

**A Texan “Cottons to” Beijing
Capturing My Time at the Chinese Academy of Agricultural Science (CAAS)**

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**Chinese Academy of Agricultural Science (CAAS)
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Personal Background



I have been active in agriculture for a long time, ever since I can remember actually. When I was younger instead of attending a wedding with my mom, I went with my dad out to the sorghum fields. It was a common occurrence. Both my father and my grandfather are majorly involved in agriculture; they are professors at Texas A&M University. My dad works on developing better plants, specifically sorghum, for drought, stress, and disease and pest tolerance all the while maintaining high yields of biomass or grain. Some of the varieties that he has developed are being grown throughout the world. My grandfather is a cereal chemist and has recently “retired” (which still means he is up at his lab more than a few days a week). His research has involved improving the nutritional value of cereal crops and how best to process those crops. I have learned so much from my father and my grandfather. One research anecdote that Grandpa relayed to me in particular taught me much about understanding the difference between science and application. There was a new variety of sorghum, a very good variety with high yields, disease and pest tolerance and drought tolerance. This was going to be a breakthrough crop for the people in Africa, but once it was introduced, it was not grown. Why? It turns out that the pericarp of the seed was too hard to be processed by traditional methods, and there was no money to acquire the right equipment (not to mention a source of electricity) and so this great variety could not be used. This taught me that it is not just the plant itself that is important; one has to look at the people who will be using it and understand the culture in order for the introduction to be a success. It is more likely that the plant will have to be adapted to the people than the people adapting to the plant; when developing new lines one needs to think about the final end goal and the culture of people that it will help.

Having said that, I love to help my dad and my grandfather in the field or in the lab. I love to listen and learn about agriculture. When I was in kindergarten, my oldest brother started raising chickens for 4-H, this led to my inevitable involvement (read as “fun”) with raising the birds, although I could not show them until I was in third grade. A large portion of my last twelve years has been devoted to agriculture. I raised turkeys and chickens for that entire time, raising over 4000 chickens and 2000 turkeys for various livestock shows. I also started a small processing business with my brothers and we have processed many birds for other people over the years. I have helped raise commercial steers and have participated in the FFA Agriscience competition for the past three years. My final year I succeeded in winning a national title in my category. I have worked at the Texas A&M corn breeding program for the past three summers and would have been working there this summer if I had not been awarded this internship. This work within agriculture has helped me to see its impact on every facet of our lives. Every human being on this planet has his or her life fundamentally run by agriculture whether he or she knows it or not. I have a bumper sticker on my homework folder, (yes this paper was put into that folder), and it reads, “If you eat, you are involved with agriculture”.

Every person needs food, from the time they are born to the time they die. Food is one of the few things that really binds the human race together, hunger does not discriminate. It makes sense then that if food is one of the few things that binds us together than the absence of food, hunger, would be one of the major causes of division between peoples and nations. Norman

Borlaug said in his Nobel laureate lecture that “If you desire peace, cultivate justice, but at the same time cultivate the fields to produce more bread; otherwise there will be no peace”. His words are still true as millions of people go hungry each day resulting in chaos and discourse in those countries.

The Process

In the fall of 2011, my future physics teacher Michelle Jedlicka approached me as she had done with my oldest brother with an opportunity that could culminate in an incredible internship. Despite the numerous things that I was occupied with, 4-H, FFA, swimming, school itself, etc... I decided to write the required paper. I wrote about how the food security of Guatemala could be affected through the introduction of hybrid seeds, especially maize seed as maize is the primary crop grown in Guatemala. In the spring semester of 2012, I attended the Statewide Symposium. I place in one of the top positions and was selected to attend the national Symposium in Iowa as a representative of Texas and A&M Consolidated High School in October of 2012

Before I knew it, it was October, nearing the time to head to Iowa. I was making it through my fullest year of school at the time and was kind of dreading all of the makeup work that I was going to have to do. That year I had 6 AP/PRE-AP classes that I was enrolled in. The departure date approached quickly and all too soon, Mrs. Jedlicka was telling me the plan for leaving for Iowa the next day. I had to scramble to get most of my makeup work and my clothes packed for the symposium.

