Co-op Work Assignment
I worked in a circuit design group in Sunnyvale, CA, a subset of the Computing Solutions Group. My group was designing the Load Store (LS) unit for a next generation microprocessor at AMD. Throughout my co-op, I worked on one main project as well as several additional tasks. More specifically, I owned the LS gizmos – six auto-generated memory arrays. I generated, analyzed, and debugged these circuits. Additionally, I worked with some of the CAD designers to resolve bugs in the analysis flows, and helped other members of my group run new analysis tools. My assignments were somewhat varied, and in addition to design and analysis work, I gained experience with the Perl programming language. I wrote two Perl scripts: one to parse results files and another to track the usage status of a tool being run by several people in my group. I also created some schematics for the L1 data cache, including calculating transistor sizing and placing cells in layout.

Most of my training throughout the term was provided by one-on-one sessions with my mentor, Michael McCabe. For the first few weeks of my co-op, I completed some practice assignments to gain familiarity with concepts, such as SRAM cells, and tools, such as the schematic editor and circuit analysis flows. I also read a few textbook sections on CMOS design, computer architecture, SPICE simulation, and Perl during the term. My mentor was always available when I had questions.

Assessment of Learning and Development
My coursework at Cornell definitely contributed to the knowledge base needed for my co-op. Since I had not yet taken a computer architecture course or VLSI design course, I had to learn a good deal of material at the beginning of my co-op. Despite this challenge, my mentor was very helpful in teaching me, and I soon became much more confident in completing my work, which was always meaningful and valuable to my group. I felt that I became much more independent and able to complete more complex tasks as my co-op progressed, and I am looking forward to learning even more during my next term.

In addition to working with other Sunnyvale engineers, I had the opportunity to interface with people at the Boston site since I was working on a cross-site project. Summarizing analysis results, sending emails, attending meetings, and documenting my work on a wiki page all helped me to improve my communication skills. All of the people in my group were very knowledgeable and always willing to answer my questions or help me with a task. In general, the work environment was quite relaxed, and work times were flexible as long as you finished your work on time.

Life Outside of Co-op
I lived in a fully furnished apartment arranged and partially subsidized by AMD for the duration of my co-op. It was conveniently located about 2 miles from my office, and a 10-15 minute walk from the downtown restaurant and shopping district. For transportation to work, my morning commute was about 25 minutes via city bus, and 10
minutes on a free shuttle in the evenings. Most of the co-ops during the fall were graduate students, thus I found socializing a bit difficult at first since there were few people my own age. Most people I met were quite friendly, however, and I ended up finding a group of recent hires with whom to socialize and eat lunch. Several athletic opportunities were available, including soccer, basketball, and football. I chose to get a membership at the workout facility located on the AMD campus, and exercised there a few days per week. Though Sunnyvale had limited offerings from a social and cultural perspective, San Jose and San Francisco are easily accessible via train. I went to San Francisco several times for sightseeing, concerts, and shopping. There were also nine other Cornell co-ops in San Jose, whom I visited regularly.

Evaluation
My mentor was extremely helpful and patient, and helped me to maintain a challenging and exciting workload. I definitely felt that I accomplished useful and valuable tasks for my group, and that some of my work will still be used after I leave. Overall, I really enjoyed my co-op experience.
Advanced Micro Devices (AMD) is one of the best companies that an ECE student can work or intern. Most of the works related to product are closely related to electrical engineering. The team I worked in is responsible of hyper transport which links cores. The work of this team is making sure the core can receive the correct data and clock from other core. This circuit is an important part of CPU and runs in high frequency compared to the core frequency. Especially within HT circuit, I worked mostly on receiver portion. One of the projects I worked on is measuring internal timing of various circuits. There was no standard measuring for internal timing and it is a crucial part as the circuit might fail to work on high frequency or even fail to run at all. Thus, my first task was to measure the hold and setup time of timing arcs and fix the problem. I reported the failures to the macro owners and discussed the possible changes. Also, toward the end of the term, I started to create or change circuit to meet the need of the clients. Most of the times there was existing circuits that need changes to meet the specifications. Thus, using my knowledge in electrical engineering, I had to come up with the solution that could meet all the requirements.

I initially had three mentors whom I go to ask questions and learn. However, I got to work with one person who owned the macro that I worked and gave to tasks. He also provided me some small quiz or information that could test my knowledge or give me a chance to explore and learn new things. There was a short orientation of company policy and work in AMD but most of the training came from reading manual and specifications through the website and learning from mentors about the circuit. I frequently had discussion with my mentors about any problem or general question regarding concepts or design of circuits.

As the products of AMD are closely related to electrical engineering, the knowledge from school is used a lot during the work. What I learned about the circuit during my school period is also used in the work. However, there is a lot of things that I am still not aware of and to learn. In order to make a good circuit, I realized that I have to be a master of what I am building. Compared to school work, the company creates a real chip that could have far more problems than what I got from a school project. Thus, I have to know detail information and learn continuously about the circuit and each small component of it. I believe working in AMD helped to develop my academic plan and the way I should focus my studying. Also, while working in AMD, I learned valuable knowledge related to electrical engineering. Working in a company was quite different experience compared to working in a school. There was more responsibility and my work influences other people significantly. Also, I learned that communicating well with the teammate is significant for the project to run well. AMD uses interns to do works that actually matters to entire circuit. Thus, what other interns and I did and found are reviewed and discussed in the team.

If any other person is thinking of interning at AMD in Sunnyvale area, I strongly recommend doing the housing provided by AMD. The money I paid to the company as housing is way smaller than the usual housing price. Also, even though you don't have a choice of roommate, house itself is really clean and good. It takes about 40 minutes by walk and 15 min by bike to work. I personally think that I had a better time after I bought
Hyunsik Eugene Minh
hem24
ECE
Advanced Micro Devices (AMD)
07 Fall term
the car. Life without car in this area is not quite pleasant. After I went to a church and bought a car, I had some social life, making friends, going for snowboard or inline skating, and camping. Our team played cricket once in the yard and I know some people playing basketball after lunch but I didn’t join much company activities. I personally recommend joining a team or club that you can enjoy and have fun. As an intern, I had plenty of extra time at night and weekends compared to school. I first joined a Korean percussion instrument group around my place and also went church. It would also be a good time to learn any instrument that you wanted to learn.

It was pleasant working here as all teammates were friendly and willing to give me information and discuss with me. The best feature of my internship was that I had a chance to explore as a real-life electrical engineer. It was interesting to use my knowledge to create new circuit and discuss and defend my idea with other teammates. Also, it was fun to learn many different aspects of circuit that has not been discussed during school. I had about five months of life without car and it was probably the worst part of this internship. There was not much thing I could do after work without car as I can not move around. Also, one hardship at the work is that there are too many vocabulary and terms that I have to learn and follow during the work that I feel lost at the meeting. However, this is a valuable experience as an electrical engineer to learn and explore many things.
Joey Kasnicki  
Electrical and Computer Engineering  
Advanced Micro Devices  
Austin, TX  
Fall 2007

Co-op Work Assignment

My team at A.M.D. was working on BobCat, a computer processor designed for UMPC’s (Ultra Mobile PC). Specifically, we did S.A.P.R. work on a block in the Load/Store Unit. S.A.P.R. stands for synthesis, autoplce, and route. This basically means using certain tools that automatically create a gate-level netlist and placement information from RTL (register transfer level) verilog.

Specifically, much of my time was spent writing scripts and debugging the flow related to a certain step that was used for setting the input and output timing constraints for a block. I also spent time maintaining a Perl script that was used to automate the S.A.P.R. design flow.

I didn’t have an “official” mentor, but I worked with my hiring manager on a day to day basis. My first month or so I would always go to him with questions. But, as I gained experience, I would often be able to debug a problem myself, or if I couldn’t figure it out, I would know who to ask to get my issue resolved as soon as possible.

