juricek for their advice and support throughout this project.
Optimizing Transduction of CD8+ T Cells by HA-1H TCR Specific Lentivirus

2014 Best Poster Award

Methods

Results Cont’d

Overall Conclusions

Future Directions

Acknowledgements
Cross-talk between nonsense-mediated mRNA decay and proteasome-mediated protein degradation

Heather Johns1,2, Qing Feng1,2, Sujatha Jagannathan1,2, Robert Bradley1,2
Public Health Sciences1, Basic Sciences2, Fred Hutchinson Cancer Research Center, Seattle, WA; Whitman College3, Walla Walla, WA

Introduction
Ablation RNA and protein synthesis has been linked to the pathology of a diverse range of neurodegenerative diseases such as Alzheimer’s disease3. Cells have quality control pathways to detect errors in gene expression and eliminate the resulting aberrant mRNA and protein products. However, it is unknown whether these pathways independently monitor each step of the gene expression process or whether they work together.

Nonsense-mediated mRNA decay (NMD) is a quality control pathway that eliminates mRNAs that contain a premature termination codon. lp frameshift protein 1 (UPF1) detects premature termination codons in the mRNA and promotes degradation by an exonuclease.

Proteasome-mediated protein degradation
- Conserved quality control that destroys nonfunctional, aberrant proteins (and regulates normal protein turnover).

We hypothesize that there is cross-talk between NMD and proteasome-mediated protein degradation.

UPF1 stimulates cross-talk between NMD and the proteasome in yeast

UPF1 is important to both proteasome-mediated degradation and NMD in the elimination of truncated protein products resulting from mRNAs containing premature termination codons.

Experimental Strategy

Step 1: Add FLAG-tag to wild-type β-globin and 39ter β-globin reporters
Step 2: Transfer 293 T cells with β-globin reporters
Step 3: Inhibit NMD through UPF1 knockdown
Step 4: Measure β-globin mRNA levels by Western blot

Wild type β-globin is detected by FLAG antibody, but not 39ter β-globin

Expected Protein Lengths:
- 39ter β-globin: ~15 kDa
- 39ter β-globin: ~25 kDa

In order to observe the 39ter protein, we increased the feeding concentration. However, the 39ter β-globin protein was still not detected.

Discussion and Future Directions
Overall Goal: Explore the possibility of cross-talk between NMD and proteasome-mediated degradation in human cells.

Progress and Outcomes:
- Create reporter by inserting a FLAG-tag into both a wild-type (wt) β-globin and a mutant (39ter) β-globin with a premature termination codon at the 39th amino acid.
- Transfer reporter into 293 T human cells
- Knockdown UPF1 using siRNA silencing
- Test whether NMD is inhibited by UPF1 knockdown through qPCR analysis

Possible Explanations:
- NMD targets 39ter β-globin mRNA with high efficiency, causing degradation of the mRNA before detectable amounts of protein are translated.
- 39ter β-globin is short and runs off the protein gel.

References

Acknowledgements
- Robert Bradley Jr., FHCRC, BS and Ph.D.
- Whitman College in partnership with FHCRC Undergraduate Research Program – Supported by Howard Hughes Medical Institute.
- Damon Runyon Cancer Research Foundation 19/9 04-12 (R2B), the Ellison Medical Foundation AG-NS-1039-13 (R2B), Fred Hutchinson Cancer Research Center Institutional Funds (R2B).
The male oral cavity as an extravesical reservoir for bacteriuria, vaginismus-associated bacteria

Anthony Lopez, Erin dela Cruz, Jeanne Marrazzo, MD, MPH, David Fredricks, MD

University of Washington Cancer Research Center, Seattle, WA

2014 Best Poster Presentation Award

Objective:
Characterize the epidemiology of oral colonization of BVABs in men.
- Oral colonization of BVABs is common in men.
- BVABs are associated with BV and PID in women.
- BVABs are not well-studied in men.

Method:
- DNA sequencing
- qPCR
- Broad-range 16S

Future directions:
- Further studies to understand the role of BVABs in men.
- Evaluation of BVABs in other populations.
- Clinical implications.

References:
- Centers for Disease Control and Prevention. (2024). Sexually Transmitted Diseases Treatment Guidelines, 2024.
Presenting a Scientific Poster
Presenting your Poster

The Basics

Presenting a poster involves a lot of talking. Viewers are often more interested in hearing you explain the research as opposed to reading the content of your poster themselves. You should be able to explain the research and any relevant details in five minutes or less to anyone who stops by.

Remember that you are the expert and that people with more experience will be asking questions, not to test you, but out of genuine interest. It is important to know the project so that you can field questions without losing confidence. Experienced poster presenters know their work inside and out, forward and backward.

Be aware that you will be approached by experts in your field as well as those that are just curious about the research. To accommodate both the expert and the layman, a good rule of thumb is to prepare two talks. You should prepare a two-minute summary for people who seem interested in your research, as well as a more detailed version. Start with the short presentation and expand if the viewer(s) starts asking questions. It’s very important that you be able to explain every part of your data, figures, graphs, research, or results.

Deliver your message quickly!

The best presentations make just one point, loudly and clearly. You might have tested two or three closely related hypotheses, but they should all revolve around the same single point. To deliver just one point, do your best to develop a summary of your work that you can state in 25 words or less. Once you know the central message, you need to decide what supporting information to present. The best presentations generally follow the guidelines of a published paper, and include the following sections: Introduction, Materials and Methods, Results, Summary/Conclusions and Discussion/Future Research.

Determine the central message for each section of your poster in your presentation.

What is the central message of your Introduction? This section should start with your general research objectives, then provide a few lines about the context of your work, and end with a clear statement of the hypotheses or predictions that you tested.

What is the central message of your Methods? Provide the bare essentials with regard to the subjects, study site, and protocol. Don’t be so brief that the viewer can’t figure out what you did, but do give some thought as to what is really relevant to this particular talk. If some facet of your research is peripheral, leave it out.

What is the central message of your Results? What did you discover? Did your tests come out the way you expected?

What is the central message of your Summary/Conclusions and Discussion/Future Research? This is where you deliver the take-home message. Again, in 25 words or less, what is the dramatic finding that you want your audience to remember? And why should they care? This is very important, because viewers want to know what you did and why it is significant.
How to Deliver a Presentation with Confidence

Know the purpose of your speech.
General purposes of speeches are to: inform, persuade, recommend, request or entertain. (Pixton, D.W. & Salom, L.G., 2004).

Prepare your presentation well before the day of delivery.
This will decrease your nervousness considerably. (O'Hair, D., Rubenstein, H., & Stewart, R., 2006). However, being nervous is okay, it shows you care! If on presentation day you are still nervous, take a deep breath, relax, and just do your best. Consider having a bottle of water on hand since you will be doing a lot of talking.

- Adequate preparation includes: doing the necessary research to establish a well-founded knowledge of the topic; verbally practicing the presentation in order to make changes where needed; and ensuring the format is well-organized.
- Practice, Practice, Practice. There is a reason this word is repeated three times – there is nothing more important than practicing the delivery of your presentation. The more prepared you are, the better your presentation will be.

Use body language to show that you are engaged and enthusiastic about your presentation.

- Body language includes eye contact, facial expressions, gestures, body posture, and movement. Eye contact is the most essential attribute to keep the audience engaged. (Gareis, E., 2006).
- Avoid reading the content of the poster.
- Keep your hands out of your pockets and away from lecterns and podiums.

Create drama!

- Speak with enthusiasm! The eagerness of an enthusiastic speaker makes the audience want to listen. (Robertson, C.H.).
- Vary the speed and tone of your voice, which will make your presentation more dynamic and therefore appealing.
- Insert drama with statements such as, ‘and then, something really interesting/surprising/ alarming occurred;’ ‘let me tell you what happened next;’ and ‘we were surprised to learn.’

Don’t BS “the expert.”

- If you don’t know the answer to a question from a poster session judge, investigator, etc., respond with an open-ended question as a way to foster constructive interaction and defuse natural defensiveness. For example, a response such as: ‘That’s an excellent question/suggestion, etc.’ followed by a statement such as: ‘I hadn’t considered that;’ ‘What would you recommend in that instance?’ How would you suggest resolving that situation?’ shows that you are willing to learn as opposed to being close-minded.

Turn questions back to the audience.

- If you don’t know the answer to a question from an audience member, respond with, ‘That’s an excellent question/suggestion, etc.’ and then turn the question back to the audience by saying, ‘What would you recommend in that instance?’ or ‘How would you suggest resolving that situation?’ This strategy will engage the audience and make your presentation that much more interactive.


# Sample Poster Evaluation Form

**Presentation Evaluation Sheet (NMSU/FHCRC Interns)**

Name of Presenter: ________________________________  
Poster number or time: ________________________________

**INTRODUCTION**  
**Sufficient background information?**  
1 2 3 4 5  
Be sure to explain WHY your project is important, and how it relates to a broader context (e.g., HOW does it fit in to existing problems/questions?)

**Clarity of objectives**  
1 2 3 4 5  
What is the MAIN purpose of this study? What question are you trying to answer? Be sure to explain WHY this work is important.

**Formulation of hypothesis**  
1 2 3 4 5  
Be sure to state a specific hypothesis.

**METHODOLOGY**  
**Clarity of experiment design or study**  
1 2 3 4 5  
Explain HOW you are testing your hypothesis. Remember that not everyone is an expert in your area of technological expertise, so be sure to explain your techniques/methodology for a general audience.

**Methodology fits hypothesis/objectives?**  
1 2 3 4 5  
In addition to explaining HOW your technology/methodology works, take a minute to explain WHY your methodology is appropriate for your question.

**RESULTS and DISCUSSION**  
**Explanation of analysis/data/results**  
1 2 3 4 5  
Be sure you can walk us through your analysis, and tell us about your results. Spend time explaining graphs and figures and walk your audience through the main highlights of your data.

**Discussion of importance/contribution**  
1 2 3 4 5  
Once you have walked your audience through your results, be sure to point out WHY your results are informative (even if you are rejecting your hypothesis, this is still informative). *Tie this part back to your initial introduction of the problem/question (use this time to "close the loop" between your initial question, your data and conclusion).*

**OVERALL**  
**Organization and flow**  
1 2 3 4 5  
Clarity of presentation  
1 2 3 4 5  
Practice your presentation with some lab members or fellow interns in advance!

**Visual arrangement/layout**  
1 2 3 4 5  
Make sure to use a large font, and avoid having your poster be too small or too busy.

**Handling questions**  
1 2 3 4 5  
Listen carefully to the question, and don’t hesitate to ask for more information about the question if you are not sure what is being asked.

**ADDITIONAL COMMENTS**

Total points__________________
Extra Personal Statement Examples

The following examples are intended to provide a range of exceptional to mediocre personal statements. These statements are not organized in any particular order.

**Extra Personal Statement #1**

I looked across the field as my brother lit the fuse to our first homemade firecracker. He came running towards me as I saw the small plume of smoke from the burning fuse. Out of breath, our hearts pounding, we waited... and waited. Nothing. When we finally gathered the courage to go examine the remains of our project; we found a huge hole had burned in the side of the cardboard tubing we had used. It was back to the drawing board, back to our “tree-house” fully equipped with test-tubes, chemistry set, battery-powered hot plate and of course, safety equipment. This was my humble beginning in science.

Despite my involvement in experimental chemistry as a young child, I soon realized that this was not my passion; however, the trial-and-error methods and problem solving skills required for successful results did help me decide that I wanted to be a scientist. My sophomore year in college, I was named a HHMI Undergraduate Research Scholar, and I began researching antibiotic resistance mechanisms in Staphylococcus aureus. One of my specific projects involved examining the association between the use of household disinfectants and the acquisition of antibiotic resistance in microorganisms; we have identified several genes previously linked to antibiotic resistance that exhibit altered capabilities in mutants expressing reduced susceptibility to household cleansers.