We left the next day from the small College Station airport and flew to Dallas then had to “rush to wait” for another 5 hours before connecting on the flight to Iowa. While waiting there, we met up with Peter Lambert, a previous intern who went to the China National Hybrid Rice Research & Development Center (CNHRRDC) in Changsha, China. Peter was a graduate of my high school and currently goes to Rice University. We sat and talked for a few hours before I went and got some food, Chinese food actually (maybe that was a bit of foreshadowing) and then boarded our flight to the Des Moines International Airport. The flight was uneventful and when we arrived we were shuttled to the hotel.

Over the next three days I learned so much about global food security, non-governmental organizations such as Heifer International, and the efforts of people worldwide to provide a stable food supply to the world. I met people from diverse backgrounds working towards the same goal, and I watched the presentation of the World Food Prize. I must admit the experience changed me right then and there. I had always thought about a career in agriculture but did not know it that was really what I wanted to do with my life yet. After attending the Global Youth Institute, I decided that my goals for a career would be in agriculture, hopefully to be a research professor much like my father and my boss, Dr. Seth Murray.



Global Youth Institute 2012 – I am located in back row, just under U.S. flag

The summer of 2013 while working for Dr. Murray, I started really asking questions about what I was doing in the field for the first time, trying to apply what I had learned from school in the field. These conversations that I had with him got me more and more interested in the fields of agronomy and genetics. When it came time to applying for college in the fall, I knew exactly what major I wanted to be put under, Agronomy (with plans to double major in Genetics). The name of the Agronomy major had been changed to Plant and Environmental Soil Science so now instead of saying, "I am an Agronomy major" I get to say, "I am a Plant and Environmental Soil Science major". Doesn't quite roll off the tongue.

Applying and Receiving an Internship

I knew that I wanted to apply for the Borlaug-Ruan Internship so come November I was hard at work getting the forms ready for submission... well come December at least... late December... but I got them done and submitted. This was load off my shoulders as it was now out of my hands. I was elated when I found out that I had made it into the second round and would be interviewing via Skype for one of the coveted spots. My interview went well, and I found out a couple weeks later that I was selected. This was awesome. I would join my brother amongst the ranks of the Borlaug Interns. This opportunity did however come with a minor downside. The mandatory meeting in Iowa was scheduled the same weekend as my senior prom. (I did make it back for the After Prom Bash which started at midnight.)

My father traveled with me to Iowa, and the day before the meeting, we visited Ames, Iowa. He wanted to see the doubled haploid program that they have active in the corn program in Iowa. While we were there, I talked to the graduate students working in labs to produce the plants. This discussion was very influential on me. I was currently taking engineering level Calculus and Physics in school and was rather fascinated by the area of physics. I was beginning to feel that a major in engineering or some other math based major would be a good idea. After talking with the graduate student, I was returned on the straight and narrow path to becoming an agronomist. It was not just what he was telling me about that made me return but the realization that there are more things to be learned about plants. I was under the misconception that the fields of engineering and physics would provide a greater challenge and opportunities. After talking with the grad student, I realized that plant genetics has just as many challenges.

The next day was the meeting. There the fellow interns and I were indoctrinated with the expectations of the program, the vaccines that we would have to get, the potential culture shock, and several other vital pieces of information such as acquiring visas. At the conclusion of the meeting, my dad and I quickly made our get away to catch our flight back to Houston, Texas. At this point I do not think that it had quite dawned on me yet that I would be gone for 60 days in a country that is known for having an extremely difficult language, with no friends or people that I knew except for the professor that I was to be working under, Dr. Cheng Hongmei. This realization never really hit me until a day or two before I was supposed to leave. I was rather sobered by the thought but still was extremely excited to be leaving on my own for the first time, ever. This trip would be the first time that I had been away from my family for more than three or four days. I had not thought that I would be very homesick at the time; something I woefully misjudged.