Assessment of Learning and Development

At A.M.D., I used some basic Computer Engineering knowledge from my Cornell classes, but most of the information I used I learned on the job. I learned a good deal about how chip-level timing works and how to read and make sense of timing reports (in PrimeTime and EinsTimer format, which are both widely used in the field). I also
became proficient at using Unix commands and Perl scripting. I will be able to apply some of what I learned at A.M.D. to my future classes at Cornell, but most of what I learned will prove even more useful in the workplace, after school.

Life Out-side of Co-op

I found my apartment on craigslist.com, which is a great resource for finding temporary housing. Some other co-ops I know used apartment locators, which are also a good service. Austin is a place to live, and there are a ton of apartment complexes all around the city, so finding a place to live is not too hard.

I had a car in Austin, and this is highly recommended as many things would have been very difficult without it.

Evaluation

The best features of the job were the laid back work environment, the city of Austin, and realizing (after about a month) that I knew what I was doing. I enjoyed being able to help others learn about some of the steps in our design flow that I had been trying out but they had not used yet. I cannot think of any bad features of my job.
Advanced Micro Devices (AMD) is one of the best company that an ECE student can work or intern. Most of the works related to product are closely related to electrical engineering. The team I worked is responsible of hyper transport which links cores. The work of this team is making sure that the core can receive the correct data and clock from other core. This circuit is an important part of CPU and runs in a high frequency compared to the core frequency. Especially within HT circuit, I worked mostly on receiver portion. One of the projects I worked on is measuring internal timing of various circuits. There was no standard measuring for internal timing and it is a crucial part as the circuit might fail to work on high frequency or even fail to run at all. Thus, my first task was to measure the hold and setup time of timing arcs and fix the problem. I reported the failures to the macro owners and discussed the possible changes. Also, toward the end of the term, I started to create or change circuit to meet the need of the clients. Most of the times there was existing circuits that need changes to meet the specifications. Thus, using my knowledge in electrical engineering, I had to come up with the solution that could meet all the requirements.

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Work Assignment

I was a part of the Circuit Design & Implementation team during my stay at AMD. The bulk of my tasks involved a section devoted to distributing global signals (most importantly, the clock signal) to each section of the core. Consistency is vital to the smooth operation of the entire system, so care must be taken so that the load is as even along all of the branches in the tree. A helpful way to analyze this is to simulate the circuit with the aid of a computer; SPICE is the tool of choice for the industry, HSPICE being the variant used at AMD. Use of CAD tools to construct designs – both schematics and physical layout- to be simulated was also key. Another process I was involved in was logic equivalence testing (LEC) for various components. When the actual design of a circuit needs to be compared to the hardware description language code given by the RTL team, the most efficient way to approach this is to compare the desired outputs with simulated results. Using a method known as formal equivalence, the rtl and netlist are mathematically proved to exhibit the exact same behavior. Again, this is accomplished with the aid of a computer.

For my term at AMD I was assigned a mentor who would ensure I understood the job at hand, and provide guidance on how to accomplish them, and additionally give help when needed. Very little orientation was given with regards to the infrastructure. Aside from a brief meeting to go over HR policies, I acclimated myself to my work environment by “getting my hands dirty” with the close guidance of my mentor. Additionally, meetings were held to introduce us to the various concepts relevant to my job, or simply to further enhance my knowledge of key physical processes.

Learning and Development

I found that the most important courses during the fall session were ECE 210 and 230. The two proved extremely relevant, and I regretted not having the textbooks with me at work. Of course, I was taught additional material, all of which fell more or less neatly into either extensions of 210 and 230. On the other hand, I learned a great deal about the work environment, and how to handle it– how much detail needs to go into communication, punctuality, taking responsibility, adapting to criticism. It is quite different from the part-time jobs I’ve held in the past: simultaneously more relaxed and more demanding, in a setting where you feel more as a part of a team effort.

Life Outside

For those that take on co-ops at AMD or Intel in Boston, I highly recommend contacting BB Realty about intern housing in Marlborough. They offer an apartment building strictly for other students with jobs, and it is a great way to maintain the “college lifestyle.” Of course, be sure to have a car-- I depended on carpooling to get around, and while this does work you miss out on the chance to explore on your own, and with Boston half an hour away it’s an opportunity you don't want to miss.

Final Comments

I found this to be an overall positive experience for me. I did have some reservations over the lower amount of classroom knowledge I was applying than I had
expected, and I especially do not like the "cubicle life," but I found these to be somewhat manageable qualms. I appreciated the chance to learn more about the industry, and how things get done in a large nation-wide effort.
Job Summary at AMD

This internship opportunity at Advanced Micro Devices allowed me to learn many useful skills and qualities as an employee and as a team player.

I was first brought into the realm of fuse platform silicon testing. My first few hours at work involved an orientation meeting, which provided information on general people to contact for computer-related questions, or any question I may have. There was also background information on employee benefits and services. After that, I was immediately assigned to a mentor by my manager. All throughout the co-op term, he has been very accessible for help and has answered all the questions that I have with anything from making an account on Linux to the technical specs of a fuse array circuit. But he wasn’t the only person I asked questions to. I have co-workers beside me in my cubicle I could approach, as well as other co-workers who are on my same team, or even someone who I have become well acquainted with.

One thing that amazed me as I started working was the casual work environment that this company has. Very rarely do you see people with nice flannel shirts and khakis with nice shoes. There were even employees coming in with flip-flops and Hawaiian shirts. I already felt comfortable fitting in with the employees here.

Within my realm of fuse testing, I was exposed to the workings of lab test equipment that performs the actual programming of the fuses. I also learned the program structure behind this test through languages like C++ and XML. One major project that I underwent was updating the test program to make our fuse tests compatible with a newer, faster, smaller kind of processing chip. This involves mastery of C++ and XML and understanding how each file is related to each other.
When the new processing chips arrived, the work place became much more team-oriented. I was assigned tasks from various co-workers, and I worked side by side with another co-worker to develop new code to extract useful data from a new kind of test platform. Managers in product development were scrambling to ask for the status of each person's work, making sure the production plan is on schedule.

By working along side various co-workers, I enhanced my communication skills. I portrayed my questions or thoughts in a clear and concise fashion. I became more organized with what I was going to say beforehand. My e-mails were also better written such that the terminology I used was more sophisticated yet concise.

With all work aside, my life outside of work was truly exceptional. Austin is a great place to explore and try new things. Many would say this city is one huge college town, so there are many opportunities to interact with other students with similar age. My only regret is that my housing location was far away from all the activities and the people. If I were to start over, I would have tried to find an apartment closer to work and closer to the University of Texas-Austin. I feel it would make my life outside of work much more thrilling.
Matthew Kuzdeba  
Electrical and Computer Engineering  
Advanced Micro Devices – Boston Design Center  
Fall 2007  

Co-op Work Assignment  

This past fall, I worked at Advanced Micro Devices (AMD) as a member of their circuit design team. The circuit design team’s job is to implement the high level RTL code that describes the overall behavior of the microprocessor into the physical circuits that the microprocessor will be made up of. This involves dealing with many issues, from the devices and transistor level, to the circuit level, and the overall chip architecture. Specifically, I worked on the Instruction Fetch team, which was a group of about 14 people who were responsible for the design of the Instruction Cache and Branch Prediction of AMD’s next generation processor core.  

Throughout my co-op tour, I had two main tasks that I worked on. The first was conducting logical equivalence tests (LEC) between the RTL Verilog code, and the actual circuit schematic design. The goal of LEC is to make sure that the schematics, which the actual chip will be built from, have the exact same logical functioning as the RTL, which is used in simulations and testing of the chip. This involves using many of the tools of the industry to convert the RTL and schematics to a common form where all of their inputs, outputs, and state points can then be mapped together and compared. I needed to develop a high level of understanding of the functioning of both the RTL code and the schematics to be able to debug errors and nonequivalent points in the LEC runs. Upon finding inconsistencies, I had to change the RTL or schematics depending on which was wrong to get the proper functioning. This often involved needing to discuss the issues with either the architecture team or circuit design team, so I was able to get a lot of interaction with the different designers in the company.  