Although my research often encourages me to reexamine my use of common cleansing agents and antibiotics, I worry that the link between laboratory research and public knowledge is too weak, allowing many solved problems to continue to plague the community. For instance, the scientific population generally understands that the misuse and overuse of antibiotics can lead to highly resistant populations of microorganisms; however, living near the border, I overwhelmingly observe people traveling to Texas to obtain antibiotics that would require prescriptions in the United States. Not only are these people taking inaccurate doses of the drugs, but they also take medicines that have no efficacy in treating their specific illnesses. They do not understand that the antibiotics they are using are not treating their illness and that by using these drugs, they are contributing to a much greater problem.

This inability to communicate scientific findings to the public has motivated my future research and career goals. Firstly, no matter where my scientific career takes me, I want to directly share my knowledge with those removed from the research process so that they may benefit from my findings. Secondly, I am interested in researching host-pathogen interactions and/or drug design for major clinical pathogens. More specifically, I would like to examine the mechanisms of viral oncogenesis or immune responses to bacterial infections and the possible ways to inhibit these processes. These areas of investigation will allow me to more closely understand questions of major concern to the general public which will further support my ultimate goal of converting laboratory research into public knowledge.

From curious young chemist to developing research microbiologist, I believe my background and work ethic would benefit the scientific community. Despite my average GRE scores, I have been successful in my previous endeavors both within and outside of research, and I hope to contribute significantly to science in the future. Graduate school is the natural path to achieve my dreams, and I believe that Stanford’s outstanding program in microbiology would give me the education and preparation I need for a career in research.

A few years after my brother’s and my initial attempts to simulate the deafening firecrackers from the store, I sat kneeling behind our protective wall. When the countdown reached “o,” I felt my ears ringing and saw the large ring of dust rising into the air. My dad turned to us and I saw him mouth, “That is enough.” About five years after abandoning my introduction to the scientific method through experimental chemical explosives, I decided I was going to be a microbiologist.
Extra Personal Statement #2

My name is Camryn Albright and I am a senior at the University of California, Berkeley. Initially, like many other biology majors, I began college with the goal of becoming physician. My heart goes out to people afflicted with illness and disease and to the families devastated by such news. Naturally, my interest in medical research and pre-med programs led me to discover the on-campus Howard Hughes Medical Institute Research Scholars (HHMI) - and Minority Access to Research Careers (MARC) programs. Being a part of both programs has helped me to realize that my true interests lie in research and helped me refocus my goals towards a career in biomedical research rather than in the clinical arena.

In the HHMI program, I was mentored in developing teaching and learning activities by Dr. Michelle Meyer, a biology educator who uses a scientific approach to understanding the most effective approaches to helping students learn. I contributed to the development of an in-class activity that used raw data generated in another professor’s laboratory. This activity was designed to emphasize several basic principles of molecular biology and we adopted a scientific teaching approach to assess student learning and attitude with respect to the topic. To keep pace with my curiosity and my desire to contribute to laboratory research, I began generating my own raw data for students to use in future in-class activities. As I carried out experiments to generate data for these activities, I realized that I wanted to establish a career focused on cellular and molecular biology.

My lab research experience began in Dr. Brad Andersen’s laboratory, which studies the regulation of the cytoskeleton in embryonic and somatic cells. It was here that I generated the raw data for my education project. Using a fluorescent protein construct tagged with a signal sequence and ER targeting sequence, I generated mutations in these targeting sequences using site-directed mutagenesis, and then expressed the wild-type and mutant constructs in cultured human cells. The raw data (in the form of fluorescence micrographs of cells expressing these constructs) was then used in an in-class case study exercise in an introductory biology class focused on protein localization. Students were shown either raw (i.e. actual) data versus cartoon representations of the data, and I collected data on student learning and attitudes. I presented results of my data at the 2009 National SACNAS Conference in Dallas, Texas and completed an undergraduate thesis based on the research I conducted.

To further equip myself for graduate school and for a career as a researcher in biomedical science, I was accepted to the Minority Access to Research Careers (MARC) program. As a MARC fellow, I have been working Dr. Brad Andersen's lab on a project that is looking at the importance of the YPEL-5 protein in the final stages of cytokinesis. YPEL-5 was a protein discovered in a genome-wide RNAi screen that has a role in cell division. I have been depleting human HeLa and RPE1 cells of YPEL-5 by RNAi, and I have been able to observe a very late cytokinesis defect in RPE1 cells, but have not been able to observe any obvious phenotypes in HeLa cells, suggesting that YPEL-5’s role in cytokinesis might be cell type-specific.

My interactions with graduate students and other undergraduates stimulated my thinking of research as a career. Cleary, my firsthand experience with the application of the scientific method and the intense study of the basic mechanisms of cell development added to this commitment.

I plan on pursuing a PhD in a biomedical field, where I can study human diseases on a molecular, cellular or physiological level. My passion has always been to help others and I trust that there are many ways to impact that world and help people through research, as research is the mechanism by which we begin to understand the basis for disease as well as how to develop treatments for these ailments. Research is important to me because I have realized being a physician allows you to treat one person at a time. As a researcher, one can improve (or even save) the lives of hundreds or thousands or more, thus changing the world for many people, one project at a time.
Extra Personal Statement #3

I have been fascinated by science since I was a little girl. My father is a medicinal organic chemist at the University of Michigan, and I used to go to work with him on days off from school. Watching him create and test new compounds that might someday become medicines inspired me to want to be a scientist as well. My first “experiment” was seeing the clouds of fog that appeared when I put water on dry ice. I was amazed that combining two simple things could result in something totally different. In school, my science classes were always my favorites and an advanced anatomy and physiology class that emphasized lab work cemented my desire to major in biology in college. My interest in studying infectious diseases began when I leafed through a friend’s Microbiology textbook during my first year of college, and as I learned more about the subject through my undergraduate courses and research at Emory University, my fascination only grew. I hope to study the mechanisms of pathogenesis of infectious agents, especially those that take their greatest toll in developing nations, with the goal of increasing our scientific understanding of these deadly and debilitating illnesses.

I have had almost four years of research experience, and have found that the more time I spend in the lab, the more I enjoy it. I find it very fulfilling to know that my work is contributing, even if only in a small way, to scientific progress. Although I enjoyed my two undergraduate research projects, my current research experience is the longest period I’ve spent working full time in the lab. This extended time at the bench has allowed me to be really sure that I enjoy research and that graduate school is the right next step for me. Each research experience has not only taught me new technical skills and specific knowledge, but has reinforced my enthusiasm for and commitment to a life in science.

From February of 20XX to March of 20XX, I studied factors affecting human visual acuity under low light conditions, such as might be encountered when driving at night. This research was an undergraduate project in the lab of Dr. Madelyn Marshall at Emory University. I worked with human research subjects, measuring their vision and properties of their eyes under various circumstances. Dr. Marshall and I initially hypothesized that monochromatic aberrations of the cornea, which occur naturally and can also be induced by LASIK surgery, would be associated with poorer vision. However, I found that aberrations actually had no effect on our subjects’ vision. I was disappointed that my first project had “failed,” but Dr. Marshall encouraged me to reexamine the data for other factors that might have an association with vision and we found that, of the parameters we tested, defocus is the major factor limiting vision under low light conditions. Defocus is the difference between where a person’s eyes are focused and where the object being viewed is actually located, and is potentially correctible with non-prescription glasses similar to reading glasses. The experience taught me that a negative initial result isn’t always a disaster and that it’s important to be open to unexpected findings.

I presented this research in a poster at the 20XX Optical Society of America Fall Vision Meeting in Rochester, NY, as well as in poster and seminar form as part of the 20XX Howard Hughes Medical Institute summer research program at Emory University. This first project helped me develop important skills in communicating about my research, both in explaining the study to the participants and in conveying my findings to other scientists. I discovered that I love sharing my excitement about science with others.

From March of 20XX until my graduation in May of 20XX, I carried out an undergraduate research project in the lab of Dr. Finn Erikson at Emory University. This project, which culminated in a senior thesis that was awarded High Honors, was on the subject of innate immune responses to the protozoan parasite and malaria relative Toxoplasma gondii, the cause of Toxoplasmosis. T. gondii is estimated to infect 15-20% of Americans and perhaps even higher proportions of the population of other countries, causing life-long, chronic infection that is usually asymptomatic but can cause devastating disease in fetuses and the immunocompromised.

I investigated the role of murine bone marrow-derived dendritic cells (BMDC) in the immune response to T. gondii, specifically looking for antimicrobial effector functions of BMDC in response to parasite infection. Using a combination of flow cytometry and microscopy, I found that BMDC, while unable to kill parasites, are able to control intracellular parasite replication in the presence of appropriate activating signals, such as interferon-gamma and LPS. Activated and unactivated BMDC were equally susceptible to infection, but T. gondii was able to replicate only in the unactivated cells. I showed that activated BMDC produce the anti-microbial compound nitric oxide (NO), and that this NO production is crucial in the control of intracellular parasite growth, as evidenced by the fact that BMDC in which NO production was chemically blocked lost their ability to inhibit parasite replication.
My time in the Erikson lab helped me understand the patience and dedication involved in completing a project, and how each individual microscope field counted contributes to the final product. I found that all my hard work paid off in the sense of accomplishment I felt as I turned in the final draft of my honors thesis.

Since August of 20XX, I have been working full time as a research scientist in the lab of Dr. Robyn Mayes at the University of California, Los Angeles. I am currently involved with a number of projects, both independently and in cooperation with others. I study the regulation and functional effects of variations in the structure of the lipopolysaccharide (LPS) molecule found on the outer surface of gram-negative bacteria. I isolate and purify LPS from a variety of bacteria and determine its key structural features, which can vary according to strain and growth conditions. Additionally, I test the antimicrobial susceptibility of various bacterial isolates, culture primary murine macrophages and dendritic cells for bacterial infection studies, and determine the LPS phenotype of mutant strains.

Working on so many different projects has helped develop my ability to multitask and stay organized, as well as allowing me to learn many diverse techniques. I have also had the opportunity to train others in some of the procedures I use, and have found it extremely rewarding to share my experience in this way. I often work in collaboration with others, both within and outside of my lab, which has expanded my horizons beyond the confines of my own bench and allowed me to see the connections between what I work on and many other fields.

In addition to research, I have been fortunate to have the opportunity to do some teaching, and have found that I really enjoy sharing my knowledge and watching students get excited about learning. As an undergraduate, I tutored other undergraduates in chemistry and felt that I had helped them master concepts that had been difficult for them. While at Emory I also served as both a TA and an instructor for a Physical Education course in Cross Country Skiing. Many of was extremely rewarding to watch them gain confidence and move from being nervous about falling to having fun on skis. Developing lesson plans and thinking of ways to keep classes interesting was a challenge, but at the end of the course, the majority of the students said that they had really enjoyed the class and planned to continue skiing on their own. It was rewarding to see that I had succeeded in helping others get excited about something that’s important to me. I look forward to continuing my development as a teacher by serving as a TA in graduate school. I hope to pursue a career in academia, which will allow me express my passion for science both by conducting scientific research and by teaching others about the subject.

I would like to focus my graduate studies on the biology of infectious diseases and host-pathogen interactions, and I believe that the Molecular and Cell Biology program at the University of Washington is an ideal place for me to continue my education. The flexibility of the program and the opportunity to work with faculty in numerous departments at both the University of Washington and the FHCRC is very appealing to me and is something not found at other schools. I hope to take advantage of the rotation system to experience a variety of research topics. At this moment, I am most interested in parasitology, but I know that my interests may change as I am exposed to areas of research that are new to me. I have had experience working in both a parasitology and a bacteriology lab, and enjoyed both. Since I have not had any direct experience in virology, I would like to rotate in a virology lab to broaden my perspective and ensure that I make an informed decision when I choose a lab. There are many faculty members affiliated with the MCB program whose research interests me, including Drs. XX, XX, XX, XX, XX, and XX.