Trip Reflections

The Adventure Begins

I would be leaving on a Friday night, or Saturday morning, 1:00 AM departure time so I got ready during the day and loaded up at 7:30 PM and headed to the Houston Airport. There I said goodbye to my mom and dad. My dad had tears in his eyes. This was the first time that I had seen him cry. I moved through security with my backpack and my ukulele and waved a final time to my parents before heading up into the terminal itself. The flight was delayed for 2 hours so I got to wait for a while. The flight itself was long. It was very long. I thought that I would never arrive. Twenty-six hours later (thirteen hour time difference so thirteen hours on the plane), the plane finally landed at the Beijing Airport. Yay! I was extremely jet lagged and not very happy. I exited the plane and notice the architecture of the building that I was in. It was actually very beautiful - almost like a large triangular sheet of paper that curved up in the middle to make a pavilion. A glance out the window though presented another story. The sun was up, and it was bright outside, but there seemed to be a very heavy fog. This was the “imphysema” (combo of infamous and emphysema) air pollution.

Wendy and Mr. Pan collected me from the airport. Wendy is a guy; his chosen American name is Wendy as no Americans can correctly pronounce his Chinese name. It was about 7 AM when I arrived at the International Students Dorm at the Academy. I got settled in, sort of. I found that the internet was only connectable via an Ethernet cord. I did not have one of these though. Thankfully, one of the people downstairs was able to understand me (with the help of a translator) and provided me with an Ethernet cord to connect to my computer. Once doing this the internet was down for a few hours, of course, until the other American on my floor, Ben, showed me a trick of jiggling the cord in the slot in the wall. This gave me internet which helped me to make it through my first day here. After getting everything settled I laid down on the bed thinking I would take an hour or so nap because I was supposed to meet Wendy for lunch. I woke up four hours later at 3 PM; I had missed lunch but Wendy left me a note down at the front office telling me to call him. I called him through Skype, and we set up a dinner time.

I was getting some other stuff set up when Ben came and knocked at my dorm room door. He was wondering what I was up to and wanted to show me around the area. He had been here for two weeks already and knew the basic layout of the area. Ben took me through the north gate of the institute and walked me straight to a long alley that ran east to west; there he showed me some restaurants, one of which would become my favorite place to go, the Sesh Wan place (as we Americans referred to it). We came back to the dorm and from there I went with Wendy to dinner at a place where I never did learn how to properly order food. It was decent but not as good as I would find the Sesh Wan place to be. This was my first experience with real Chinese food. My entree was a noodle soup - very hard for a beginner to eat with chop sticks, but with a lot of slurping, I was able to get it down. After dinner he showed me a grocery store where I could get some general goods and then I headed back to my dorm. Because I was very jet lagged I was not paying much attention to my surroundings; for the life of me I could not remember where that grocery store was. That was to be the bane of my existence for the next two times I

ventured out to find it. I went two days in a row looking for it. The first I ended up in some very high end apartment buildings. The second I ended up in an alley with a ton of restaurants on either side. It was rather annoying. But one day as I was walking, I glanced across the street, and there it was, shining like a dusty beacon (well at least standing there like a dusty beacon, as much as beacons can stand, as they do not have legs...).



My dorm room - palatial by Chinese standards and I had the room to myself.

After he showed me around I got back to my room at about 7:30 and promptly fell asleep. Falling asleep so early, I naturally woke up at eight hours later at 3:30 A.M. Upon waking, I did some exercises for a few minutes and then called people via Skype. I came into Beijing on a Sunday morning so the next day was my first Monday in Beijing and my first day of work. Wendy showed me where I would be working. He showed me my “desk area” and then I started off that day by following people around in the lab and learning what they were doing. This type of schedule would be my schedule for the next two weeks while I

learned about what went on in the lab and some of the procedures for DNA extraction and testing.

After lunch on my first day I came back to the lab at 1:00 P.M. and was surprised to find everyone in the lab was asleep. And they stayed asleep until about 2:00 P.M. After returning on the second day to find this again, I started showing up at 2:00 which to everyone seemed normal. The people that I work with have to have their nap every day or they are not very happy people. They go to bed very late and rely on the nap to catch up on their sleep. This was crazy to me when I first got there, and I never did get on the same crazy schedule that they had. After lunch, I would come back to my room and work on anything that needed to be worked on – writing my blog, practicing guitar or ukulele, downloading photos, or even just having some down time by watching movies. This led to a very interesting work schedule. I got there at 8:00 in the morning, left for lunch (typically with the lab group) between 11:30 and 11:45, returned by 2:00 in the afternoon, and then worked until 5:00 or 5:30 P.M.