The other task that I was given was to help one of the senior circuit designers with the design of a large functional block for the Instruction Cache. He started off by giving me small chunks to work on, and taught me everything that I needed to know along the way. Eventually, I was able to design significant parts of the block by myself, and learned an enormous amount about circuit design while doing so. The circuit design process consists of first getting an understanding of huge sections of RTL code that represent a particular function of the processor, and breaking them into smaller functional chunks. I then would go through a chunk and make a block diagram of its logic. Then, I’d begin drawing schematics of the block, implementing it using logic gates, flip-flops, latches, and other digital logic components, optimizing the logic where possible. I learned to design to optimize power, efficiency, and timing. After the schematics were drawn, I’d design the layout of the block, and then run timing tools on it. The timing tools would expose critical timing paths, which would need to be looked at and fixed by either re-optimizing the logic in the schematic, or having the architects change the RTL.  

Learning and Development  

The way that AMD does training was very effective. There was no long, formal orientation at the beginning. I was given my first task on my first day of work, and received help as I needed it along the way. Training was done throughout the co-op term. I would have weekly meetings with either my mentor or another of the co-ops’ mentors to learn about various topics in the microprocessor industry, many of which will be very helpful to know about when returning to school. I also met twice a week with the senior circuit designer that I worked with, in which he taught me in even more depth about microprocessor design and many other VLSI topics. There were also other training sessions about once a week about various more advanced topics that were open to all AMD employees, which I regularly attended. I learned an enormous amount from all of these training sessions. Anything that wasn’t covered in the meetings, or if I just had any other questions in general, I could always ask other members
of the design team, and they'd give me in depth answers and explain the concepts behind them. For
general questions, as well as questions with LEC and tools, I'd usually ask my mentor first, who sat in the
cubicle across from me and was always very helpful. For circuit design questions I'd usually ask the
designer that I was working with. Also, AMD tries to help all of its employees to specialize in certain
skills, so as the term went on I learned which members of my design team were experts in which aspects
of the design, and would go to them for specific questions about their specialty. I was able to learn a
good amount just by doing that.

My work at AMD built on the basics of my educational background at Cornell. If you're
interested in computer engineering, microprocessor design is truly computer engineering at its finest. The
circuit design aspect of it also draws heavily on many electrical engineering concepts. ECE210 and
ENGRD230 were both helpful classes towards some of the basic concepts used. Classes that I haven't yet
taken, but would be very helpful, are ECE314, ECE315, and ECE474. In general though, most of what I
needed to know was taught on the job, through either training sessions, or I learned it as I worked and
asked questions about what I was doing.

Life Outside of Co-op

AMD provides subsidized housing in Lowell, MA which is pretty affordable, and I've heard is
pretty nice as well. However, being from Massachusetts, I've also heard that Lowell isn't the greatest
place to live, so I looked at housing in Marlborough, MA instead, which is about a twenty minute drive
from work. I got lucky and found an apartment building that had just started to house only interns and co-
ops that are working in the area. It was a great deal, as rent was very affordable, and included everything
from electricity to high-speed wireless Internet and cable TV. I lived in a fully furnished 3-bedroom
apartment with another AMD co-op and an Intel co-op. There were also many other co-ops from Intel
and other companies in the area that lived there.

Unlike Lowell, there are many things to do in the Marlborough area. There's a large mall close
by with a movie theater, and a lot of restaurants and bars nearby. It's also only a half hour out of Boston,
which always has a lot going on. With the way Boston sports were doing this past fall, it was a very
exciting time to be in the area. If I could do it again, I'd buy tickets to the Patriots and Red Sox early on
because they sold out very quickly. Also, my hometown is only an hour and a half away from the area, so
I was able to go home or travel on the weekends every now and then.

In terms of recreational activities, AMD had a group of people that played pickup basketball
every week until it got too cold. I heard that during the warmer months, there are many more pickup
sports played as well. AMD also has a small gym for employees to work out in, but I ended up getting a
membership at the local Gold's Gym in Marlborough, which was very nice, and I was able to workout
there every day after work. There were also a couple of company outings and work parties while I was
there. Due to it being crunch time on the project that we were working on, there weren't as many
employee outings as there would be at other times.

Evaluation

Working at AMD taught me a lot about engineering and working in the industry in general. One
of the best features of AMD is that they treat co-ops the same as any other full-time employees. The
work that I was given was all very meaningful, and contributed significantly to the project that we were
working on. It was always challenging, and thus even more rewarding to be able to work through. The
actual design experience that I was able to get there will stay with me and be very helpful anywhere that I
go. There is a large employee focus at AMD, and they put a lot of effort into training and developing all
of the employees. Even though it was a very busy time for the current project, I still felt like the work
atmosphere was relaxed and enjoyable to be in. Working with some of the brightest minds in the industry
on leading edge technology is always a very rewarding experience.
Co-op Job Summary
Advanced Micro Devices
Austin, TX

Joseph Kasnicki (jkk38)
Electrical and Computer Engineering
Summer 2008 (Work Term 2)

Co-op Work Assignment

During my second work term at Advanced Micro Devices, I was working on the same project as I was during my first work term. This project is Bobcat, a computer processor designed for UMPC's (Ultra Mobile PC). However, the areas I was working on were different than my previous term. During this term I worked with both the macro and library teams. The macro team designs all the memories used in the CPU. I created and tuned simulations schematics and prepared documentation for a design review on the macro I was working on. The library team is in charge of the standard cell library. I wrote some scripts to automate the characterization of the standard cells for simultaneous switching, which is important for fixing hold-time violations.

Assessment of Learning and Development

I learned a lot this term. I learned a lot about digital circuit design, including how transistors are sized, how dynamic logic works, how to determine the logic function of a transistor-level circuit, and about the architecture of memories used in modern CPUs. I also learned to use many industry standard tools, such as Cadence and HSpice. I also learned about the scale of work that goes into maintaining a large set of data, such as the one needed for the standard cell library. The classes that were most helpful for this term that I took at Cornell are ECE 314, ECE 315, and ENGRD 230. On the job, I learned a lot that will be very useful in ECE 474, which I plan to take next Spring semester.

Life Out-side of Co-op

I once again found a place to live on craigslist.com. Craig list is a great resource for finding temporary housing. Last term I lived by myself, but this term I lived with 2 roommates in a three bedroom townhouse on the University of Texas West Campus. I did not know the
roommates before I left, but I became good friends with them and many of their friends during my summer here. Austin is a great place to live, and there are many apartment complexes all over the city, so finding a place to live is not too hard. I had a car during my tour, which is highly recommended in Austin.

**Evaluation**

The best part of my job this term was that I learned how to use a lot of industry standard tools and learned a lot about digital circuit design that will be very useful in my future classes as well as in future jobs. The only bad part of the job was that I was sometimes underutilized. And, it is hot in Texas in the summer.
Job Summary
Daniel Zuo (dyz2), Applied & Engineering Physics
Advanced Micro Devices
Summer 2008

During my second co-op session I was part of the DE design team at AMD. This is the module that essentially interprets instructions for the processor, and feeds control signals to the rest of the chip. The responsibilities of a design engineer include ensuring that the implemented circuit behaves as intended, arranging the physical layout of all the devices used, and ensuring that the physical specifications enable the required timing of signals. These three tasks were the primary focus of my work.

Unlike work done while taking classes, raw calculations are for the most part obscured in the background. Industry-standard tools are used to evaluate logical equivalence to match physical designs to actual behavioral RTL, and determine signal delay to ensure the design meets the frequency goals of the processor. Knowledge of the mechanics at work is still required, albeit indirectly. Having a firm grasp of logic is necessary to draft circuits and interpret errors, and an understanding of MOSFET transistors and CMOS technology allows one to correct timing issues. This difference between classroom and workplace is what struck me first when I began working here.

Over time, I learned other things that were not directly related to circuit design. Using data management to handle a shared design, publishing them to milestones, bug tracking systems, etc. On a project where many people spread across the globe are contributing, it's easy to recognize the importance of organization. I myself barely kept my own class projects in the same folder on my computer, not needing to collaborate with a large team while in school.