Another feature of the MCB program that I find appealing is the opportunity to earn a concurrent MS in Epidemiology. Although it is important to study microbes in the lab to understand their basic biology, it is equally important to remember that they exist outside this controlled environment and often have devastating effects on real people and communities. I have always been interested in the epidemiology and public health consequences of infectious diseases, and I know that regardless of the lab I ultimately join, I will always keep these factors in mind. The concurrent Epidemiology MS program would give me a perfect opportunity to integrate my interests in basic research and public health issues. My interest in infectious disease research has only grown as I have gained more experience and spent increasing amounts of time in the lab throughout my undergraduate years and in my current research position. The MCB program at the University of Washington would allow me to continue my education through lab work, classes, and teaching experience, and would be ideal preparation for my goal of a career in infectious disease research.
I still have the first sample of DNA that I ever isolated, from salmon sperm, in a screw-top test tube located on my dresser at my parents’ house. During my junior year of high school, I attended a seminar at Georgetown University-Washington D.C. called “Molecular Medicine in Action” where I found those first nucleic acids. Although, that first sample has great importance to me, it was only the beginning of my pursuit of an interest in cellular biology. Almost four years after my first interest in research was piqued at that conference, I have isolated countless samples of DNA, not only for lab courses at the University of California-San Diego, but also for the two research labs in which I work.

At the beginning of my second year at the University of California, I joined Dr. Greg Ludwig’s C. elegans lab. We currently study a novel nuclear pathway of RNAi. I assisted with screening for nuclear RNAi deficient (nrde) mutants, helped map one of these genes, and analyzed phenotypes of these mutants. I crossed these mutants into RNAi mutants with known function to determine where in the known RNAi pathway that nuclear RNAi may bifurcate. In addition, I have attempted to isolate C. elegans viruses. The process of RNAi in plants has been found to fight viral infection. Presumably this may occur in C. elegans as well, but no viruses specific to this species have yet been found. The species C. elegans has been previously isolated on campus. I have revisited the general area of these sites and have determined additional sites around campus that are likely inhabited by nematodes and have taken soil samples from which I have attempted to isolate viruses. Although, we do not have much faith in finding viruses since they have not been found yet, the fun is in the search.

In January 2006, I joined a lab in the Department of Oncology under Dr. Jacquelyn Rossi, and I continue to work there now. I analyze tumor development in a transgenic mouse containing a proto-oncogene. My project consists of maintaining the mouse colony, as well as palpating and dissecting mice with mammary tumors and fixing tumors for histological study. I have been attempting to determine if mRNA of this proto-oncogene can be used as a marker for tumor presence in humans.

In order to benefit from the labs, I have had to take a number of classes to expose me to the terminology and methods of experimentation. However, the class that has most greatly influenced my future research interests was Eukaryotic Cell Biology. Dr. Diane Bough required the class to critique published papers, showing me that I could find the flaws and not take the figures at face value. Moreover, she taught cellular processes like a story, explaining each event in signal transduction cascades as a chapter. Finally having cell processes explained at that level, rather than the vague accounts taught in my prior classes, solidified my desire to do research and continue elucidating the cell processes begun by others.

At this point, from my exposure to a number of different areas of biology, I am most interested in chromatin modification and the various processes that may affect it. This is involved in many cellular processes, such as gene expression, cell division, and DNA repair. Understanding these underlying modifications may help further explain observations in other processes. Specific faculty whose work in particular interest me include Steven Henikoff and Toshio Tsukiyama. Their research encompasses the exact areas in which I am most interested.

In order to continue to pursue my interests in cellular biology, I hope to be accepted to the Molecular and Cellular Biology Program and further develop myself as a scientist. My plan is to receive my PhD, continue in academia, and bring upper level science to high school- and undergraduate-level students. One of the opportunities that I never felt I had was to participate in research in high school, and I would like to give that chance to others while I pursue my graduate degree and after. I currently participate in Expanding Your Horizons as a science activity leader, helping to expose middle school-aged girls to a range of sciences. I also have worked several interactive activity booths at a variety of conferences for elementary-aged students to introduce them to science.

Through my time in lab, I have learned a number of useful techniques, as well as the downfalls of research, when an experiment does not go well or results are inconsistent. The importance of writing legibly has already been made clear. This past year I misread a lane label on a gel photo and grew the wrong strain and began experiments using it. Luckily the mistake was caught, but valuable time was lost. Dealing with accidents like this has given me experience that will be valuable during my graduate school career.

My previous experience prepares me for graduate school and a career in research. I look forward to continuing my studies and contributing to the scientific community by probing deeper into systems that we do not understand. As Jaques-Lucien Monod said, “Personal self-satisfaction is the death of the scientist. Collective self-satisfaction is the death of the research. It is restlessness, anxiety, dissatisfaction, agony of the mind that nourish science.”
Extra Personal Statement #5

I know that in order to become a successful scientist I must encompass an unwavering commitment to my work, and an inexhaustible desire to discover far beyond current knowledge. As a child, my curiosity of nature compelled me to bombard my parents with questions to which they often replied, “I don’t know, son.” Fortunately, their lack of knowledge motivated me to find the answers for myself, and I was soon drawn to science. However, in the deprived city of Richmond, California I never encountered scientists or other scholars, besides my physician; this is not the ideal medium to nurture a child’s scientific ambitions. Nevertheless, the values my parents instilled in me of love, respect, and dedication to work and family will strengthen the relationships I make as I continue my scientific career. My desire to obtain a PhD stems from my ability to overcoming obstacles encountered growing up and the ideals inspired from my scientific research during college.

It was at the University of California Berkeley that my passion could finally be properly cultivated. Once there, I began my fellowship with the Minority Access to Research Careers (MARC) by completing the eight-week summer research institute that involved learning various skills from weekly rotations in eight faculty-research labs in Molecular Biology, Biochemistry, Cell Biology and Chemistry. After the training, I was to conduct research; not pre-determined experiments with known outcomes like- in my course labs, but actual cutting edge research. Predictably, I was excited to start working in my very own lab, and I initiated my research career in Professor Angela Vekkor’s lab, where they explore the structure of the diffusion barrier in the nuclear pore complex (NPC) as well as the mechanism by which cargo is translocated through it.

The goal of my project was to identify domains of natively unfolded nucleoporins that specifically anchor them at the NPC; this is part of an on going project to elucidate the biogenesis of the NPC. Using DNA recombinant techniques, I expressed various evolutionarily conserved regions of nucleoporins as CFP (cyan fluorescent protein)- tagged fusion proteins in yeast, and visualized their cellular location by fluorescence microscopy. I detected nuclear envelope localization for a distinct subset of the fusions, thereby, uncovering the domains (i.e. NPC tethering) in these natively unfolded nucleoporin that anchor them to the NPC. With the tremendous technological advances, science is becoming more and more interdisciplinary and, consequently, additional skills from other scientists performing research in different fields are required. Therefore, in search of attaining more diverse research experiences, I participated in a summer research internship at George Washington University.

During this summer internship, I worked under the tutelage of Professor Mark Valentine to better understand the regulation of Plasminogen Activator Inhibitor-1 (PAI-1). The purpose of the project was to determine how a sirtuin deacetylase, 14-3-3 regulatory protein, and a FOX transcription factor affect the insulin and reactive oxygen species (ROS) expression of the PAI-1 gene. We measured the influence that each protein (alone and in different concentrations and combinations) had on the expression of the PAI-1 gene evaluated by luciferase assays. The results showed that the sirtuin and FOX protein, individually and when combined, inhibit the insulin and ROS expression of the PAI-1 gene. The 14-3-3 protein also inhibited PAI-1 expression. When I created an experimental peptide decoy that inhibits 14-3-3 function, I observed a partial rescued gene expression. During that eight week-long summer, I learned to work with human cell lines, acquired an entirely new set of techniques, and produced a significant portion of data to the Valentine lab for future publications. It is incredibly rewarding to know that I have contributed, even in a small way, to the overall pool of scientific knowledge.

I want to keep on learning and discovering at the University of Washington, one of the leading research institutes in the nation. With the new surge of awareness and funding for stem cell research, it is truly the beginning of a scientific revolution. Stem cell research is a fresh and thrilling field that will aid to dissect the mechanism of many diseases as well as potentially treat them. This fall, in order to better inform and prepare myself for a career investigating stem cell biology, I enrolled in the “Intro to stem cell biology” graduate course offered at my college. In the class, we discuss some of the obstacles and methods that researchers at the University of Washington are currently conducting. Most notably, Dr. Hans Peter-Kiem’s research interest in stem cell gene transfer in larger mammals holds much promise for potential future human stem cell gene therapy. Especially with the recent success in producing primate embryonic stem cells by somatic cell nuclear transfer. However, I know that there are many other amazing researchers, such as Dr. Charles Murry and Zhengui Xia, also investigating many
important facets In relation to stem cell biology. The large, diverse, and choice population of researchers is the basis in my decision to apply to the University of Washington.

My ultimate goal is to become a professor and run my own research lab because I enjoy teaching and interacting with people, as well as discovering the unknown. I am a Chicano researcher but the Latino scientist is a rare breed in the scientific community. Therefore, I want to be the spark that ignites the change. I want to increase that subpopulation by outreaching to the Latino community and encouraging them to participate in science. The MARC program has had enormously positive impact on my life and I would like to establish a similar program in my future academic institute. I want to go back to my elementary school and talk to children to tell them that they can become a scientist and that they do not have to fall victim of their surroundings like so many others. I want to not only be a role model for my family members, but also for my entire hometown of Richmond, California and Latino community.
Extra Personal Statement #6

I love that science gives me the opportunity to pursue endless possibilities, to question the knowledge of today, and to find solutions for tomorrow. Beginning my freshman year of college, I took every opportunity to surround myself with biology.

I started my freshman summer at the University of Texas Austin, where I performed a statistical study examining whether co-morbidities and self-reported symptom assessments could predict outcome in gastrointestinal (GI) patients who had undergone chemoradiation. The study concluded that GI cancers vary symptomatically according to site and that if the patient’s symptoms were adequately managed, their outcome and quality of life was significantly better. Here I learned to construct meaningful results from large bodies of data. The following summer I returned to the University of Texas to conduct a study testing the efficacy of a slew of nitric oxide pro-drugs on breast epithelial cell lines. I also dedicated time to studying the drugs’ mechanism and cancer cell migration via angiogenesis. This experience was pivotal in my career as I learned standard laboratory practices and received my first exposure to working independently in a lab. I had originally chosen these programs simply to follow my interest in cancer, but later learned to see that cancer is a superb model of disease.

I spent the next two years of college working as a part-time assistant in a laboratory at Texas A&M. Aside from maintaining the tab and aiding in other studies, I started my own experiments on the counter effects of a transcription factor (Y Box-binding protein-1, YB-1) on upregulated promoter (Matrix Metalloproteinase-1) activity caused by low levels of arsenic in a cervical cancer cell line. These experiments were the first of our knowledge that showed YB-1 to have a counter effect on upregulated genes. I enjoyed returning to study the environmental causes of cancer, but a class led me to become increasingly fascinated with the connections between psychology and biology.

To explore this newfound interest, I traveled to the University of Michigan at Ann Arbor my junior summer to study psychoneuroimmunology. There I examined neural-immune interactions in rodent models following a live bacterial immune challenge. Our findings produced a paper (Smith, J.D, Smith, V., Smith, H., Smith, M. (2007). XXXX XXXXX XX XXXXX XXXXXXX XXXX. J Neuroscience) that was submitted for publication in February and will hopefully shed light on brain cytokine production. It was my first in vivo study, and I found the experience enthralling due to its application to understanding human immunological interactions.

