My department was responsible for optimizing and scaling up the chemistry used to manufacture pharmaceuticals during their clinical stages and throughout their time on the market. Specifically, my group was working to optimize the chemistry for a product that was on the market and for which demand was not being met. My project was to explore the use of continuous extraction technologies in the pharmaceutical industry. I worked to characterize two pieces of equipment and create a new continuous process for use with the current chemistry. Training was provided through orientations, online classes, and personal interaction. I was assigned a mentor who I approached with most of my questions.

My work activity was most related to organic chemistry, so my chemistry background was particularly helpful. Since I was working in the lab a lot Organic chemistry lab was the largest contributor to my helpful background. I learned a lot about communication in the workplace. For instance the most effective way to communicate is to talk to someone in person or over the phone. This position has taught me about the more research driven side of chemical engineering and will be invaluable in my eventually job selection. I also learned a lot about working relationships, as well as cultivation and maintaining friendships with your coworkers. Overall I am very satisfied with the experience and would not change many things about it.

My recommendation for finding housing is to use Craig’s list and talk to the people in the Department. You can either drive to work or take the train. There is a train station right next to the campus. Social activities consisted of mostly interacting with coworkers on off hours. Merck does offer several intramural sports leagues and time off for community service.

The best part of my job was the fact that I received a real project and not just busy work. My project is important to the company and I was able to use many of my own ideas. I also had an amazing boss/mentor. The worst part was the commute and the hours. I was about a bit over a half hour commute to and from work and I would continually work more than a 40 hour week; this did allow for flex time which was a plus.
At the start of my Fall 2009 term I was given two binders filled with research articles and I quickly became familiar with two alternative primary recovery technologies. During these first two weeks, I also completed my laboratory safety training because safety has to be a top priority in order for a lab-oriented company to function.

These two technologies focused on purifying a protein from a media containing cells. My assignment was to evaluate the feasibility of both technologies and compare them to the traditional process. Both were first examined on a small scale, where a window of operation was defined. Then, the systems were scaled up to a more functional scale, narrowing this window to a few specific conditions. Finally, the technology was further scaled up to pilot scale. By analyzing the results, it is possible to see if either technology is an improvement in terms of process economics and productivity (yield and time cycle).

Although I was technically a part of a small bio-purification group within the Bioprocess Research and Development Department, my project allowed me to interact with the fermentation group, the analytical group, and even vendors who had a vested interest in my project. If I ever had any technical questions I would generally ask my supervisor who would always take the time to teach me about the details, even if I didn’t really need to know the information to complete the experiment. Nearly everyone was busy but I felt that if I ever had a question or needed help, they would often take time out of their day to answer my question or help me make up a buffer. It was a shock to me at first how altruistic people were to others when they needed assistance.

As a biological engineer I explored two purification technologies based around molecular interactions, heat and mass transfer, and a little fluid mechanics. On the surface it was a primarily chemical engineering project but there was a subtle aspect of biology involving the product itself. Invoking questions like is the protein stable in this medium? Under what conditions will the protein aggregate or will fragmentation occur? In the beginning my work was very hands-on and lab oriented. I followed many set experimental procedures. However, as I gained more experience I started designing my own experiments and exploring how one variable influenced another. I was able to take initiative and given the responsibility to do follow-up experiments on conditions that I wanted to test.

I developed professional communication skills quickly. I often had to determine when I would receive materials from the fermentation group or when sending off samples for the analytical group to examine for specific traits. Weekly group meetings allowed me to see how other project teams worked and expanded my technical knowledge about protein purification. If I were to do anything differently I would have made labels using a computer template much, much sooner (as opposed using a marker).

I became friends with a lot of the younger and older workers in my group. We would go out to dinner and we had a happy hour celebration when one co-worker received his PhD while working full-time at Merck. The Sunshine Committee planned out a fun picnic day where we played volleyball, kickball, bocce-ball, and competed in a scavenger hunt to get to know other people from different departments. One night we had a Rock Band Extravaganza which consisted of a lot of bad singing, mostly by me, and good times. I commuted to work by car but
many other coworkers worked in the nearby city of New Brunswick and commuted to work via the train and used the Merck shuttles to get from the train station to the Merck site which is located in Rahway, NJ. Since it is such a large company there were many different sports leagues available to participate in if you chose to do so; some people were very competitive about it while others were competitive about the office fantasy football league.

I moved through the engineering design process and gained insight into the production of therapeutic proteins on a large scale. The best thing for me was this very broad exposure to so many different techniques and machinery used to create and produce a purified protein for use by the general population. One potential drawback of working in this industry is that life does not stop, proteins can still degrade even if it is 5pm and you've worked 8 hours; sometimes full-time employees would have to work night shifts and weekends to process batches as quickly as possible. I received an overview of what it takes to get a drug to market with Safety Assessment, Phase I, Phase II, and Phase III trials and the high level of scrutiny at Good Manufacturing Practice (GMP) facilities to Food and Drug Administration (FDA) approval. I learned various analytical techniques such as High Performance Liquid Chromatography (HPLC), BCA, and SDS-Page gels and how to interpret this analytical data. Overall, I thoroughly enjoyed my co-op with Merck and I feel that I have gained valuable knowledge, hands-on experience, and close friends.
The first day, a mix of nervousness and excitement filled me as I stepped off the train alongside a hoard of interns and boarded a shuttle to the Rahway site. During the summer, the Future Talent Program (FTP) organizes events for the co-ops and interns, the first of which was an Orientation Presentation. FTP leaders introduced us to the company, reviewing its hierarchy and its mission. When the presentation concluded, I was paired with my manager, and began working in the fermentation group within the Bioprocess Research and Development Department.