Outside of work, I found life in Boston very enjoyable. The housing AMD provided in Waltham was very comfortable, and not too far from Boston. Though high gas prices were a concern, having a car still proved invaluable. I recommend carpooling with fellow interns and co-ops, as this is a great way to reduce the overall cost of the commute. It's also one advantage of going with your employer's housing, as it increases the odds of having people to carpool with, or just socialize after work.

I've found that AMD does not organize gatherings for its co-ops as much as other companies. Here in Boston, there were not many co-ops working over the summer, so virtually nothing was arranged for us. The situation may differ at other locations such as Austin and Sunnyvale, but prospective co-ops looking at AMD should be prepared to take things into their own hands. Boston is an excellent place for recreation, however, so there is no lack of things to do provided the opportunity.

Overall, I found my academic experience here at AMD to be very rewarding. They've been working with co-ops for quite a while and know what our needs fairly well. The absence of organized social activities did bother me somewhat, though it was a minor obstacle and didn't detract from the experience.
Co-op Work Assignment
I worked in a circuit design group in Sunnyvale, CA, a subset of the Computing Solutions Group. My group was designing the Load Store (LS) unit for a next generation microprocessor at AMD. Throughout my co-op, I worked on several different tasks involving a variety of circuits in the LS. My primary task for the first part of my work term involved bringing the physical circuit and the architectural code description to logical equivalence. During the last month of my co-op, I made several design changes to a circuit that determines the least recently used way in the L1 cache. This involved planning the general circuit layout, sizing the gates, and drawing the schematics. My work also included running SPICE simulations to compare the timing of different design options.

My mentor, Michael McCabe, helped me learn how to use the tools that I needed to complete my work assignments. My mentor was always available when I had questions, and provided useful advice regarding design choices. I also worked with a few of the other circuit designers in my group throughout the term.

Assessment of Learning and Development
My coursework at Cornell definitely contributed to the knowledge needed for my co-op. The computer architecture course I took between co-op terms increased my understanding of how the LS interfaces with the rest of the chip. Between the experience from my previous work term and my additional course work, I felt that I was able to work more independently than during the first term.

All of the engineers in my group were very knowledgeable and always willing to answer my questions or help me with a task. In general, the work environment was quite relaxed, and work times were flexible, though I worked overtime to finish my last project.

Life Outside of Co-op
I lived in a fully furnished apartment arranged and partially subsidized by AMD for the duration of my co-op. It was conveniently located about 2 miles from my office, and a 10-15 minute walk from the downtown restaurant and shopping district. For transportation to work, my morning commute was about 25 minutes via city bus, and 10 minutes on a free shuttle in the evenings. Several athletic opportunities were available, including work leagues and lunchtime pickup games. During the summer, I played in softball and tennis leagues. I also made use of the free workout facility located on the AMD campus. On the weekends, I went to San Francisco or San Jose for sightseeing, concerts, and shopping, as well as Capitola beach, near Santa Cruz. San Jose and San Francisco are easily accessible from Sunnyvale via train. There were also several other Cornell co-ops in the Santa Clara area, whom I visited often.

Evaluation
My mentor was extremely helpful and patient, and assigned me a variety of challenging and interesting projects. I was excited to be able to do some real circuit design work
during this co-op term. I definitely felt that I accomplished useful and valuable tasks for my group, and that my work contributed to the forward progress of the project. Overall, I greatly enjoyed my co-op experience.
Co-op Work Assignment

I arrived at AMD in Boxborough, MA and found myself working on the next generation processor core as part of the IF (instruction fetch) team. The first few weeks of my co-op were spent familiarizing myself with AMD's procedures and computer system, as well as relearning the basics of Linux. During this time I worked mostly on fixing failing timing paths in some of the IF caches and arrays. After I was more comfortable working with the system, I spent some time learning perl and writing scripts that helped users quickly and easily trace failing timing paths through their schematics in Cadence (a program used to draw and view schematics). When those scripts were complete, I was given the rtl (register transfer language, written in verilog) for a small block from the PRQ (prediction queue separating the BP from the IC) and began drawing the schematics. Soon I was given the whole PRQ to design. I worked on drawing / updating these schematics to the latest rtl release, placing gates, debugging, and fixing timing paths in the PRQ for the rest of my co-op term.

I was assigned a mentor who was responsible for getting me up to speed with AMD. The timing lead for the IF, Ethan sat across the hall from me and was readily available to answer questions and help me backtrack from mistakes. Throughout my co-op term, he ensured that I had enough work and understood what I was doing, and would give me timing paths to fix or file bugs against if I had downtime. To help another co-op and myself understand some of the newer technology and techniques that we hadn't seen in classes, he and the other co-op's mentor gave weekly informal lectures to bring us up to speed.

Assessment of Learning

I used a lot of what I had learned in my intro ECE courses, specifically 314 and 315. Being familiar with Linux and the command line was very helpful when I started, and understanding verilog was useful when I began working on circuit design. I had learned the basics of dynamic logic and gate sizing in 315, which was extremely useful knowledge when working on timing paths and looking at caches and arrays. I would recommend taking both of these courses before doing a co-op; others who didn't have this background struggled quite a bit when they had to learn it all on the fly.

By working at AMD for eight months I learned a significant amount about the processor industry. I heard talks about the research and development that goes into understanding new technologies, the actual chip design process, as well as chip production and back end debugging. I also got to learn about upper-level management by attending meetings about assorted projects, scheduling, and AMD's financial situation. These all helped me understand the direction that the industry is headed and how I can better prepare myself for a job after college / graduate school.

Life Outside of Co-op

I found an apartment on my own that was about 30 minutes from Boxborough, though I would not recommend living further than 15 or 20 minutes away. The hour of travel each day can wear you out and puts a lot of miles on your car [and having a car is basically a necessity: co-oping would have been frustrating without one]. I would also suggest finding housing near a developed area so that you have convenient access to restaurants and other social activities.
There weren't many work-related extracurricular activities besides an IF team summer bbq while I was there, but the Boston Design Center has a small gym on-site which was a convenient place to exercise after work. I also found that by joining a sports team in the area I met a lot of people with similar interests, providing me with a group of friends outside of work.

Evaluation

I really enjoyed the past eight months working at AMD and I would make the same choice again in a heartbeat. I've learned a lot through this co-op and I have a much more solid understanding of what I want to do in the future, along with some of the possible career choices open to me. I gained a lot of experience in circuit design as well as working on a large project. I would strongly recommend a co-op to anyone trying to figure out what they want to do with engineering or looking to gain experience in the industry.
Co-op Work Assignment
I worked as a Co-op Design Engineer for the Instruction Fetch (IF) team working on one of AMD’s new microprocessor projects. The IF team deals heavily with data arrays used in caching instructions and predicting branch instructions. There is also a large amount of logic surrounding the arrays for selection and comparing. The IF team is one of 6 major component blocks in the core. In addition to these 6 teams of design engineers, there are also teams of architects and layout designers for each block and other teams that develop tools and methodology. I worked as a design engineer, and dealt mainly with circuit analysis flows for timing and electrical testing. After analyzing reports, it was my job to suggest what changes needed to be made to the custom layout or standard cell implementation of a particular schematic cell. I also spent some time running SPICE simulations on different circuits for feasibility analysis.

Most of the work assigned to me in the second term used concepts from ENGRD 230, ECE 314, ECE 315, and ECE 210. There was a lot of exposure to custom transistor layout, so ECE 474 would have been very helpful. Most of my major projects involved cleaning electrical and hold/setup timing violations. I either made logic or sizing changes in schematics, worked with the layout designers to make changes to the custom transistor layout, or changed the placement of standard cells. Every once in a while I ran feasibility simulations on potential circuit fixes to find the best option considering area, power, and timing. Having knowledge of VLSI, digital logic, device physics, and computer architecture helped a lot. This term I did not spend much time looking at HDL code so my experience with verilog didn’t help as much as in the last term. Experience in a Unix environment was very helpful.