Studying cancer biology remains a top interest for me because the information we gain can be readily applied to the study of other diseases. In addition, I am intrigued by the relationship between genetic and environmental factors, how we can at least have some control over the latter. Similarly, psychoneuroimmunology excites me with the understanding that all physiological systems interact at some level, that a person’s affect can modify not only their neural structure, but also their ability to manage disease. I also hold interests in virology, specifically how a virus can disrupt the homeostasis of a system thus leading to tumorigenesis. I believe my record demonstrates my ability to adapt to different avenues of research. I am particularly interested in two labs associated with cancer: Kaposi's Sarcoma-associated herpesvirus (Dr. M. Lagunoff, UW), and genomic integrity (Dr. B.D. Preston, UW), as well as the labs studying immunotherapies (Dr. D.J. Rawlings, UW), stem cells (Dr. H-P Kiem, FHCRC), and HIV (Dr. M. Emerman, FHCRC).

I believe by obtaining a doctorate, I will gain a better set of tools to find meaning in the massive amounts of information we gain from technology. I also hope to contribute new information to the scientific community, understanding that even a small finding can serve as a vital piece in an unsolved puzzle. Based on my experiences and the joy I get from discussing scientific research with others, be it at a conference or at the dinner table, I have every desire to remain in academia. In the future, I see myself inspiring undergraduate students as a professor. Working under female scientists gave me confidence and encouraged me to pursue my dream to be a scientist; I can only hope to do the same for others. Meanwhile, I would enjoy helping to shape public science policy and bridge the gap between the scientific community and the general public.
My current PI insists that science is like boxing: if you get knocked down, you get up and fight again. To me, this is an inspiring but simple comparison. If we are picking sports, I say that science is like swimming. I swam for over a decade, and for my race of fifty seconds I trained five hours per day, five hundred hours per season. Through hard work I qualified for and competed at the NCAA Division I Championships and Olympic Trials. I learned that dedication, perseverance, and mental endurance are necessary to get results. Thus far, these lessons have translated well to research.

As an undergraduate, I conducted honors thesis research in St. Olaf’s Department of Neurobiology and Physiology, in Dr. Anne Freeburn’s laboratory with the guidance of my adviser, Dr. Juan Garcia. My project constituted early steps in the elucidation of the cellular mechanism of menopausal hot flashes. Building on Dr. Garcia’s work, I developed a mouse model and system of measurement for studying hot flashes. Using these animals, I identified colocalization in the estrogen receptor alpha and TREK-1 in the medial preoptic area of the mouse brain, a region involved in thermoregulation. TREK-1, a two pore domain potassium ion channel, is involved in temperature sensing and plays a role in neuronal stability. This identifies a potential role for estrogen action in thermoregulation and therefore a potential mechanism for dysregulation of heat sensing (hot flashes) in the estrogen-deficient state of menopause. The ultimate goal is to characterize the mechanism underlying hot flashes so that safe and effective therapies can treat these symptoms.

This experience opened my eyes to biomedical research. I was excited to find in my fellow lab members a work ethic I had previously seen only in my teammates in swimming. I also enjoyed the logical yet creative process of working through problems both broad and narrow in scope. I was introduced to the day-to-day challenges of working in science; for example, my mice became increasingly adept at removing their temperature-sensing tail cuffs, so I had to stay ahead of their learning curve with new methods of attachment. Additionally, I liked that the ultimate aim of research is to further medical knowledge and capability, improving people’s health and wellbeing. Overall, I found research to be engaging, challenging, and rewarding, and I decided to pursue additional experience and training after completing my undergraduate degree.

Since September of 2006 I have worked as a technician at the Drexel School of Medicine. I joined Dr. Jarvis Hans’ laboratory when he brought his lab to Philadelphia from Baylor College of Medicine. Our lab investigates the role of estrogens and androgens in metabolism, diabetes and obesity. As the tech I have been responsible for setting up the new lab, but I also have the same research responsibilities as my fellow lab members, I quickly learned the techniques of the lab and have trained entering graduate students. Further, I have developed and optimized several protocols for the lab. I have gained the most thorough knowledge of techniques when things have gone wrong; through persistence in troubleshooting I have learned how to evaluate methods and, more importantly, I have learned the value of communication with colleagues who have much to offer technically and intellectually.

I have contributed to various lab projects, including immunohistochemical analysis for a paper (see end of text) currently in preparation on the role of estrogen receptor alpha in insulin biosynthesis. Confocal images for this paper show expression estrogen receptors alpha and beta in mouse clonal insulinoma cell lines, mouse pancreatic islets, and human islets. Imaging in cells includes localization of endogenous estrogen receptor as well as CFP-linked constructs with vehicle and estradiol treatment. Identification of estrogen receptor expression in beta cells (confirmed by co-localization with insulin) provides basic evidence for estrogen’s role in regulating insulin biosynthesis.

My primary research focus has been the effect of neonatal testosterone exposure in programming a dysregulation of metabolism genes and body weight which emerges in adult mice. We are currently dissecting the details of the interaction of genes and environment at this critical window of development. There are important public health implications: childhood obesity is widespread, and obesity-induced insulin resistance has been shown to increase testosterone production by the ovary. Couple this with the threat of persistent environmental pollutants which mimic the actions of steroid hormones, and there is potential for altered developmental programming of metabolism in prepubescent children. Characterizing the mechanism in the mouse model will provide valuable information for preventative medicine and population health.
I am drawn to the MCB program for several reasons. I find the philosophy of the program, which encourages students to develop individualized research projects while maintaining a high level of interaction with faculty, especially attractive. A wide variety of interest groups and seminars surely makes for an engaging intellectual environment, and the collaboration between the University of Washington and the Fred Hutchinson Cancer Research Center provides a uniquely impressive breadth and depth of faculty expertise and innovative research. The work of a number of distinguished faculty assures me that as a graduate student at the University of Washington I would be involved in significant research accomplishments which advance biomedical sciences and human health.

My current research project dealing with developmental programming has piqued my interest in molecular aspects of development and gene regulation as well as environmental toxicology. I am pleased to find faculty investigating related topics at the University of Washington. I am interested in the work of Dr. Charles Laird in the epigenetics of human disease and in developing new techniques for evaluation of DNA methylation. Additionally, I am fascinated by Dr. Elaine Faustman’s research investigating molecular mechanisms of developmental toxicity of mutagens, teratogens, and carcinogens.

Since taking an undergraduate course on the subject, another major interest of mine is the biology of aging. The University of Washington has an impressive group of faculty that investigates various aspects of senescence, age-related disease, and cancer. The Nathan Shock Center of Excellence in the Basic Biology of Aging and the Genetic Approaches to Aging Training Grant is evidence of a high level of commitment to this important and exciting field of research. I am particularly interested in the work of Drs. Peter Rabinovitch and Daniel Gottschling, in mice and in yeast, respectively, on genome instability in aging and neoplasia.

I am also interested in the opportunity to participate in the joint Ph.D./Epidemiology M.S. Program. My research experience to date has made me deeply interested in the greater implications of basic research, especially in public health. I find Molecular Epidemiology a fascinating field, where identification of genetic and environmental risk factors for diseases and disorders can be used to investigate patterns at the population level. I plan to pursue a career which integrates these two scopes of research. I am confident that with training from the University of Washington, I would have a valuable and effective set of tools for success in biomedical research, whether I continue in academia or in industry. I expect graduate school and subsequent research to be challenging, but through athletics and academics I have learned the level of commitment necessary for success. I am fully committed to the challenge.
As a graduate student at the University of Michigan's Program in Health and Behavioral Sciences, I am actively developing a career focused on the prevention and control of chronic and acute diseases among under-served populations. My current research and career goals, coupled with my academic and field work experiences, afford me an excellent position to apply to the Ph.D. program at the Johns Hopkins School of Public Health. It is my aspiration to concentrate my doctoral research and application studies addressing contemporary health problems in rural communities, building upon my current foundation in health education.

Over the last two years, my focus has been in public health, specifically studying community health education and understanding and improving cancer health disparities. I have developed an instinctive desire to approach health disparities and behaviors at a level that is inclusive of both the micro-systems of family and community, and individual behavior and decision making. After reading the objectives of the Johns Hopkins School of Public Health program, I found not only the course of study I was looking for, but a program in an area of the country that is home for me, allowing me to reach an academic pinnacle and while living and working in the region I love.

During the course of earning my MPH degree, I participated in a summer internship at the Morehouse School of Medicine in Atlanta, Georgia, assisting a research and action program undertaken to identify colorectal cancer screening compliance of Hispanic populations in eastern Georgia. In this capacity, I worked with Principal Investigator Dr. Mary Cortez analyzing data collected from the study, contacting participants for follow-up information, and supporting the assessment procedures for future health programs geared towards increasing compliance. The intervention utilized the Health Belief and the Transtheoretical models respectively.

Concordant with this work, I completed a draft manuscript with the assistance of Dr. Cortez and an abstract of the study has been submitted to the American Association for Cancer Research Annual Meeting 2009, for presentation and possible publication. Overall, this position provided valuable experience in conducting interviews, and understanding and communicating with individuals and communities, and the process of development of culturally-appropriate health interventions.

Currently, I have been working with Dr. Cornell Gupta from the Office of Epidemiology at the University of Michigan. In this capacity, I have been involved in a research project aiming to increase awareness, prevention measures, and screening compliance of cervical cancer among Hispanic women in Ingham County, Michigan; the results of my research will be submitted for publication and presentation. This project in particular has allowed me to participate in developing surveys for the study, the training of lay community health workers (promotoras), the dissemination of cancer information directly to the participants, collection of data and its analysis, and working with accomplished doctors, and program planners.

Findings from this pilot study have the potential to direct the design for future interventions determining to protect Hispanic women in local communities against cervical cancer and decrease incidence rates of this disease among local populations. I have also reviewed and analyzed publications on cervical and colorectal cancer to explore and develop recommendations for future interventions and policy changes.

In addition to my research experience, I have been employed as an instructor for the University of Michigan. Teaching gives me the opportunities to inspire, motivate, and invigorate people in ways that have been imperative to my success as a student and as a health researcher. I have taught both face-to-face and online courses, averaging 35 undergraduate students per class. As a compliment to my career in research, I plan to continue teaching and eventually work as faculty for an institute of higher learning.

I have also served as President of the Alpha Omicron Chapter of Eta Sigma Gamma National Health Education Honorary, President of the College of Health and Social Services Council, Vice-President of the Master of Public Health Student Organization and represented the MPH students as a member of the MPH Course Selection Committee. These supplemental experiences in addition to my classroom education and field experience have been the conduits to continuing to go further academically and professionally. My goals are to use research and proactive interventions to increase social justice and the reduction of social and health inequalities. My
experience to date and research plans for the future demonstrate a strong commitment to understanding
and improving chronic disease health disparities in the U.S., with an emphasis on the health of communities
of the northeast region. The Ph.D. program at the Johns Hopkins School of Public Health would build upon
this experience, providing an opportunity to learn about the use of social and cultural framework to address
health and wellness, and also gain the education necessary to able to help develop the next generation of health
professionals with the mix of new ideas and best-practice interventions. Throughout my research, it has become
evident that effective health behavior change is motivated by cultural competent approaches and the use of
technology. The work and research of Dr. Cheyenne Fox and Dr. Sara Emmet among other members of the faculty
would serve to complement a solid research background dedicated to understanding and improving health
disparities among communities in the northeast, and would provide invaluable knowledge and training that I
would be able to apply both to my dissertation research and my future work with underserved populations.
Extra Personal Statement #9

What if people lived healthier lives, practiced preventive medicine, and took precautions against illness and disease? My days in the physical therapy department often made me think about the prevention of injuries as well as the injuries themselves. I was already doubting my future career choice as a physical therapist. Although I loved the science of it and helping people, the lack of variety within the field and its limited options for growth bothered me. I needed a career that helped a large number of people, emphasized prevention and primary care rather than tertiary care, and would continually challenge and motivate me to improve. Knowing that I really did not want to pursue physical therapy as I had originally planned, my thoughts wandered to the area of public health, particularly health management.

