* **great essay**
* **good overall organization -- the essays flows well, there's a clear time line**
* **good motivation for each project**
* **good discussion of independent work**
* **good discussion of evolution of your scientific interests**
* **how is the work continuing to move forward? how is the company still pursuing the work? what is the impact of your projects. maybe add a sentence to the end of the section for the first project. you do a good job addressing this in the second project**
* **I'm a little unclear on the technology that was developed at ATFI. i think you could elaborate on your design contributions a little more. (note I'm not familiar with solar cells and thin films)**
* **perhaps in the conclusion mention career goals -- what do you want to do after graduate school? how is graduate school preparing you for that?**

**Applied Thin Films Incorporated (2006-2011).** I realized while attending Northwestern University for my B.S. that nowhere in my classes was I learning what it was like to work as a scientist or an engineer. Instead of waiting until graduation to find out, I applied for a position as a cooperative education (co-op) employee with Applied Thin Films Inc. (ATFI) and was hired! ATFI is a small, research driven start-up company where I worked on basic research developing thin-film technologies for solar cell and aerospace applications. Between the summers of 2006 and 2010 I worked a total of 15 months as a full time employee, and after graduation I was hired by ATFI for 3 additional months to train new employees in the processing techniques I developed. In addition to developing thin film technologies, because ATFI is small company with only six full time employees, I was able to gain a broad range of experiences while working at AFTI – everything from client meetings to wet lab work. Here I will describe two of the projects I contributed to at ATFI, and how they affected my development as a scientist, researcher, and engineer.

***Project 1: Planarizing dielectric layer for thin-film solar cells***. Thin-film solar cells require a planarizing dielectric layer applied over flexible metal foil to serve as an insulating barrier upon which semiconducting materials can be deposited. Under the supervision of materials engineer Dr. Todd Gudgel, during the summer of 2009 I developed technology for this application. By varying coating and curing parameters, as well as by modifying a custom-built dip-coating apparatus & high temperature furnace, I produced a thin film that met all of the desired specifications of surface roughness and breakdown voltage.

Because AFTI was a small company with a limited staff, from the start I worked independently. I set my own weekly objectives and assessed my own progress toward perfecting solar cells coatings. Additionally, I formulated, planned, and executed solutions to any engineering problem I encountered. In short I learned what it takes to work productively as an independent researcher, leading my own project.

***Project 2: Thermally stable, compact, high energy density capacitors***:

Compact, high energy density capacitors which are thermally stable at temperatures up to and beyond 300°C have numerous applications in aerospace and pulse-powered systems. During the summer and fall of 2008 I worked on a team led by my supervisor and mentor at ATIF Dr. Todd Gudgel to develop high energy density capacitors. This project was a massive undertaking for the company. The capacitors that we developed extended the applications of the company's solar cell technologies into that extended their technology’s applications into un-tapped dielectric markets. Specifically, our goal was to develop thin films with highly controlled dielectric properties that could be deposited onto solar cells. This required us to determine the new technology’s dielectric constant and breakdown strength over a range of stoichiometries, and to engineer a coating architecture, which would have a loss tangent of less than 1%. Over the course of this project we accomplished our goals and designed robust thin-films with loss tangents as low as 0.1%.

I was responsible for characterizing the dielectric properties of the thin films we created and communicating my findings to my team. This required me to develop impeccable data management, organization, and presentation skills. I measured over 3,000 properties -- including capacitance, loss, induction, impedance, and phase angle, for each of the hundreds of dielectric foil samples my team created. I designed the entire data collection protocol and management system for the project. AFTI continues to use this management system today. I also contributed to many quarterly and final reports written for our funding sources, as well as prepared presentation materials and posters for industry conferences and presentations.

**Department of Chemical and Biological Engineering, Northwestern University (2009).** Motivated by bioengineering research I saw at a lecture series at Northwestern University, I contacted Prof. Linda Broadbelt and joined her lab's computational efforts to discover novel biosynthetic pathways for butanol biofuel production. Working with , I took a cyber-enabled analysis of the biosynthetic butanol pathwaysSpecifically, I developed “enzyme operators” or mathematical representations of chemical bond rearrangements catalyzed by enzymes. First I systematically generated reaction networks and quantified the percent coverage of the Kyoto Encyclopedia of Genes and Genomes (KEGG) database by our current enzyme operators. Next I expanded the coverage of our enzyme operators of the KEGG database using published enzyme mechanisms.

My project with the Broadbelt group was my first hands-on exposure to computational systems biology. I enjoyed the challenges of searching, reading, and developing computational models based on the experimental literature. My positive experience in computational systems biology inspired me to pursue a PhD with Prof. Markus Covert at Stanford University working on a project combining novel experiments with systems biology mathematical modeling.

**Department of Bioengineering, Stanford University (2011 - Present).**

[Talk about viral project with Elsa. Working as a team. How this fits in with interests as I have described them.]

**Presentations and Posters**

[1] Materials Science & Technology. 2009.

[2] Bio-X Interdisciplinary Initiatives Symposium. 2011.

[3] Biology and Mathematics in the Bay Area. 2011.