I was lucky to have a cube near to my mentor, who was my primary source of information and training. Most of my training was accomplished by asking questions, or by receiving brief tutorials. My mentor was able to give me a crash course in just about everything I needed to know. There were a few other people I frequently approached for more work or answers. A lot of what I learned came from working with the schematics and tools on my own and asking questions when I got stuck. There is also an internal information page that contained explanations and information on a lot of the tools and methodology.

Assessment of Learning and Development
The work they assigned me at AMD was right on track with what I had been learning in school as a computer engineer. I felt that the Cornell ECE course work prepared me very well for working in the microprocessor industry. One of the most interesting things I took away from the whole experience is that unlike a lot of the problems I faced at school, there are different solutions to many of the problems in this industry. There isn’t one right answer, which often requires you to explain your solution to others who may have a
different opinion. Overall I found that an engineering profession requires a lot of patience and flexibility.

I was able to meet a lot of smart and interesting people that I will stay in touch with. If I could go through the same experience again I would spend a lot more time going up to different people asking them what their role at AMD is and what they are working on. I was often too involved in my project to ask other people about their work.

**Life Outside of Co-op**
I grew up in Boxborough, MA and was able to live at home for the summer. I did not have to find a place to live and was able to save a lot of money on rent and utilities. The only other Cornell Co-op I spoke to in Boxborough also grew up nearby and lived at home as well. I have heard that AMD used to offer subsidized housing in nearby towns like Lowell, MA. I recommend looking well in advance for housing if AMD no longer offers the corporate housing deal.

Having a car in this area is absolutely required. Acton and Boxborough are about 40 minutes from Boston, and there is no public transportation to speak of in these suburban towns. Biking isn't really an option unless you live really close by and don't mind absurd New England weather conditions.

The Acton/Boxborough area is a pretty boring area. I've lived here for 15 years and haven't found many exciting things to do. The city of Boston is really nice and there are plenty of things to do there. The ocean is nearby and there are mountains nearby for hiking or skiing. I was lucky to have high school friends around for the summer to hang out with. During the week I would see them at night or spend some time with my parents. On the weekends I did a lot of hiking and went to concerts or the city.

AMD here has a fitness room that I used throughout my work term. There are gyms nearby if it is not a big enough. Some of the people I worked with liked to play sports after work, but I did not participate. I wasn’t involved in any community service during my work term, but I am sure it wouldn’t be hard to find.

**Evaluation**
I really enjoyed working at AMD during the Summer. This job allowed me to work on assignments that actually contributed to the project. At AMD I got to work on a lot of different tasks wherever help was needed, and wasn’t forced to do the same thing for months. The work was challenging, but I was prepared for it and the assignments were fun and rewarding. The only thing I didn’t like was waiting for people to make a necessary change or reply to an email before I could continue with an assignment. However, this is the case with any engineering job, and it taught me how to work on a few different tasks in parallel. Overall I would highly recommend working at AMD to any ECE major interested in the microprocessor industry.
Co-op Work Assignment
I worked as a Co-op Design Engineer for the Load/Store (LS) team on one of AMD’s new microprocessor projects. The LS team deals mostly with data arrays and the logic responsible for selecting between arrays. In the grander scheme of things, the LS team is one of six teams that make up the entire core design. Within each team there are architects that determine functionality, specialists that plan the physical layout of the chip, and designers that determine how functionality will be implemented with gates and transistors. I was the latter, and I worked with transistor level and gate level schematics, design and testing tools, and feasibility simulations.

Most of the work assigned to me in the first term used concepts from ENGRD 230, ECE 314, and some ECE 210. At this point I had not taken ECE 315 or ECE 474, so I only had some assignments involving VLSI and transistor specifics. Most of my time was spent on verifying that schematics logically matched what the architects intended. I made schematic edits (mostly at the gate level) and used tools that checked for logical equivalency. It helped to have knowledge of Verilog to understand and make changes to the functional coding of the chip. I also ran feasibility simulations on a new memory cell that tested for writability and stability. Finally, I ran tests to check the electrical and thermal characteristics of different blocks within LS. Throughout the term, I had to communicate with team members (largely via email) and be able to describe and explain what I had been working on or what problems I had run into. Knowledge of Excel and Unix greatly helped as well.

I was lucky to have a cube next to my mentor, who was my primary source of information and training. Most of my training was accomplished by asking questions, or by receiving explanations. My mentor was able to give me a crash course in just about everything I needed to know. A lot of what I learned came from working with the schematics and tools on my own and asking questions when I got stuck. There is also an internal information page that contained explanations and information on a lot of the tools and methodology.

Assessment of Learning and Development
The work they assigned me at AMD was right on track with what I had been learning in school as a computer engineer. I felt that the Cornell ECE course work prepared me very well for working in the microprocessor industry. One of the most interesting things I took away from the whole experience is that unlike a lot of the problems I faced at school, there are different solutions to many of the problems in this industry. There isn’t one right answer, which often requires you to explain your solution to others who may have a different opinion. I learned that it is important to remain professional during these situations and not stubbornly call someone’s idea wrong. Overall I found that an engineering profession requires a lot of patience, compromise, and flexibility.
I was able to meet a lot of smart and interesting people that I will stay in touch with. If I could go through the same experience again I would spend a lot more time going up to different people asking them what their role at AMD is and what they are working on. I was often too involved in my project to ask other people about their work.

Life Outside of Co-op
AMD offered me subsidized corporate housing that was about 2 miles away from the AMD campus. I lived with another Cornell Co-op working at AMD in a 2 bedroom, 2 bathroom apartment. A fixed amount of money was taken out of my paycheck which included electricity, heating, internet, cable tv, and water. The apartment came fully furnished and included a television. Before the corporate housing was locked in I looked online through an internship housing website that AMD is a member of. I didn’t find many reasonably priced places to live, and most of them did not have a short enough lease. I recommend looking well in advance for housing if AMD no longer offers the corporate housing deal.

Having a car is not required, although I highly recommend it. The weather is always nice and the roads are all flat, so walking and biking around is easy and comfortable. There is also good public transportation in the area that can take you directly to AMD’s campus, the grocery store and the mall. There is also the option to get groceries delivered. There is a train station in Sunnyvale that can take you into San Jose and San Francisco. I went to SF often, and found it to be a beautiful and exciting city with plenty of things to do. It takes about an hour and a half by train to get there. Aside from that I found Sunnyvale itself to be rather dull. After work during the week I didn’t have much energy to go out so I wound up relaxing at home. During the weekends there are many places to visit in surrounding towns when there is more time to do so. There are many other co-ops in the area to get together with too.

AMD has a gym (with free membership) that I used throughout my work term. I also participated in the company flag football league, which was a lot of fun. My roommate played basketball in a league with other companies as well as AMD. I wasn’t involved in any community service during my work term, but I am sure it wouldn’t be hard to find.

Evaluation
I really enjoyed working at AMD during the Fall. It was especially nice to walk around in a t-shirt while my friends back home dug their cars out of the snow. This job allowed me to work on assignments that actually contributed to the project instead of making copies or getting coffee. At AMD I got to work on a lot of different tasks wherever help was needed, and wasn’t forced to do the same thing for months. The work was challenging, but I was prepared for it and the assignments were fun and rewarding. The only thing I didn’t like was waiting for people to make a necessary change or reply to an email before I could continue with an assignment. However, this is the case with any engineering job, and it taught me how to work on a few different tasks in parallel. Overall I would highly recommend working at AMD to any ECE major interested in the microprocessor industry.
Thomas Gowing  
Electrical and Computer Engineering  
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Fall 2008  

Job Summary

I was a member of the processor design team. I worked on the development of the next generation processor. My major tasks had to do with timing and logic equivalence checking. I helped create some code which provided additional data in the timing test run on the processor. I also ran tests to check multiple schematics to make sure they are logically correct. This required much interaction with the owners of schematics, to ensure that the proper changes are made when necessary.