Those first two weeks were very rough. The air pollution, coupled with the unfamiliarity of my surroundings and the language barrier between me and most of the people that I was working with, led to me being a most miserable person. After those first couple of weeks, I began to relax a little in my surroundings and became acclimated. We had a few days of clear air (note: I come from Texas which has very clean air all the time, so this aspect of Beijing was the hardest for me to adapt to). I had the chance to get a pass to a local pool which provided me with a place of refuge. Back at home, I normally swam every day for exercise – and twice a day when I was swimming for my high school team and the local club team. Doing something familiar helped to calm me. I started to meet and network with people in my dorm. It was the international students’ dorm so there were people from all over the world, people there for master’s, PhD’s and post doctorates. These people would become great friends, and I would learn a lot about their local customs and cultures.



Salma and me - she made sure I was well fed and taught me to make some Bangladeshi dishes.

Of these people, there were a few that really helped me. There was a family from Bangladesh that I ended up spending some significant time with. I had dinner with them several times and even spent an entire day cooking with them before they left. It was definitely a highlight and one of my most memorable days. I learned how to make an awesome dish with chicken legs, some of the best that I have ever had in my life. Hopefully, I will remember how to make the dish so that I can duplicate it for my family. (We raise broilers and typically have fresh chicken at nearly every meal.) I established a good relationship with the family, and they have invited me to come to Bangladesh at any time and even stay in their home. Another person that I befriended was a Thailand woman named Pimpan, She finished up her PhD while I was here and went back to Thailand, but not before inviting me to come to Thailand to see her soon! That first week I was in the lab, I worked with her. She taught me how to do some of the procedures including how to grind samples (one of the most useful things that she taught me). I also had dinner with her a few times. On one very awesome occasion, we made our own dinner (definitely my preference over going to a restaurant).

Pimpan and her boyfriend Jay Jay helped me a lot in the weeks that they were in Beijing. Pimpan let me borrow some plates, a spoon, and other necessary items. The spoon was most useful for eating the watermelon I enjoyed on a daily basis. (I was so happy to find watermelon as I was missing the watermelon season in Texas.) She let me use her cookware so that I could cook some of my meals. I cooked several times here - just very simple stuff though. I was unable to find complex ingredients in the grocery store, and there are no ovens in the kitchen, only hot plates (specifically induction hot plates so the pan that I got from the store did not work on them). This is part of the reason why Pimpan took pity on me and let me use her cooking supplies. Pimpan and Jay Jay also helped me purchase a guitar from the Ping'al'li district. I had just recently wanted to learn how to play the guitar. Practicing guitar and/or ukulele was a great diversion on the days when the pollution was exceptionally bad and outdoor activities were out of the question. I decided to get a guitar in Beijing as opposed to America which really came as a surprise to person whom I bought it from. He knew as well as I did that all of the good guitar brands are American. I was doing the reverse of what anyone would have expected; I bought a Chinese brand guitar and am taking it back to America. My logic was this: most American guitars are very good which means that they are pretty expensive as well; I just needed a cheap guitar to learn how to play. Pimpan and Jay Jay both left to go back to Thailand before I left to head back to America. Even though my time with them was short, they were great friends.

I met the next group of people when I was walking down the street looking for a place to eat dinner. After walking back and forth down the street two or three times, they yelled over to me to join them, and so I met the African guys - Vincent, Hankie, and one other whom I never got the name of. Hankie had just finished his PhD at CAAS and was heading home for good in the next few weeks. Vincent had another full year and would be spending the summer here, and the other guy was going home for a vacation shortly. They were the ones who introduced me to the Sesh Wan restaurant and all of the "yumminess" that was served there. After answering a few of their questions, I sat and listened to their conversations. They had seen a lot and hearing them speak

about issues presented me with a whole new perspective on certain scenarios. There was another guy with them named Samess (pronounced Samesh) who was from Nepal. His views were also awesome to hear. They were very friendly people, and by sitting and talking with them, I felt more at home than anywhere. The Chinese people are exceptionally polite, but they are not as open to outsiders as some other cultures are.