Although fermentation may first conjure images of wine and beer production, cells can also be used to produce a biologically-active protein for medicinal use. Whether it's a monoclonal antibody to treat an infection, or a small therapeutic protein to treat diabetes, fermentation is ultimately responsible for manufacturing this raw protein. My project investigated proteases, native enzymes in the cells, which could be degrading our product. This protease characterization project spanned across three cellular expression systems, allowing me to interact and learn from multiple project groups. A typical day was spent in the lab, running experiments to elucidate active proteases. Since I had already worked for 18 months in the fall, I didn't have to repeat most of the safety training and was able to enter the lab the first week. I quickly gained hands-on experience with cell culture, seeding and passaging cells and using equipment to determine the viable cell density. Most techniques were learned in the lab, gaining a functional knowledge of how to prepare bioreactors and operate a bioreactor skid during a fermentation process. My supervisor entrusted me with a lot of responsibility early on, fostering an environment where I had to think for myself, formulating my own answers to questions and problems. During the second week, my manager went on vacation, and I was responsible for running the entire batch, recalibrating probes, sampling each bioreactor, feeding the cells, and analyzing all the subsequent data. One of the best things about working at Merck is the environment. While I thrived in the independence I was given, it was comforting to know that there were many people I could ask for help when I had questions.

Honestly, the people that I've met and interacted with at Merck have taught me a lot about working professionally and matters outside of Merck. I've been extremely impressed by how helpful employees are to me and one another, often sacrificing their own time to aid others when they need it. This feeling of cooperation adds to the entire experience and talking to others in the lab makes the downtime between experiments soar by.

Conducting my fermentation experiments, I saw Physiology, Biochemistry, and Genetics applied to engineering problems. While not essential, these courses helped me to formulate reasons to explain results and design experiments to test new ideas. Personally, I've found Biochemistry to be the most applicable course for both co-op terms. At the conclusion of the work term, I presented my project in an hour-long PowerPoint presentation. This helped me to improve my technical writing and public speaking skills. Furthermore, during the last week, there was a poster session and all the
interns and co-ops presented their findings. It was interesting to see what the 40 other people that I had been living with for the past 3 months did for their summer projects.

Merck provides housing over the summer to all interns and co-ops for free. However, if you bring a car, you'll have to pay $200 for a parking permit. Merck gives each intern a free train pass from New Brunswick, where you're housed, to Rahway making a car a convenient for running errands and travelling but not essential. The provided housing was in a Rutgers University high-rise dorm. Merck rented out a wing on the 12th floor for all the interns and co-ops. Each apartment housed 4 people in two double rooms who shared a common kitchen, bathroom, and living room. Overall, I enjoyed living with the other interns and many people organized weekly basketball and frisbee games. If you're over 21, New Brunswick also has bars and clubs, which the older interns and co-ops visited. Also, the Future Talent Program organizes one fun event each year. Last year, all the interns across the different sights went on a "booze-cruise" on a boat outside of NYC and this year we were all taken to Six Flags Great Adventure Theme Park. It was really nice to get paid for a day to ride roller coasters and log flumes. Also, the FTP organized a paid day off from work for the interns and co-ops to visit Whitehouse Station, the Merck managerial site. While there, we listened to a panel of Merck's upper management discuss and take questions on the different aspects of the company.

I enjoyed how my project applied to Merck as a whole. When large scale batches cost over a million dollars to run, preventing proteases from degrading your final product is imperative. I moved through the entire fermentation process, starting with a strain, seeding the cells until they reached a certain cell density and volume before inoculating bioreactors to produce a product. I then operated this system through a 14 day fermentation and analyzed the material I produced for protease activity. Furthermore, I engineered zymograms to detect proteases capable of degrading our product and worked to characterize these identified proteases. All in all, I've really enjoyed contributing to a meaningful project and gaining widely applicable experience in the process.
My department was responsible for optimizing and scaling up the chemistry used to manufacture pharmaceuticals during their clinical stages and throughout their time on the market. Specifically, my group was part of Legacy Schering Plough and in the process of being merged with the corresponding group at Legacy Merck. My project was to develop a continuous, on-line UV-Vis spectroscopy apparatus and demonstrate its feasibility for impurity removal process development. I worked to characterize color removal processes through activated carbon adsorption. Training was provided through orientations, online classes, and personal interaction. I was assigned a mentor who I approached with most of my questions; however, I also addressed many of my questions to my peers.

My work activity was most related to organic chemistry, so my chemistry background was particularly helpful. Since I was working in the lab, organic chemistry lab was the largest contributor to my helpful background. I learned a lot about communication in the workplace. For instance I learned how to accommodate many different personalities and styles. This position has taught me about the more research driven side of chemical engineering and will be invaluable in my eventually job selection. I also learned a lot about working relationships, as well as cultivation and maintaining friendships with your coworkers. Overall I am very satisfied with the experience and would not change many things about it.

Merck provides housing and transportation for summer terms. All of the summer interns were housed on the same floor with Rutgers’ housing. As a result the many interns socialized with each other, providing a plethora of potential activities. In addition, Merck does offer several intramural sports leagues and time off for community service.

The best part of my job was the fact that I received a real project and not just busy work. I was able to take control of my project, instead of just following directions. I also had an amazing boss/mentor. He really took an interest in my personal development and job satisfaction. The worst part was the limited amount of time during the summer term in which to work on my project.