On the first day I had an orientation which gave an introduction to the systems used at AMD. I also was trained a significant amount by Mike McCabe, my co-op mentor. Mike had meetings with Jeff, Kirill, and myself to teach us many of the tools necessary for our jobs. In general, I approached Mike with most of my questions. If I had any questions about the schematics I was working on, then I would ask the appropriate person.

This work is closely related to what I have been learning in class. Most of it is actually a bit ahead of my classes. I learned a lot here that will be material in my upcoming classes this spring. I think that is great, because I am better prepared for my next semester. The work here was very interesting to me, and I enjoyed it a lot. I learned a good amount about Engineering and the professional environment as well. It is amazing how everything fits together. Communication is key to get so many people to work efficiently together, and eventually provide a finished product that people will want to buy.

Life outside of the job was much different than life outside of classes. Luckily for me, AMD provided subsidized housing. If I had needed to find my own housing, I
probably would have tried to sublet from someone at San Jose State. I doubt there is any other way to get such a short-term lease. There are lots of buses in this area, which you can use to get just about anywhere you want to go. Also there is the Caltrain, which takes about 1.5 hours to get to San Francisco, and runs frequently. In the immediate area, there isn’t much in terms of social activities, but if you’re willing to travel a little, there are a lot. Stanford is only about half an hour away by train, and San Francisco is very nice and always interesting.

AMD has its own gym with free membership for employees. They also offer intramural sports. There was flag football and basketball in the fall, and I believe there is softball and volleyball later on. There are also usually pick-up games of basketball at lunch a couple days a week. There is plenty to do to keep active.

I really enjoyed the team atmosphere at AMD. Everyone is always trying to help each other out. If someone gets finished early with something, they always lend a hand to someone else who needs help. It seems to me that this is what needs to happen in order for a company to be successful. If everyone just does exactly what is expected of them, things will not get done as quickly, or as well. When everyone combines their efforts, everything is finished faster, and with higher quality. There isn’t anything that I can really single out as the worst features of this job. Overall, it was a great experience, there isn’t anything that sticks out in my head as being bad.

One final point I would like to add to anyone considering working a co-op in Silicon Valley. I highly suggest that you have a car out here. The buses and trains are fine, but it would be infinitely better to have a car. It’s a pain to walk to the grocery store and carry all of your stuff back. If I had a car out here, I think I would have had a lot of fun exploring the area, but without one, it’s just not possible to see as much.
Co-op Work Assignment

My work at AMD was with the Circuit Design Team. I worked as an engineer on a new CPU core. I worked in a unit team of about 16 people, which was a part of a much larger team for the entire processor. I was trained on the job. I did not have an orientation this term, because I had already had one during my Fall 2008 term. I basically just picked up where I left off and asked questions when I got stuck. I do have a mentor here, Mike McCabe, but I don’t think he was really assigned. I approach him with all general questions. If I have a specific question about a design, I go to whomever owns that design and ask them my questions.

Assessment of Learning and Development

My work was very closely related to what I am studying in class. Some of the material is even in classes that I haven’t taken yet, so I will be very prepared when I do take them. I learned a lot about professional engineering here. It is important to work well in a team, but a lot of work is still done by yourself. A designer just needs to ensure that any changes they make don’t break something someone else is doing. I developed a lot from this co-op. I came into this last Fall knowing nothing about a professional working environment. Now I believe that I fit in quite well, and understand how to approach most situations at work.

This co-op also affected me personally. I have made a bunch of friends here at work that I play basketball with and occasionally hang out with after work. It is always great to meet more people, especially people with common interests to talk about. If I had to go through the same experience again I probably wouldn’t change anything. I had a great time out here.

Life Outside of Co-op

Finding housing in this area is not an issue, since AMD provides subsidized housing. The location is about 2 miles from AMD, and is easy to get to by bus. I would recommend having a car out here if that is possible for you. In my first term, I did not have a car, and my outside activities were somewhat limited because of that. This term I did have a car, and was much more free to do whatever I wanted.

There are a lot of social things to do out here. Downtown San Jose is pretty close, with Bars and such to go to. There are a couple good movie theaters close by. Also San Francisco is about a 45 minute drive, or a 90 minute train ride. There is a lot to do in San Francisco.

In the summer there is a co-ed slow-pitch softball league that AMD is a part of. I played in that league, along with a couple other co-ops. We had a great time, and it was a good way to get to know more people at AMD that aren’t necessarily in your team.
Evaluation

Overall this job was great. I really enjoyed being around the people I worked with. Everyone was very supportive and always willing to answer questions. I also like that AMD is involved in Intramural Sports, because I like to keep active. There is honestly nothing that sticks out in my mind as one of the “worst” aspects of this job. There is nothing that I can think of that was really negative. This co-op was a great experience, and if you are considering AMD, then go for it.
Co-op Work Assignment

During my first work term at AMD, I was put into the timing integration subgroup of their Computing Solutions Group, which is responsible for developing the company’s leading server, desktop, and mobile processor products. The integration team’s primary responsibility is to conduct a variety of full-core timing analyses to help drive the chip design towards specified timing envelopes. As part of this effort, most of my work went into designing an analysis flow that would isolate specific paths from the chip to perform more accurate timing analysis. Throughout this project, I was exposed to a wide span of tools – software both internal to AMD and industry-standard (e.g. Spice, Cadence). I was also involved in minor assignments for other sub-groups, which dealt mostly with design verification. Much of my training was provided by my mentor at AMD, Michael McCabe, who often provided one-on-one help with tools and VLSI concepts necessary to complete my tasks. Michael and my subgroup supervisor, Ashok Venkatachar, were my main resources for questions regarding my tasks, and they were always very helpful and patient in pointing me towards answers.

Assessment of Learning and Development

Most of the courses I’ve taken at Cornell prior to starting this work term were not specifically geared towards the semiconductor industry and VLSI design. Most relevant courses are not taught in the ECE major until the last three undergraduate semesters. Furthermore, the programming languages used at AMD (and much of the rest of the industry, to my understanding) such as Perl and Tcl, were never introduced to us through coursework. Regardless, the necessary knowledge was readily taught and explained primarily by my mentor, Michael, at an appropriate rate. I was somewhat surprised to find that experienced engineers largely use a rule-of-thumb approach that is nearly always sufficient for a given design problem, instead of an academic by-the-book approach for every task. My impression of the industry after four months is that it is an exciting and competitive workplace where you constantly face interesting and intellectually-stimulating problems that lend themselves to creative solutions. I’ve been exposed to engineers at the forefront of their field, and individuals who drive the field to where it is today – and they have all been surprisingly approachable, voluntarily informative, and patient towards me as a co-op. In a group faced with as large a project as my team at AMD, it would have been helpful to have the importance of prior research stressed to me. In several cases, a problem that I’ve worked towards had already been solved elsewhere, and there was little use reinventing the solution. However, it was sometimes more time-efficient to do just that, rather than to find and adapt someone else’s work towards my specific task.

Life Outside of Co-op

When choosing among several different co-op offers, I placed emphasis upon location. I expected a very rewarding experience from being in Silicon Valley – the heart
of the high-tech industry. It has indeed proved very rewarding. Housing was a non-issue largely due to AMD’s subsidized offerings – I was given a place at “Heritage Park Apartments,” about two miles away from work, which was fully furnished and equipped, and situated in the center of Sunnyvale. Other Sunnyvale co-ops found housing with relative ease in the nearby San Jose State University community using services like Craigslist. Getting to and from work was done by either walking (about 35 minutes from my apartment) or using public busses and shuttles. Biking is also a very viable alternative. Though a car would have solved many problems regarding transportation, it was not absolutely necessary. A train station 5 minutes away from the apartment complex enabled easy transport to the many towns in the valley, as well as San Francisco. Informal outings with co-workers on nearly every other Friday evening allowed me to socialize and meet with many people working for both AMD and other industry-leading companies. This not only presented terrific networking opportunities, but also provided an informal setting conducive to learning about the general lifestyles of employees in Silicon Valley through conversations that would otherwise be out-of-place in the office. Such knowledge is valuable in considering the area as a potential workplace. I highly recommend active participation in any social events within and outside of work, and not letting your co-op status become an inhibition to do so – at no point in my experience did I ever feel less ‘welcome’ than full-time employees for being a co-op. A terrific place to start is at AMD’s many intramural athletics offerings, which welcome new participants.