As mentioned in the beginning, I met an American named Ben who became a great person to visit with. After a full work day of dealing with translations into broken English and my English being misinterpreted/mistranslated, it was nice to just sit and talk with him. Silvio was a guy from Cape Verde (which is an island country off the west coast of Africa) that I had a great time hanging out with. He spoke English very well, though Portuguese was his native language. Silvio has been great because he is the one person here that is most like me with respect to athleticism. He enjoys playing football and being athletic, as do I, and I introduced him to the Frisbee and showed him where the pool at Renmin University was (as he likes to swim). The last guy outside of the lab that I had close contact with was Albert. He was from a small country on the south-western coast of Africa called Benin. When I first met him, he asked me about good colleges in America to find a post doctorate position. I did what could to get him the information he needed (based on the limited knowledge that I had).

Adapting

As said before, I think that it was about two weeks before I really adapted. There were some major things that were different from where I live in College Station. The first one was the air and having to monitor air quality on a daily basis. The second was going from an extreme rural area in Texas to an extreme urban area in Beijing. I went from having to drive or bike everywhere to a place where everything was in walking distance; or at least everything that I needed to go to on a daily basis. This was a big change but a positive one. I rather enjoyed having everything I needed within walking distance. Most of the other things that came with this move from rural to urban, I cannot say that I was a huge fan of. When I am at my home in College Station, it is quiet save for the noise that we make and the noise of the wildlife outside and an occasional train. There was almost constant noise of some sort at all times in Beijing. For the last two weeks of my stay, it was particularly bad as there was construction going on (on the first floor of my dorm building; I was on the fifth floor). The construction noise would start at 7:20 A.M., and the sounds of traffic and people were masked by the sounds of hammering, grinding, and demolition. At 5:30 PM it would stop to be replaced by the sounds of basketball, traffic, and other miscellaneous noise. These sounds would go on until the morning – well, not the basketball, that stopped at about 12:00 A.M. Then the construction noises would start again. There were some nights that the construction crews would be out working until 12:30 A.M., and on those nights, they were picking up the demolition trash and were using the heavy machinery to dump large amounts of heavy material into trucks. Those nights were not conducive to a peaceful night's sleep.

Another major adaptation dealt with was the language. The Chinese language, as most people know, is written with a series of pictures or characters. Each character has a different meaning and the only way to know what that character is through memorization. The only character that I could successfully recognize was the one for water as it was prevalent on several items in the lab

(e.g. the flasks of distilled, autoclaved water). Needless to say, this made going to restaurants hard sometimes as I did not really know what I was ordering. I would just point to a random name of a dish and hope for the best. At most of the places that I frequented, there were pictures of all or most of the dishes that I would order. At the Sesh Wan Place, I memorized the position of the certain things that I liked on the skewer menu. I knew that the first one on the list was the lamb kabobs, the last one on the first row was bread, and the second to last one on the list was the chicken gizzards that I really enjoyed.

Speaking Chinese was even more difficult. I only managed a very few basic words and grammar type things - although there is no real grammar in the Chinese language I was told. Most people there speak some amount of English. In order to live in the International Student Dorm one is required to speak English, and most of the lab folks were good at speaking, at the very least, a noun and a verb so I could get the gist of what they were talking about. My nonverbal communication skills definitely improved due to my increased gesturing for things in place of words.

I was immensely frustrated that the employees who ran the dorm and maintained it (and that I had to deal with daily) were not required to know any English. To me this was one of the many puzzling aspects about the University that defied logic. In order to be in the dorm, English was a requirement, but the people who sold the electricity and water, and took care of the place did not speak any English. This made almost any transaction between us very difficult. I almost always had to get a translator to help me to say “electricity” or “water” in Chinese so that they would know what I was talking about. (Note: Electricity was a separate expense. If the amount of electricity used exceeded the amount purchased, then they would cut the electricity off to the room until you went and paid for additional “hours”. There was no warning when this would happen – and it was a bit disconcerting when all you had to light the room was your laptop screen running on battery reserve. This happened a couple of times to me during the summer; once while I was on Skype with my mom. It definitely freaked her out!)