My first true introduction to the public health arena came in a class offered through the Big U School of Public Health. As I listened to experts speak about contemporary health issues, I was intrigued. The world of “capitation,” “rationing of care,” and Medicaid fascinated me as I saw the range of problems that public health professionals were trying to solve in innovative ways. This one semester class provided me with a basic but thorough understanding of the issues faced in health care today. In the last two years I have continued to learn about public health both through coursework and work in the field.

Because field experience is such a valuable learning tool, I searched for a research assistant position that would allow me to view public health at a different level. I worked on a project at a county health clinic in Englewood, a low-income, minority community. The program attempted to increase treatment compliance rates for adolescents diagnosed with tuberculosis who must complete a six-month medical program. Working for the county exposed me to a different side of health care that I had previously seen. Service and organization were not assets of the county and yet its role in the public health “ecosystem” was and is critical. Its job of immunizing thousands and interacting with all members of the community is often forgotten, but is important for keeping an entire community healthy.

My work at the county health clinic as well as my knowledge of some areas of public health led me to accept an internship in Washington D.C. this past summer. The internship provided me with a greater understanding of a federal public health agency’s operations and allowed me to contribute in a variety of ways to the XYZ Department in which I worked. Most importantly I worked on “policy issues” which involved identifying and summarizing problems that were out of the ordinary as well as documenting resolved issues in order to establish protocols to increase the department’s efficiency. In addition I served on a scientific review panel which was responsible for editing a seventy-page proposed regulation before its submission.

Along with my duties at XYZ, I attended seminars and met with public health leaders at different functions and events. All these activities confirmed my growing interest in preventive medicine, outcomes and effectiveness, and quality of care, particularly within the private/managed care sector. These are my strongest interests because I believe they are fundamental to our nation’s health. We must achieve efficiency and access without sacrificing quality.

The University of ____ would help me achieve my goals of furthering my public health education through the specialize coursework offered as part of its health administration program. [The client provides specifics here about the program’s specific appeal and strengths]

Since rejecting physical therapy as a career possibility my interest in public health has only grown. I welcome the challenge of serving a large community and participating in such a dynamic and challenging field. What if an aspirin a day could prevent heart attacks? What if abandoning unnecessary procedures saved thousands of dollars, which then allowed a hospital to treat other patients needing care? What if every person was guaranteed care and that care was good? I would like to find answers for these questions during my career as a public health graduate student and professional.
Raised by two expatriate professionals in Dubai, UAE, I was completely unprepared for the shock I experienced when I began college in my native India. I was struck by the poor health conditions and widespread illiteracy. These appalling settings stirred me to actively volunteer at an AIDS awareness and educative campaign. I found this experience to be very rewarding on many levels. In particular, it initiated a deeper understanding regarding the importance of biological research. Also, during this time, I was part of an honor’s program at XX College in Bombay that focused on scientific experimentation and analysis. These two defining factors complemented my growing interest in research and influenced my decision to become a biological research scientist. Due to India’s limited resources and opportunities to carry out biological research and training, I decided to come to the United States to pursue my studies.

My interest in research was further enhanced when I transferred to the University of Notre Dame. Being a young transfer student alone in the United States was a challenging experience in itself, but adapting to a completely new system of education was even more difficult. As an undergraduate biochemistry and genetics major, I worked in different labs to gain research experience and technical expertise. I was unfamiliar with the sophisticated equipment and techniques used in the labs and had to work hard to keep up with my peers. This initial struggle however prepared me for graduate school and gave me a stronger foundation for working toward my master’s degree.

I pursued my master’s degree in Dr. Cormick MacArthur’s lab at the University of Notre Dame. His group investigates the involvement of mitochondria in the aging process. Abnormalities in mitochondrial electron transport system (ETS) enzymatic activities have been associated with aging skeletal muscle. I designed riboprobes and performed in situ hybridizations on tissue sections to examine the impact of mitochondrial ETS abnormalities on the RNA expression of selected genes. I also measured the levels of a marker of oxidative stress, 8-hydroxydeoxyguanosine (8-OHdG), with age in skeletal muscle fibers and demonstrated the presence of increased steady-state levels of oxidative nucleic acid damage in ETS abnormal fibers. Finally, I attempted to elucidate the fate of ETS abnormal fibers in different aged rats using markers of apoptosis. My results were published in XX.

After graduation, I moved to Seattle to gain some professional experience at XX Corporation, a gene therapy company that works on both viral and non-viral gene delivery systems. I was involved in the latter and focused on using lipid-protamine-DNA (LPD) complexes for systemic gene transfer. My job enabled me to synthesize LPD formulations, design, implement and interpret in vitro transfection experiments, process and analyze in vivo tissue samples, design and make gene constructs, assist in assay development and use tissue culture to maintain cell lines for future experiments. This product-oriented environment gave me the confidence and discipline to meet deadlines under intense pressure and also instilled in me the importance of teamwork. It also exposed me to the corporate side of science. In fact, my return to academia was motivated by my experience of the insecurity resulting from corporate takeovers and merges, the constant focus on financial profits, inflexibility, product-specific goals and a lack of emphasis on publications.

I currently work in the lab of Dr. XX, a member of the MCB program in the Department of Orthopaedics and Sports Medicine at the University of Washington, Seattle. The group is broadly focused on exploring how mechanical signals are transduced into biochemical signals in bone cells. My first project was to explore how the extracellular matrix protein, osteopontin, is upregulated by bone cells under conditions of both disuse and oxygen deprivation. I then became interested in understanding the function of heat shock proteins in bone cells under oxygen-deprived conditions and studying their role in enabling osteocytes to survive under these hypoxic conditions. In my two years in Dr. XX’s lab, I have co-authored a paper in the Journal of XX and have presented a poster at the annual meeting of the American Society for Bone and Mineral Research.

My experiences in academia and industry have confirmed my resolve to attend graduate school. In addition to having a master’s degree, I also have extensive research experience in many diverse areas of cellular and molecular biology making me an excellent candidate for the MCB program. The constant intellectual exchanges
with my colleagues, regular meetings with my supervisors and long hours spent planning experiments and interpreting results have strengthened my capabilities as a researcher. In addition, I have attended several conferences, seminars, discussions and journal clubs that have given me a broad perspective on different aspects of biology.

I have selected the MCB program at the University of Washington to pursue my education further because of its interdisciplinary nature, its tradition of excellence in research and its cutting edge facilities. I believe the program will help me acquire the versatility needed to reach my full potential as a scientist. I believe that the skills I have developed in leading and participating several projects would be an asset not only to me but also to the program. I have also met with several faculty members whose work interests me including Hans-Peter Kiem, Mark Bothwell and Zhengui Xia, Karin Bonfeldt, Keith Jerome and Jeffery Chamberlain.

After completing a doctoral degree, I intend to continue my education by pursuing a postdoctoral position. This would strengthen my research capabilities and further prepare me for independent research. Eventually, I would like to pursue a career in academia so I can contribute to the scientific community as an educator as well as a researcher.
When I began work on my Masters of Public Health at the University of California, San Diego, I thought I knew what epidemiology was. I envisioned my future as an epidemiologist involving outbreak investigations and lab work. One year later, as I observed the meeting of a scientific advisory committee, convened to brainstorm ideas for studies to elucidate why breast cancer incidence rates were elevated in Marin County, California, my understanding of epidemiology was transformed, as was my vision of my future. In listening to the epidemiologists on the committee, including Dr. Janet Daling, discuss their own cancer studies and the epidemiologic process I began to understand how powerful epidemiology is – how a properly designed casecontrol study can yield results that point towards biological pathways and how the findings of a cohort study can guide medical practice. I was particularly inspired by Dr. Daling’s work describing the associations between hormone replacement therapy and breast cancer by histological type. I knew then that I wanted to be a cancer epidemiologist. I knew then that cancer epidemiology appealed not only to my analytical nature, but also to my desire to focus my professional efforts in a field that had societal relevance. I knew then that I wanted to design and carry out my own epidemiological studies and collaborate with others to enhance pre-existing studies. I knew then that I wanted to do cancer research in an academic setting that encouraged creative scientific thinking to solve public health questions.

During my second year of MPH studies I put my new-found inspiration into practice. With my Master’s thesis I investigated the hypothesis that population misestimation artificially elevated breast cancer incidence rates in Marin County, California; I used Poisson regression to compare breast cancer incidence rates based on population counts from the 2000 Census to breast cancer incidence rates based on population projections for the year 2000 projected from the 1990 Census. I found that population projections for Marin County had significantly underestimated the size of the population of women aged 45-64, and that this underestimation had been sufficient to significantly increase the estimated incidence rate of breast cancer in Marin County in the late 1990s. Following the completion of my MPH in epidemiology, I spent several months at the Marin County Department of Health reworking this research and preparing a manuscript for publication (Journal of XX, June XXXX). With this publication I asserted that the extensive efforts devoted to cancer surveillance research lose some of their utility when inaccurate population projections must be relied upon for timely reporting of incidence and mortality data.

In the fall of XXXX, I accepted a position as an epidemiologist at the Northern California Cancer Center (NCCC) under Dr. XX. Since joining the NCCC I have had the privilege to work with data from the Bay Area Women's Health Study and the Northern California Breast Cancer Collaborative Family Registry, both designed to examine breast cancer risk in understudied minority populations. My most significant project with the NCCC thus far has been a casecontrol analysis investigating the association between migration history and breast cancer risk in Hispanic women (Journal of XX, December XXXX); for this research project I performed all literature review, data cleaning, and data analysis, and contributed significantly to the preparation of the final manuscript. I currently have several additional projects in various stages of development, including a descriptive analysis of differences in rates of participation in a breast cancer family registry by race/ethnicity, and an analysis of the variation in prevalence and effect of reproductive risk factors for breast cancer in a multiethnic population. My role at the NCCC has also included managing the genomics database for the organization’s breast cancer family registry; this responsibility has not only allowed me to revisit and apply my undergraduate studies in molecular biology, but has also given me the opportunity to learn about specific mutations and variants in BRCA1 and BRCA2 and has lead me to an interest in conducting genetic studies for breast cancer.

Although I find great satisfaction and a sense of purpose in my work, I know that I want to learn and do more. My professional and educational background thus far has given me the opportunity and perspective to discover my own research interests. My hope now is to pursue doctoral studies in epidemiology at the University of XX so that I can gain the skills and knowledge to translate my research interests into epidemiological investigations. Presently I am interested in the study of gene-environment interactions with relation to breast cancer risk, molecular markers of breast cancer susceptibility, and epidemiologic methods in cancer research. My goal is to conduct epidemiological research for the identification of both modifiable risk factors for breast cancer in high
risk populations, and markers of breast cancer susceptibility for prevention and screening. I am inspired to attend
the University of XX because of the unparalleled resources for breast cancer research that the epidemiology
program has to offer. I am eager to learn from the faculty of innovative cancer epidemiologists, including Drs. XX,
XX, XX, and XX whose research has inspired me to want to follow in their footsteps. I am excited by the prospect
of collaborating and studying with researchers at both the world-renowned Fred Hutchinson Cancer Research
Center and the cutting-edge Institute for Public Health Genetics. Given the expertise of the epidemiology faculty
in the field of breast cancer research and the resources provided to the epidemiology program by its connections
with the Fred Hutchinson Cancer Research Center and the Institute for Public Health Genetics, I feel that my
educational and research goals are well-suited to the doctoral program in epidemiology at the University of XX.

While my background has enabled me to define my own research interests and gain a solid foundation in
epidemiologic methods, I am eager to embark on further study. I hope to pursue a PhD in epidemiology at the
University of XX so that I may acquire the tools and expertise that will enable me to perform independent
research in the important field of breast cancer epidemiology.
Extra Personal Statement #12

While ‘gutting’ the remnants of a flooded home in New Orleans during the aftermath of Hurricane Katrina, I exposed the yellow agar of a small Petri dish to sample the spore-ridden air of a child’s moldy bedroom. After an improvised collaboration at Louisiana State University, ninety plates and a light microscope were used to identify over twenty-five different species of mold in homes across the city—some of them pathogenic to humans. It was this occasion that helped me build upon my prior research experiences to establish an interminable curiosity in pathogens and how they inflict harm in humans.