Evaluation

What I enjoyed most about working at AMD were the people with whom I worked – specifically, their welcoming approach to co-ops. The atmosphere in the company was appropriately relaxed, and most employees were visibly enthusiastic about their work. It took less than two weeks after starting the job for me to feel like I was being useful. Also of notable value was the experience of being in a company which plays the somewhat underdog-like role in the industry – after just a few conversations with co-workers, the innovation and enthusiasm that keeps the company competitive was readily visible. Perhaps the only disagreeable experience I had was being somewhat unsure of the utility of one of the projects assigned to me. Though the project was a tremendous way to expose me to the broad range of design methodologies and analysis tools at AMD, I was concerned about its value to the company, as it was the biggest mark of my efforts after several months. Regardless, throughout the project I gained an equally broad amount of knowledge, which will certainly be valuable in my second work term.

Additional Info

I should note I found much mileage in simply stepping up to random people throughout the office, introducing myself, and asking what kind of work they did. This way, I was able to meet several co-workers who lent me their help on many occasions. Also, reaching out to the many Cornell alumni in the Bay Area, some who I had not before met at school, made several weekends more interesting.
Co-op Work Assignment

For my second work term at AMD, I returned to the same group I had worked with the previous fall. This was the integration team in AMD’s Computing Products Group, which is responsible for developing server, client, and mobile x86 processor products. The specific project I worked on was the Bulldozer core IP, AMD’s next-generation processor. The integration team’s primary role is to conduct a variety of timing, verification, and power analysis to drive the design towards set feature and milestone specifications. As a member of the team, my efforts involved working with designers and architects to debug parts of the design with the aid of verification tools. Other smaller work involved symbolic verification and timing analysis scripts. Most of the training necessary for me to do my work was done during my first work term, but the new tools I was using during my second term were quickly explained to me by my supervisor, Ashok Venkatachar, and other team members. I retained the same mentor between work terms, Michael McCabe who was always available to answer my questions. This time around, however, I had fewer questions to ask, as both Mike and Ashok did a very good job training me during my previous work term.

Assessment of Learning and Development

Having now completed my co-op at a leading company in the semiconductor industry, I’ve confirmed that it is my field of choice in the broad major of Electrical & Computer Engineering, and I will be taking more classes geared towards this specialization in my senior year. The products made at AMD are arguably the most complicated systems made by engineers of any field, and there is a broad span of learning and specialization available within. The most important lesson I’ve learned about the profession of engineering and its culture is that it is a career path where you will work with some of the most intelligent people in industry, and each one is a wealth of information and experience. Doing a co-op with AMD gained me valuable real-world experience and gave me a much-needed head start on understanding whether the semiconductor industry is a good career path. Just as important as the work experience were the many networking opportunities presented to me as a result of being in Silicon Valley. The relationships I’ve made while on my co-op are valuable both in opening career opportunities and in learning a great deal from others. If I had the entire experience to repeat once more, I would strive to meet even more people and establish good connections.

Life Outside of Co-op

As with my previous work term, I lived in AMD’s subsidized apartments. I shared a two-bathroom, two-bedroom unit with a fellow co-op at “Heritage Park Apartments”, situated about two miles away from work. Given that weather in the Bay Area is sunny and warm 90% of the year, a bike would fulfill basic transportation needs, like getting to and from work or going to the nearest grocery store to do some light shopping. Last fall I
had no access to a car, and while it was often inconvenient to go without one, the many public transit systems in the Bay Area proved adequate for going to visit San Francisco and nearby friends. This summer, a fellow co-op had a car with him and was kind enough to carpool to work, go shopping, and make trips on weekends. Having access to a car like this definitely improved my experience, and we were never bored or at a loss of things to do. A great way to stay busy and have fun in the Bay Area is get in touch with other co-ops and alumni, of which there are plenty in Cornell’s case. I also highly recommend joining co-workers for social outings after work, where you’ll learn a great deal about how life in the Bay Area is outside of the office. This is important information when considering your co-op employer for a full-time workplace after graduation. I was also involved in an inter-company softball league during the summer. There is plenty of team sport activities offered at AMD, and I highly recommend joining in on one to stay in shape and have plenty of fun.

Evaluation

Once again, what I enjoyed most about working at AMD were the people with whom I worked. Every person at the company is approachable and has a wealth of experience and information which they dispense readily and gladly. The office environment itself is appropriately relaxed and employees are enthusiastic about their work. Having entered the co-op near the end of the Bulldozer design cycle, it was exciting to see the mix of enthusiasm, pressure, and relief as more and more project milestones were being met. The people I worked with in the company definitely made it a very positive experience. On the other hand, the less thrilling part of the job came from the computer tools used to perform everyday tasks. I felt like a disproportionate amount of time was spent on debugging workflows and just getting the tools to pass without error rather than debugging actual design problems. Of course these tools perform highly specific and complicated tasks, but their complexity – an unavoidable attribute – is a source of great inefficiency. I feel that I spent too much time trying to get tools to pass a run instead of actual ECE work. While this may be attributed in part to my lack of experience, there are other co-workers who agree with me on the issue. I imagine most engineers like myself enjoy tinkering and figuring out problems, and so I won’t say that the tool problems subtracted from my co-op experience.

Additional Info

When selecting between co-op offers last fall, I placed much emphasis on the location, and I must say that choosing the San Francisco Bay Area was a terrific decision. Having a veritable plethora of activities to do and places to visit every weekend made the co-op experience very worthwhile, and the experience was further improved with the contacts I’ve made and hope to maintain while working there. Whereas some of my co-op friends in other locations had trouble finding things to do on nights and weekends, I was having trouble fitting in all the activities I wanted to do into three months! From going frisbee-golfing in Santa Cruz to camping in Yosemite to visiting some amazing museums, I must say there was never a dull moment for the entire 13 weeks.
Co-op Work Assignment

During my term at AMD, I worked as a Design Engineer for the Integration team. The Integration team works to verify that the chip meets the timing requirements set to achieve a target clock frequency, the speed at which the chip can run. In addition to verification, the team also helps in fixing paths that are found to violate timing requirements when the chip is tested. Although I was part of the Integration team, my supervisor, Robert Williams, exposed me to many tools and projects so that I would have a broader understanding of the different types of projects that I could perform as a Design Engineer. Although some of these projects might not have pertained to the Integration team directly, I found that these projects gave me a better understanding of what the Integration team did.

On my first day at AMD, I attended orientation, where they briefly went over the goals and mission of AMD as well as the roadmap and current projects. Once the orientation finished, my co-op mentor, Mike McCabe, met me and another co-op student, and gave us an introduction to the basics, such as logging in, and accessing tools and services. He also gave us an introduction to some tools that we might need to use in the future, including a tool which allowed us to view the layout schematics of various gates and a programming language called Perl. He then introduced us to our supervisors. I remember asking my supervisor, “What do we use Perl for?” and he smiled and said, “We use it for everything.” Although I might not have used Perl for everything, during every project, I did use Perl.

While I was still learning how to use Perl, Robert gave me simpler assignments, which consisted of data mining. For each chip design, the integration team runs a timing tool, which generates reports about the different paths in the design which might be too slow. The data mining assignments consisted of using Perl to parse through the reports and retrieve certain data values, which could then be summarized in a different format, such as a histogram. Robert would think of some interesting comparison, and I would use Perl to do that comparison.

An example of a more major project that I worked on was a logic tracer. When the Integration team receives data about which paths are found violating timing requirements, they are only given the end point. There can be many start points that lead to that end point. My job was to create a tool that used the logical values of the different start points to narrow down the possible start points and paths to the end points that could have led to the violation.

Along the way, there were some smaller projects that I worked on. Through the different projects, I was able to approach different people with my questions. Some people were in the Integration team, while others were on other teams. If someone did not know the answer to my question, they would refer me to someone who did, so I would always get an answer from someone. In general, I was happy with the amount of help that everyone provided.