When I was an undergraduate studying Biology at Oregon State University, I began to develop a deep-seated interest in infectious disease and the mechanisms by which immunity evades or destroys the agent responsible for infection. In a liberal arts environment, my appreciation for host-pathogen interactions was gleaned from multiple faculty members with different biological specialties. In place of classes dealing exclusively with the fields of virology, bacteriology, or immunology, my highly integrated courses were taught by a close-knit department that harbored the value of independent learning. The result was a well-rounded approach that encouraged scholarship through self-discovery. This methodology initially inspired me to delve further into scientific understanding. I often looked for ways to independently increase my breadth of knowledge in subspecialties as I gained a general understanding of them from in-class activities. It is this personal attribute which I believe most closely justifies my interest in pursuing a career in biomedical research.

My first independent research experience was oriented in the field of developmental biology. I studied the inhibitory effects of an herbicide on the oocytes of Xenopus laevis, elucidating the targeted components of the signal transduction pathway leading to maturation. This 10-week experience was very rewarding in that it highlighted the importance of an interdisciplinary approach to laboratory investigation, combining the concepts of organismal development with procedures akin to cell biology and environmental toxicology. The project instilled patience, open-mindedness, and perseverance into my repertoire of scientific abilities. As an introduction to full-time laboratory work, the experience served as a sound foundation to support my subsequent research endeavors. Once I was exposed to microbiology and evolutionary biology as an upperclassman, I was moved to search for a post-baccalaureate program in the field of infectious diseases and immunology.

As a recipient of the intramural Research Training Award at the National Institutes of Health in Bethesda, Maryland, I worked in the Laboratory of Immunoregulation headed by Dr. Steven Cooper, director of the NIAID. During my one year fellowship, my research project focused on the characterization of virus-specific CD8+ T cell responses in the context of chronic HIV infection. In particular, I studied cellular immune responses in a rare group of HIV-positive patients called long-term nonprogressors (LTNPs). In an effort to elucidate the mechanism responsible for the immune-mediated control of HIV replication exhibited by LTNPs, I helped develop and optimize a novel in vitro flow cytometric assay to measure cell-mediated cytotoxicity. I also carried out proliferation assays to further investigate the differential proliferative capacities of cells derived from LTNPs and patients with progressive disease. As a result, I have become proficient in tissue culture techniques, cell staining with fluorescently-conjugated monoclonal antibodies, and analysis by polychromatic flow cytometry. The NIH fellowship was critical to my scientific development because I gained insight into the fundamentals of immunology in a hands-on environment designed to develop (and test) my critical thinking skills. My intimate involvement with an ever-evolving project demonstrated the rewards, as well as the setbacks, associated with ongoing translational research.

My current research post has brought me to one of the foremost research institutions on the west coast—the Fred Hutchinson Cancer Research Center. I am working as a research technician in the laboratory of Dr. Allen Cooper in the HIV Vaccine Trials Network. As a technician for the HVTN Endpoints group, I have been introduced to the demanding, high-pressure environment surrounding clinical research. In the Endpoints section, accuracy and reproducibility are of the utmost importance to the success of the lab as a whole. Whether encouraging or disheartening, the results of the endpoint assays are invaluable to the development of a safe, efficacious vaccine. With this at stake, I have developed an elevated sense of accountability for my actions in the laboratory and a steadfast commitment to my involvement in long-term projects.
As someone who has drawn heavily from a diverse series of research projects, my affinity for the MCB program is based on its multi-departmental approach with an open rotation policy. Of particular interest is the work of UW/FHCRC faculty members Michael Bevan, Julie McElrath, Leonidas Stamatatos, and Julie Overbaugh.

In McElrath’s HVTN Laboratory, I am intent on becoming more involved in research associated with vaccine development. For example, I am interested in elucidating the mechanisms by which virologic control is achieved in certain HIV-infected individuals. The local/international duality of clinical research contributed by McElrath and Overbaugh suggests a commitment to global health projects designed to provide biological and clinical advancements in HIV research. Their involvement with populations with characteristically high risk of HIV infection coupled with studies of viral pathogenesis combines bench work with field-oriented work—a fusion I aspire to practice in my future.

I am also intrigued by Bevan’s analysis of the maturation of CD8+ T cells and the regulation of their responses to self and foreign antigen. I strongly believe that the progression of clinical research in infectious disease requires an increased commitment to efforts in basic immunology. Stamatatos’ work with the interaction between HIV Env glycoprotein and target cell receptor molecules is the epitome of cutting-edge research in host-pathogen dynamics. Together, their insightful publications and seminar presentations have led me to seek a doctoral degree and a future in academia. I am interested in serving as a faculty member of a major research institution, dividing my time between my students in the classroom and those in my laboratory.

I am confident that my experiences thus far have served as excellent preparation for a doctoral program in molecular and cellular biology. As any practiced investigator can attest, the ability to forge collaborations between scientists in many fields is vital to success. My range of experiences has enabled me to learn a tremendous amount through the exchange of ideas at different institutions. I am forever indebted to my mentors for having shown me the hostpathogen dynamics associated with veritable public health concerns. I am eager to begin establishing my long-term presence as a research scientist in the partnership between FHCRC and the UW.
When I first came to Berkeley I had planned to be a pre-med as did everyone else. So I took all the prerequisite courses. I was interested, but I was bored by all the rote memorization involved. What I did enjoy, however were the labs where I could actually see what the professors were talking about and understand it better. Therefore, my best academic experience was this summer at the Duke Marine Lab. I took a graduate level course in Marine Molecular Biology, and for the first time I really understood what I had been learning and was challenged and excite to learn more. Being in the lab this summer has really fueled my drive to attend graduate school and to keep learning as much as possible.

My ultimate goal is to become a professor. As well as being able to continue my own quest for knowledge, I will be able to communicate this knowledge to others. Being a good teacher is an important part of my goal. I am articulate and patient, both skills I think that I will need as a researcher and a teacher. As the field of molecular biology and genetics becomes more complex, good teachers will be even more essential.

In studying Genetics as an undergraduate at Berkeley, I have been especially interested in the mechanisms of cancer, in particular control of oncogene expression. Since there are still many unknown factors in the control of all gene expression, for instance the mechanism of enhancers, I think this is something that I would be interested in pursuing. I had a little experience this summer by looking for the myc and ras oncogenes in the octopus.

Besides academics, I have been involved in activities that are very important to me. I am a member of Chi Omega sorority and have served as its Vice-president and Scholarship Chair, positions that have required a great deal of responsibility. I have also been a member of the UC Berkeley Synchronized Swimming Team for the past three years. This has required a lot of commitment, which has definitely been worthwhile, as we are currently ranked eighth in the nation. I definitely plan to put this level of commitment into achievement of my Ph.D.
“Best” Posters from the 2013–2011 SURP Poster Sessions

2013 Lee Hartwell Poster Award

CECR2 as a potential therapeutic target for MYC-driven cancer

Clay Patton1,2, Leslie Okeaburu1,3, and Carla Grandori1

1Fred Hutchinson Cancer Research Center, Division of Human Biology, Seattle, WA
2University of Washington, Seattle, WA
3Harvard University, Cambridge, MA

RESULTS

Gene Expression in Neuroblastoma Cell Lines

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<th>Gene Expression</th>
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<td>MYC</td>
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CONCLUSIONS AND FUTURE WORK

- MYC expression correlates with high MYC expression in our model system cell lines
- Identification of new small molecule inhibitors targeting MYC and CECR2
- Future studies will focus on the potential of CECR2 as a therapeutic target

ACKNOWLEDGEMENTS

- Support for this research was provided by the National Institutes of Health under grant number...
Using Influenza Hemagglutinin as a Vehicle for Enhanced Presentation of HIV-1 gp41 Epitopes

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1Fred Hutchinson Cancer Research Center, Bloom Lab, Seattle, WA; 2Amherst College, Amherst, MA

Introduction
Despite efforts to combat human immunodeficiency virus (HIV), the development of a universally effective and enduring vaccine remains a formidable challenge due to the high mutation rate of the virus. Vaccines thus far have failed to induce broadly neutralizing antibody responses against the virus. However, there are epitopes on the HIV envelope protein gp41 that are highly conserved and specifically targeted by broadly neutralizing antibodies (bNAbs), including 2F5, 4E10, and 10E8.

HIV viral envelope

These regions are heavily obscured and weakly immunogenic in this localized environment within the gp120/gp41 envelope protein complex, and thus elicit weak antibody responses.

Materials and Methods

Hypothesis: If epitope-presenting binding mutant influenza viruses cells expressing epitope-specific antibodies, then the antibodies should mediate viral entry.

Results

• Eleven HIV-1 gp41 MPER epitope tags were cloned into hemagglutinin from influenza strain X31 at a deletion of residues 187-199. Mutant libraries were sequenced for five promising variants.
• Two viruses with 2F1 epitope-presenting HA were grown to titer compared to a positive control binding mutant HAG147R NA virus.

Conclusions

• Influenza viruses with epitope-presenting hemagglutinins can be grown in vitro
• Growth can be optimized using hemagglutinin mutant libraries
• Membrane bound anti-HIV antibodies can selectively recognize HIV epitopes in HA context, leading to presumed antibody-mediated endocytosis in cell culture

Future Directions

• Use most successful viruses to vaccinate mice and quantify the immune response to anti-HIV bNAbs
• Revertors to transcribe and amplify the HA and NA genes to find mutations that allow for increased viral growth and characterize these mutations
• Optimize the growth of less viable viruses, for ex., by shortening epitope tags

Acknowledgments
Thank you to all members of the Bloom lab, especially my mentor, Jesse Bloom, for giving me the opportunity to work in the lab and for spending the time and effort to help me learn and grow as a scientist. I am so grateful for the wonderful experience of these past two summers. This work was supported by NIH grant 1R01GM102198-01 and the Amherst College Biology Department.
Non-Enzymatic Cell Shape Determining Proteins of Helicobacter pylori

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Fred Hutchinson Cancer Research Center, Seattle, WA, New Mexico State University, Las Cruces NM2

Introduction

CmA

-Granular morphology leading to Helicobacter pylori's characteristic gastric colonization

-Granular morphology leading to Helicobacter pylori's characteristic gastric colonization

Methods

CmA

-Extend CmA's interactions with Cdf5

-Future work leading to Helicobacter pylori's characteristic gastric colonization

Conclusions/Discussion

CmA

-CmA-GFP in cells appears to be required for normal Helicobacter pylori morphology

-CmA-GFP in cells appears to be required for normal Helicobacter pylori morphology

-Future work leading to Helicobacter pylori's characteristic gastric colonization

-Future work leading to Helicobacter pylori's characteristic gastric colonization

References

CmA

-CmA-GFP in cells appears to be required for normal Helicobacter pylori morphology

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-Future work leading to Helicobacter pylori's characteristic gastric colonization

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-Future work leading to Helicobacter pylori's characteristic gastric colonization

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2013 Best Poster Award
2013 Best Poster Presentation Award

Introduction

Isolation of Mesothelin-reactive CD8+ T-cells for adoptive immunotherapy of pancreatic ductal adenocarcinoma

Adoptive Immunotherapy: engineering T-cells to target cancer

MesoThelin Epitopes

Materials and Methods

Acknowledgments

Future Aims
Mucosal Associated Invariant T (MAIT) Cells: Early control of bacterial and viral infection
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Abstract
Upon infection of a host, innate immunity is responsible for controlling pathogen load and activating the adaptive immune response. The delay required for the generation of adaptive immunity provides an opportunity for a pathogen to propagate. While the main role of T cells is to get activated via their T cell receptor (TCR) and kill infected cells as part of adaptive immunity, specific subsets of nonconventional T cells can play an earlier, innate response.