Assessment of Learning and Development

At Cornell, I took ECE 2300, 3140, and 4750 with the hope that they would help with my co-op assignment. While the knowledge was definitely useful in understanding some concepts, the most useful class was CS 2110. This may be more specific to me and the type of projects that I did, because having knowledge of data structures helped when creating complex programs in
Perl. The two areas of knowledge that I would have liked to have were a better understanding of the UNIX environment and a better understanding of VLSI. In order to understand the layout schematics of individual gates, a class in VLSI would have been useful. Fortunately, I had taken a class on MEMS (ECE 4320), in which we saw some layout. In addition, Mike let me borrow his book from the VLSI class he had taken at Cornell. In general, however, I felt that the best skill I learned from my courses at Cornell was the ability to solve problems. This single skill was the most valuable for me during the co-op term. In a short while, I was able to learn what I didn't know, so I eventually learned what I needed to in UNIX and VLSI and the courses or experience in these was not necessary.

I found the Engineering profession and culture at AMD to be pretty flexible and laid back. There was no strict time when I needed to arrive to the office, so some days I arrived very early and left early, while other days I arrived late and stayed late. While everyone works hard, they also walk around and chat with others. Everyone was friendly, which made the atmosphere welcoming. There was a lot of freedom, since nobody was constantly looking over my shoulder, but there was the expectation to get the work done. I found this position as a great opportunity to learn about working as an Engineer. It was my first time working full time over a long period, so I definitely saw both the benefits and challenges.

Life Outside of Co-op

AMD offers the option of finding your own housing or living in their subsidized housing. I chose to live in their subsidized housing. The housing was only two miles away from AMD, so there was not much in terms of commuting. However, I was surprised to find that everything is pretty far away in Silicon Valley. While there are buses and train, a car is definitely very convenient to have. Even the two miles to AMD would have been more difficult without a car. My real home is actually about 50 miles from Silicon Valley, so I was able to bring a car from home. Although I stayed in Silicon Valley, I was able to go home on weekends if I wanted to.

AMD offers free membership to a fitness center as well as opportunities to join company athletic teams. While I did not take advantage of any of these, they are opportunities to get exercise and stay fit. In addition, the subsidized housing also had a small fitness room and swimming pool.

Growing up in the area, I didn’t find much motivation to explore the area. San Jose is 10-15 miles south of Sunnyvale, while San Francisco is about 40 miles north. In addition, Stanford is on the way to San Francisco and is a nice place to visit. The bay area has many nice parks and places to visit. In addition, many roads have bike lanes, so riding a bike is a great way to explore. I was able to bring my bike from home, and used it to ride around Sunnyvale and Santa Clara (which is just south of Sunnyvale).

Evaluation

Overall, I found the co-op experience to be a positive experience that reinforced and expanded upon what I had learned at Cornell. I was fortunate to have the opportunity to try different aspects of design to varying degrees. My favorite aspect was the ability to apply what I had learned in new and challenging situations to make a difference. I found that the work I did actually did contribute and was not some tedious work that was assigned to me to pass time. While most of the experience was positive, I found the one aspect that I found that I didn’t like was the amount of time spent in front of the computer. This is inherent in the type of job that I do, but is something worth considering.
Job Summary

Co-op Work Assignment

During my second term at AMD, I continued working as a Design Engineer for the Integration team. The integration team focuses on verifying that the physical chip design meets the timing requirements necessary for a given performance level. If there are any paths that violate these timing requirements, the integration team works with the other teams to apply a fix so that the timing constraints will be met. Although I was part of the Integration team, my supervisor, Robert Williams, assigned me projects that pertained to other groups. In this way, I was able to get broader experience in the different areas of design engineering, instead of focusing solely on what my team did.

Since this summer term was a back-to-back term with my previous spring term, I continued working without any introduction into the second term. This second term consisted of two major projects along with some smaller projects. One project pertained to the Integration team, while the other project pertained to many other groups as well. In the first project, I was asked to develop an algorithm to optimize XOR trees. From past observations, paths with XOR trees seemed to fail timing constraints more often. An easy way to optimize XOR trees is to balance them, so I had to create a tool that could automate the balancing while taking into account constraints such as number of swaps, distance between gates, and delays through the gates. Once I created the tool, I had to evaluate whether it was worth optimizing all of the XOR trees in the current design. In the second project, I focused on a tool that could map the nets in the physical design to the nets in the RTL. For this project, I had to parse Verilog and create dependency maps, and using the dependency maps and logic equivalence tools find the correct mapping.

Throughout the summer, I also worked on smaller projects. Whenever I had a question, I was able to approach somebody for help. If that person didn’t know the answer, they pointed me to someone who would. There was never a time where I didn’t have enough help. In general, this co-op term was more focused, but I still got to focus on various aspects of design engineering.

Assessment of Learning and Development

For most of my projects this term, I thought the courses at Cornell which were most useful were CS 2110 and ECE 4750. Since I did a lot of programming, a class in data structures was relevant. I found at different times that I wrote a piece of code which either ran too slow or consumed too much memory. By using my knowledge of data structures, I was able to make the code more efficient so that it ran with less memory in less time. For example, at one point, I had code which was using over 30GB of memory. By changing the data structure that I used to store the data, I was able to run with about 4GB of memory. At another point, I had code that ran for longer than 5 minutes, but by making some small changes to the algorithm, I was able to make the code run in about 10 seconds.

For one of my projects, I needed to parse through Verilog, so experience from ECE 4750 was very useful. I was able to recognize a large number of Verilog constructs, but I was also able to learn about many more Verilog constructs that I had never used in any of my courses. In
addition, ECE 4750 gave me some better understanding of what the Verilog was doing and what techniques were used to improve performance.

I thought this co-op experience was a valuable way to learn what any profession in engineering may be like. The biggest lesson I learned was how to adjust to the work environment. Going into the position, I thought working would be similar, but easier to school since at school you might have to stay up all night to study for a course, while at work you only work a certain hours and you are done. Through the experience, I learned that both can be challenging in their own way. Although you have to work hard at school, you get longer periods of rest. At work, you work every weekday, and your time off is weekends and holidays. In addition, at school you are guided in what you need to do. At work, you are left to yourself to figure out something and get it done.

I found the culture at AMD to be pretty flexible and laid back. I was able to arrive when I wanted and leave when I needed. Although everyone works hard, they would walk around and talk with others. Whenever I needed help, I was able to approach somebody and people were able to make time to help me out. There was a lot of freedom as nobody was looking over my back and making sure I was working. However, with this freedom, I had the responsibility of getting things done when they needed to be done. Through this work experience, I was able to see firsthand the benefits and challenges of a career in this kind of position.

Life Outside of Co-op

During my first co-op term, I chose to stay at the subsidized housing offered by AMD. During this term, I decided that I was familiar enough with the area to find my own housing. I chose a location more convenient in terms of social life, so I decided to stay in Santa Clara about 10 minutes away from AMD. I had a car so transportation was not a problem. Buses and train are available, but I did find a car to be far more convenient. While I found a place closer to my outside work activities, I did think that the subsidized housing offered by AMD would have been a better option, because everything is taken care of in terms of utilities, etc.

I also had a bike, so I was able to take occasional bike rides. I found that many of the roads in the area were bicycle friendly making a bike a viable option for getting around. The place I stayed was closer to parks and shopping centers, so it was a nice place to be.

Evaluation

Overall, I found the co-op experience to be an enjoyable experience. I would definitely recommend it to any engineer to get a feel for the career. Going into the co-op, I had no idea what such a career would entail, but after this experience, I have a much better idea. I thought that I was able to contribute positively to my team and to the company. The work I was assigned was challenging, and I thought that it was useful to others. I felt I got a well-rounded experience as I was able to work in many different areas. While the experience was positive, I was set back through wrist pain due to incorrect setup of my keyboard and mouse. AMD did help me work through this, but I did learn the importance of work place ergonomics.