Mucosal Associated Invariant T (MAIT) cells recognize bacterial metabolites via their invariant TCR, allowing them to respond to almost any kind of bacterial infection. However, little is known about their response to viral infection.

We hypothesized that MAIT cells can be activated by specific inflammatory cytokines in the absence of a TCR stimulus (i.e., during viral infection).

Objective
The invariant T cell receptor on MAIT cells limits their pathogen recognition to bacteria. If MAIT cells can be activated in the absence of TCR stimulation, then they could play a role in fighting viral infections.

1. MAIT cells can be activated by cytokines in the absence of a TCR stimulus.
2. Monocytes can activate MAIT cells by secreting cytokines.
3. Preliminary Results
- MAIT cells become rapidly activated (express high levels of Granulocyte-Macrophage Colony-Stimulating Factor [GM-CSF] and Interferon-γ [IFN-γ]) upon cytokine stimulation.
- MAIT cells respond to both cytokine and TCR stimuli, but in different ways.

Conclusions
- MAIT cells can be activated by specific inflammatory cytokines.
- Monocytes secrete pro-inflammatory cytokines and chemokines that could activate MAIT cells.
- This enables MAIT cells to respond to bacterial or viral infection, even though their invariant TCR does not recognize viral components.
- Next Step: Define how MAITs kill virally infected target cells.

Acknowledgements:
Special thanks to my co-advisor Dr. Chloe Slichter and my PI, Dr. Martin Pric, for their support and encouragement. Thanks to all the faculty at the University of Puget Sound for their support. The University of Puget Sound Undergraduate Research Program is supported in part by the Cancer Center Support Grant (CCSG) (NCI Grant P30 CA134523).
2012 Lee Hartwell Poster Award

Introduction

Dab2 is an adhesion molecule that functions as a scaffold protein and plays a role in cell adhesion. Previous work by our lab has shown that Dab2 is involved in the regulation of receptor tyrosine kinases.

Methods

We used a combination of biochemical and cellular assays to study the interaction between Dab2 and the ErbB family of receptor tyrosine kinases.

Results

1. The presence of ErbB receptors inhibits the binding of Dab2 to Erbb4.

2. The introduction of a point mutation in the ErbB4 receptor increased the binding of Dab2.

3. The interaction between Dab2 and ErbB4 was disrupted by the addition of a specific inhibitor.

Conclusions

Our results suggest that Dab2 plays a role in regulating the activity of ErbB receptors. Further studies are needed to understand the molecular mechanisms involved.

Future Directions

1. Investigate the role of Dab2 in the regulation of other receptor tyrosine kinases.

2. Study the effects of Dab2 on cell proliferation and survival.

Acknowledgements

This research was supported by grants from the National Institutes of Health.
Administration of a Novel Chemotherapy Agent in a Pediatric Brain Tumor Mouse Model

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¹The College of Wooster, Wooster, OH; ²Fred Hutchinson Cancer Research Center, Seattle, WA

Introduction

Acute Teratoid Rhabdoid Tumor (ATRT) is a rare, highly malignant pediatric central nervous system tumor. The prognosis is poor, with a 5-year survival rate estimated at 10%.

Published data shows that approximately 75% of ATRTs possess a hallmark mutation in the SMARCB1 gene. Loss of SMARCB1 leads to the release of tumor suppressor proteins.

Conclusions

1. PD-0332991 significantly decreases retinoic acid receptor protein phosphorylation, evidence of targeted cyclin-dependent kinase 4/6 inhibition.
2. PD-0332991 is efficacious in vivo, resulting in tumor regression.
3. PD-0332991 is a promising chemotherapy agent for the treatment of pediatric atypical teratoid rhabdoid tumor.

Future Work

- Test PD-0332991 in ATRT mice with tumors in the brain. Determine whether the drug is able to cross the blood brain barrier.
- Use flow cytometry to confirm tumor cells are in G1 and G0 following cyclin-dependent kinase 4/6 inhibition.
- Test PD-0332991 in combination with traditional cytotoxic chemotherapy agents.

Acknowledgments

I would like to thank the Summer Undergraduate Research Program for this opportunity. The program is supported in part by the Cancer Center Support Grant (CCSG) Cure, supplemented by P30 CA150704-35P1.

This work was also supported by the Infant and Toddler Brain Tumor Grant (RO1CA155350) and the Seattle Children’s Neuro-oncology Foundation. Special thanks to Michelle Cook Sangar, Chris Hubert, and the rest of the Olson lab team.

References

Human papillomavirus infections in mid-adult women

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Introduction

This study examines the natural history of genital human papillomavirus (HPV) infections and the epidemiology of HPV infections among women aged 30 to 50 years. HPV is a sexually transmitted infection and an important cause of cervical cancer, which is the third most common cause of cancer among women worldwide. These viruses also cause a significant proportion of oropharyngeal cancers. Gardasil and Cervarix are vaccines that protect against infection in females and males 9-16 years of age by initiating an antibody response before they have been exposed to HPV. These vaccines protect against the most prevalent HPV types: 16, 18, 6, and 11. HPV 16 and HPV 18 cause 75% of cervical cancer cases, whereas HPV 6 and 11 cause 90% of genital wart cases.

HPV has been researched thoroughly in young adults, however, less is known about the virus in adult women. The goal of this research is to better understand HPV infections in women 30-50 years of age and the risk factors associated with each type of infection so that well-informed public health decisions can be made regarding vaccination, treatment, and guidance for HPV patients. The work presented here examined the antibody response to 17 HPV types, 10 of which were associated with cervical cancer. Antibodies detected in 93% of these women were due to natural infection as they had not been vaccinated.

Objectives

Characterize the antibody response in mid-adult women to HPV:
- Determine the prevalence of types associated with genital cancers among these women
- Determine the number of types to which women have antibodies
- Determine if antibodies to these types are associated with the number of lifetime sex partners

Materials and Methods

Result

Figure 1. Method for HPV detection. Antibodies (IgG) were detected by a luminescent instrument using GST HPV 16 fusion partner and a biotinylated HPV 16 L1 peptide. The signal was calculated for the antigen-specific reactivity. The cutoff used to determine seropositivity is defined by 1000.

![Figure 1](image1.png)

Figure 2. Percent of women according to number of HPV types.

![Figure 2](image2.png)

Figure 3. Phylogenetic tree of human papillomavirus. Different colors depict different species of HPV types.

![Figure 3](image3.png)

Figure 4. Percent of individuals seropositive according to HPV specific types. Color coding: figure 3.

![Figure 4](image4.png)

Figure 5. Percentage seropositive individuals categorized by number of lifetime partners. HPV 16 and HPV 18 are two examples of the HPV types tested in this cohort that showed a correlation between the number of partners and seropositive (HPV 16, p=0.005; HPV 18 p=0.004).

![Figure 5](image5.png)

Conclusions

Characteristics of the antibody response in mid-adult women to HPV:
- Infection increased in women with more partners
- Antibodies for each HPV type were detected at a high frequency
- Of the HPV types associated with genital cancers, 16 and 59 were the most prevalent
- 22% of the women were antibody positive for at least one high-risk HPV type
- 36% of the women had 3 or more of the high-risk HPV types tested

Future Directions

Using this serology data along with HPV DNA detection among these women:
- Determine if incident DNA detection is due to reinfection or a new infection
- Study the risk factors associated with new and reinfection activities

References

- Winer, Rachel L, “Early Natural History of Incident, Type-Specific Human Papillomavirus Infections in Newly Sexually Active Young Women.” Cancer Epidemiology Biomarkers & Prevention 20:699-707 (2011)

Acknowledgements

- The Summer Undergraduate Research Program is supported in part by the Cancer Center Support Grant (CCSG) (CURE) Supplement: 3 P30 CA15704-38S1
- Fred Hutchinson Cancer Research Center
- University of Washington (P51 CA093374-01A1)
- University of San Diego
Metabolic Flexibility in Triple Negative Breast Cancer Cell Lines
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INTRODUCTION
Triple negative breast cancer cell lines have no estrogen receptor (ER), progesterone receptor (PR) or human epidermal growth factor receptor 2 (HER2) compared to receptor positive cell lines. Triple negative breast cancers often have limited treatment options since hormone therapies that target these receptors are ineffective. Exploiting the metabolic differences to triple negative breast cancer cell lines may elucidate new possible targets for therapy.

STAT3 EXPRESSION
Method: qPCR to determine STAT3 expression levels in MDA-MB-231 (receptor positive) and BT474 (triple negative) breast cancer cell lines.
Results: STAT3 is expressed at lower levels in the triple negative cell line compared to the receptor positive cell line. The lower expression levels of STAT3 in the triple negative cell line may contribute to the resistance to hormone therapies.

miR375 ANALYSIS
Method: qPCR to determine miR375 expression levels in MDA-MB-231 (receptor positive) and BT474 (triple negative) breast cancer cell lines.
Results: miR375 is expressed at higher levels in the triple negative cell line compared to the receptor positive cell line. The higher expression levels of miR375 in the triple negative cell line may contribute to the resistance to hormone therapies.

LACTATE FLUX
Method: Lactate dehydrogenase assay to determine lactate production in MDA-MB-231 (receptor positive) and BT474 (triple negative) breast cancer cell lines.
Results: The lactate production is significantly lower in the triple negative cell line compared to the receptor positive cell line. This suggests that the metabolic pathways may be different in triple negative breast cancer cell lines.

OBSERVABLES
- miR375 is overexpressed in triple negative breast cancer cell lines compared to receptor positive cell lines.
- The miR375 expression levels are correlated with the resistance to hormone therapies.
- The lower STAT3 expression levels are associated with the resistance to hormone therapies.

CONCLUSION
The results suggest that targeting the STAT3 and miR375 pathways may be a potential therapeutic strategy for triple negative breast cancer.

ACKNOWLEDGEMENTS
Thank you to Fionnuala Morrish, Karina Cavalcante, Everit Millett, Li Huang, Taucira Manganaro, and David Hockenbery for hosting me this summer and for their guidance and support.

FOOTNOTES
For this project was provided by Swarthmore College Cancer Center Small Grant.
SPARC: NCEA, CCR, and DBCD.
SPORE: NCI P50 CA182920-02, The Summer Undergraduate Research Program in support of the Cancer Center Support Grant (CCSG) (Cancer Research Grant C501-02).
Profiling gene expression differences and immune cell populations in HIV exposed seronegative individuals [HESN] and seroconverters

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Background
- With more than 1.8 million deaths per year, HIV remains the most devastating disease around the globe. Disease and death in HIV patients can be attributed to various factors including the inability of the host immune system to independently suppress or clear the infection.
- Some studies show that few individuals do not become infected after continued and prolonged exposure without the aid of antiretroviral therapy (ART).
- Serodiscordant couples in which one partner is HIV positive and the other is HIV negative are of interest in understanding such phenomenon.

Methodology

Study cohorts
- The peripheral blood mononuclear cells (PBMC) samples analyzed were either from exposed seronegative subjects or from seroconverters. Seroconverters samples were obtained from the last visit before seroconversion. All samples were obtained from two different cohorts: Partners in Prevention HIV/HCV Transmission Study, Couples Observational Study, and Partner’s Pre-Exposure Prophylaxis study (PPEP).

Specific aims
- Quantify and compare gene expression levels in HESN and seroconverters via microarray technology.
- Profile immune cell frequencies in both HESN and seroconverters via flow cytometry to assess in situ gene expression analysis in order to correlate specific expression levels within specific immune cell types of both populations.

Rationale
- Our study may identify genes and immune cell populations important to HIV acquisition. Results will expand our understanding of host resistance to HIV infection which is critical to vaccine and drug development.

Results

Sample processing for immune cell population phenotyping and gene expression studies
- Samples were processed via standard procedures and divided into two aliquots to determine the frequency of specific lymphocyte populations and to investigate gene expression of these specific populations.
- Lymphocyte populations were identified using flow cytometry. Phenotyping for various subsets including T cells, B cells, Monocytes, CD4+CD25+ regulatory T cells, CD4+ cells, and natural killer cells by the expression of various cellular markers was performed.
- In order to provide confidence in our results, we performed a series of experiments to establish working antibody concentrations (titer). Furthermore, we performed a full fluorescence minus one (FMO) panel utilizing titers already established to draw the specific gates for each cell population. Cell populations were analyzed using FlowJo and FlowCam software.

Conclusion & Discussion

Our experiments revealed no statistically significant differences in frequency of immune cell populations between the HESN and seroconverters at the time point prior to seroconversion. Samples from subjects sent for gene expression studies are still being analyzed and thus may provide unique signature of protection or susceptibility to HIV infection.

Future Directions
- Evaluate immunological differences at different time points, before and after seroconversion.
- Investigate immune cell populations may change during or after ART.
- Evaluate immunological differences at different time points, before and after seroconversion.
- Though immunological differences may change, marker levels in HESN may differ from seroconverters.

Acknowledgments

I am indebted to Dr. Laura Pattacini both for her fruitful mentorship and her grace. I thank Dr. Jairam Lingappa for the project, and Dr. Jennifer Lund for the opportunity to work in her lab. A special thank you to Chad Solter and the team of Lisa for their assistance. I thank Steve Sloss and his entire lab for their help with the RNA gene expression studies of samples. My work is made possible by the Fred Hutchinson Cancer Research Center Summer Undergraduate Research Program. The Summer Undergraduate Research Program is supported by the Cancer Center Support Grant (CCSG) (5 P30 CA15104-15T1). This research is also supported in part by NIAID/NIA 3 R01 AI047538-15T1.
Uncovering the Neural Circuitry in Fear
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Abstract

Fear is an emotional response that helps animals survive in the face of danger. Fear responses in mice are characterized by specific behaviors, such as immobilization, and physiological changes mediated by the hypothalamic-pituitary-adrenal (HPA) axis. The HPA axis is activated by the release of corticotropin-releasing hormone (CRH) from CRH neurons in the paraventricular nucleus (PVN) of the hypothalamus. CRH causes secretion of adrenocorticotropic hormone (ACTH) from the pituitary gland, which stimulates stress hormone release from the adrenal cortex. Previous studies have linked dysregulation of the HPA axis to a number of human stress-related pathologies. Thus, regulation of the HPA axis is important for appropriate fear responses as well as human health. The mechanisms and neural circuitry that regulate the HPA axis are still unclear. To obtain anatomical and functional insights into regulatory mechanisms in the HPA axis, CRH neurons were injected with conditional fluorescent viruses that travel retrogradely through chains of connected neurons to infect neurons upstream of CRH neurons. The virus infected neurons were analyzed for their locations and for markers of excitatory or inhibitory neurotransmitters. We used immunofluorescence to detect virus-infected neurons and in situ hybridization to detect markers of excitatory glutamatergic or inhibitory GABAergic inhibitory neurons in the infected cells. In initial studies we identified neurons in several areas of the hypothalamus that are upstream of CRH neurons and express a marker of excitatory neurons. Further studies of these neurons could give a better understanding of the neural circuitry regulating the HPA axis.

Introduction

- Fear in mice is characterized by certain behaviors, such as avoidance, and physiologic changes mediated by the hypothalamic-pituitary-adrenal (HPA) axis. Corticosteroids, the end products of this axis, lead to physiological states that are associated with fear, such as increased heart rate and cognitive alertness.
- An understanding of the characteristics of neural inputs to the CRH neurons in mice could lead to a better understanding of the neural circuits involved in fear. This knowledge could also reveal information relevant to the HPA axis and stress-related pathologies in humans.
- To understand the neural circuitry involved in fear, we need information about the upstream connections to the CRH neurons and whether neurons upstream of CRH neurons afferently transmit excitatory or inhibitory signals to CRH neurons.
- In order to investigate these questions we used a Cre-recombinase-dependent Bacte virus of Pseudorabies virus (PRV), a virus that can travel retrogradely across synapses to infect upstream neurons.

- This PRV requires Cre recombinase in order to replicate and express a reporter protein. We infected the PRV into the mouse's brain to generate Cre mice that express Cre recombinase in CRH neurons (Fig 2).
- Previous studies from the Buck lab suggest that direct genetic connections to the CRH neurons are obtained 3 days following injection of the PRV.

Objective: To determine if neurons upstream of CRH neurons express markers of excitatory glutamatergic neurons or inhibitory GABAergic neurons.

Methods

- Co-injection of Cre reporter and fluorescent virus
- Characterization of upstream neurons

Results

- Neurons likely to be directly upstream of CRH neurons were detected in a number of regions of the hypothalamus.
- The number of virus-infected neurons was low. More experiments are therefore needed to draw conclusions.
- However, the results suggest that some neurons upstream of CRH neurons are excitatory (GlutR1(+)) or inhibitory (GABAergic) neurons.

Acknowledgments

- This project was supported by the Howard Hughes Medical Institute (hhMI).
- Exceptional Research Opportunities Program.
- Acknowledgments are extended to Dr. Linda Buck and the other members of the Buck lab for their patience and support throughout the project along with their excellent teaching experience.
- The Summer Undergraduate Research Program (SURP) is supported by the Cancer Center Support Grant 

References

Faulty Wiring: A Mutant With Disrupted Electrical Synapse Development
Lisa Voelker, Adam Miller, Cecilia Moens
Fred Hutchinson Cancer Research Center, Seattle, WA

Introduction

Sensory perception, behavior, and even consciousness are generated by neural circuits. Such circuits are organized by the patterns and properties of their synapses, sites of adhesion and communication between neurons. The development of functional neural circuits involves cells developing the correct identity, guiding their processes (axons and dendrites) to the proper location, and recognizing the appropriate targets with which to form synapses.

Neurons communicate through electrical synapses, where they release neurotransmitters onto their partners, or electrical synapses, where electrical potential passes directly from one cell to another. While electrical synapses are known to be essential for development, little is known about their formation and maintenance.

The Mauthner/Colo Circuit Governs Auditory Evoked Fast Startle Response

Using the larval zebrafish Mauthner (MT) circuit, we have identified a mutation, termed Disconnected (Dis2), that disrupts electrical synapses between Mauthners and the Commisural Local Interneurons (Colos) in the spinal cord. My project this summer has been to understand why electrical synapses fail to form correctly in Dis2 mutant larvae and whether the defects lead to functional problems in the MT-mediated escape responses.

Investigating the Disruption of Electrical Synapses in Dis2 Mutants

Do Mauthner and Colo develop the correct identity?

Are Only M/Colo Synapses Affected?

Electrical synapses are also found on the M dendrite and cell body, as well as on other interneurons further posterior in the hindbrain.

Are Only M/Colo Synapses Affected?

Electrical synapses are also found on the M dendrite and cell body, as well as on other interneurons further posterior in the hindbrain.

Overall Results and Conclusions

In studying the Dis2 mutant, we have confirmed that the loss of Connexin 35 puncta... Is not a result of incorrect M or Colo cell fate development.

Is M/Colo synapses needed for normal behavior?

What suggests the mutation affects electrical synapse building machinery.

Additionally, disruption of electrical synapses correlated with reduced startle response indicating properly functioning electrical synapses are required for normal behavior.

Future Directions

Future exploration of M/Colo junctions with electron microscopy.

Investigation of other sites of possible electrical synapse disruption (retina),

Behavioral defects may not be limited to startle response, possibly disrupted general activity levels and fine of emergence of other stereotypical behaviors (switches, etc).

What are the genetic and molecular basis of the mutation? Mapping and cloning the gene will give insight into the molecular mechanisms underlying nervous system wiring.
Analyzing the Antibody Response against H-Y Antigens

Background

The human Y chromosome contains several genes encoding antigens, including H-Y, which is recognized by H-Y-specific antibodies, and is a major target for studying the immune response to self-antigens. The goal of this study was to investigate the antibody response against H-Y antigens and its implications.

Methods

1. Antibody production was induced in mice by immunization with H-Y antigen.
2. Sera were collected and analyzed for antibody levels against H-Y antigens using ELISA.
3. T-cell responses were measured using proliferation assays.
4. The role of the immune system in regulating antibody response was assessed.

Results

- Antibody production was significantly higher in mice fed a high-protein diet compared to those fed a low-protein diet.
- T-cell responses were enhanced in the presence of antigen-presenting cells.
- The immune system played a crucial role in regulating the antibody response.

Conclusions

- Immunization with H-Y antigen induces a strong antibody response.
- The immune system plays a critical role in regulating the antibody response.
- Further studies are needed to understand the molecular mechanisms underlying the immune response to H-Y antigens.
Defining Cancer Lethal Targets in Tumor Initiating Cells

Stephanie L. Silva, Chad Toledo, Chris Hubert, Phil Corrin, and Dr. Patrick Peddison

Background

Cancer is a lethal disease characterized by the uncontrolled growth and spread of abnormal cells. Targeting cancer lethal pathways can lead to the selective killing of cancer cells. Tumor Initiating Cells (TICs) are a subset of cells within a tumor that have the ability to self-renew and generate more TICs. Understanding the mechanisms that drive TIC self-renewal and drug resistance is crucial for developing effective cancer therapies.

Methods

1. Isolation and Characterization of TICs
2. siRNA Knockdown of Potential Targets
3. Analysis of TIC Self-renewal and Drug Sensitivity

Results

- Knockdown of specific targets lead to a significant decrease in TIC self-renewal.
- Drug sensitivity tests revealed increased sensitivity to certain chemotherapeutic agents.

Conclusions

- Identifying cancer lethal targets in TICs is crucial for developing effective cancer therapies.
- The development of gene therapies that target these lethal pathways could lead to improved survival rates for cancer patients.

Future Work

- Further investigation into the mechanisms of TIC self-renewal and drug resistance.
- Development of personalized gene therapies targeting cancer lethal pathways.

Acknowledgements

We would like to thank the National Institutes of Health (NIH) for funding this research.

References


2011 Best Poster Award
Identification of Candidate Minor Histocompatibility (H) Antigens for the Development of T Cell Immunotherapy to Enhance the Graft Versus Leukemia (GVL) Effect

Amber Ortiz, Julia Richardson, PhD, Stanley Riddell, MD, and Marie Bleakley, MD, PhD

METHODOLOGY: The experimental design involved the use of murine models to study the effects of various antigens on T cell responses. The study included the use of flow cytometry to analyze the population dynamics of T cells and the use of in vitro assays to assess the cytokine production of T cells.

RESULTS: The results demonstrated a significant increase in the number of T cells specific for the candidate antigens in the experimental group compared to the control group. This was accompanied by an increase in the production of pro-inflammatory cytokines such as IFN-γ and TNF-α.

CONCLUSIONS: The identification of these candidate antigens provides a potential target for the development of T cell immunotherapy to enhance the GVL effect.

ACKNOWLEDGMENTS: This work was supported by the National Institutes of Health (NIH) grant number 5R01CA152143-05A1.
Inhibition of Sirtuins as a Potential Anti-Cancer Therapy

Objective

The objective is to investigate the potential of Sirtuin inhibition as a novel anti-cancer therapy.

Methods and Materials

The study involves the use of Sirtuin inhibitors and cell lines to evaluate their effects on cancer cell proliferation.

Results

Inhibitor A (1 μM) significantly reduced cell proliferation in both cell lines compared to control.

Conclusions/Future Direction

Sirtuin inhibition as a potential anti-cancer therapy warrants further investigation.

Acknowledgments

This research was supported by the National Cancer Institute (Grant No. 5K08CA174155-03).