Food

The food here for the most part was very good, though there is no actual bread as they do not like or use ovens. They do most of their cooking in a pan called a wok which is a very rounded pan with high sides. In this pan, they make stir fry, fry fish, and boil water to make noodles, dumplings, or even rice. A rice cooker is typically used for preparing rice. The food is almost always different, but the same. For example, I do not think that I ever had the same stir fry twice, yet it was still a stir fry dish. It may be that my palate was not discerning enough to detect the differences. This is the same with much of the food here and it took some getting used to. In America, one can have any type of food at any time whereas here it is almost always Chinese food and only Chinese food. There were a few fast food American places here, but unfortunately, they were chains that I did not even frequent in the U.S. (Our family does not “eat out” and 99% of the time we prepare our meals at home.) I did have a pizza from a Domino’s Pizza after being in China for about 4 weeks. It was edible but it just did not have the flavor that I expected for a pizza (I got a Hawaiian pizza). The Chinese, for whatever reason, also do not like cheese. In most grocery stores in America, there are entire sections devoted to this cultured delight. But here, there was barely a Brie to be seen, and if I did find Brie, it was not the same. To go along

with my cheese, I also attempted to find crackers. Again, crackers were not a typical grocery item (though this might have been due to my lack of ability to recognizing the Chinese symbols for “cracker”



Boiled peanuts and lamb skewers at my favorite restaurant.

My favorite things to eat were all from the Sesh Wan place and included: fried rice, the skewers of lamb, chicken gizzards, rice bread toasted with butter, and the boiled peanuts and soybeans. They got a lot of my business while I was in town. Before coming to Beijing, I had never heard of boiled peanuts, but Ben, the American guy on my floor said that they are common in the south eastern U.S. I am going to miss the Sesh Wan place’s food now that I am back in America. But being able to cook my own food in our family kitchen should more than make up for it. I do plan to try to reproduce the

chicken gizzard skewers when we process chickens in the late fall.

Another dish I really enjoyed was the famous Peking Duck. It is much different than one would expect from a duck though. The dish is served with the duck already carved, and it is served with very thin layers of cooked dough. To eat it properly one takes the sauce (SO GOOD), dips the duck meat in it and then makes a wrap (using the thin pieces of cooked dough) with the duck, sauce, and some random vegetables, cucumbers, bamboo shoots etc... I went and ate this with another intern in the lab. The meal was definitely delectable.

I did eventually locate a bakery here in China – a French style franchise place. The bread there was very good compared to what I had had so far in the Beijing area. The place produced an interesting mix of Chinese taste and breads. Most of the breads that they seem to eat in China are sweet breads. Many of the breads that would be thought to be savory actually turned out to be sweet. For example, the “Delicious Pizza Bread” was a sweet bread as opposed to a savory one. The bakery certainly did not rivaled my own baking (and definitely not my Mom’s or Dad’s), but for the situation, it was perfect. I went there twice even though it was about an hour ride on the subway to get there.

There have been several occasions in which I have gone to fancy restaurants, and these have always been interesting. The first major occasion that I went to a fancy place was when Wendy and Pimpan had their graduation party. They gave me the menu to order one dish. I made the mistake of pointing to a particular dish in the hopes of having someone explain to me what it was. Upon further examination, I then said I want “that one” and pointed. Wendy told me only one dish should be ordered per person; I got very confused as I did not think that I had ordered yet. Eventually they realized what had happened. When the food came out, it was placed on a huge fancy lazy Susan in the middle of the table. As it is turned, one just uses chopsticks and eats straight out of the dishes on the turntable. I found out that it is impolite to take some and put it on your plate to eat as it means that you do not care about something. Also one is supposed to turn the lazy Susan clockwise, which is the opposite of how we pass dishes.

During this meal Wendy stood up and gave kind of a speech, I guess that he was thanking everyone in the lab, but he was speaking in Chinese so I was not sure. I just kind of tuned it out and kept on eating, which obviously was not the correct course of action. Wendy tried to tell me about proper etiquette, but his English was so poor that I could not make heads or tails of it. I definitely could have used a translator for that tongue-lashing.

The fancy restaurant previously described was a far distance away by Beijing standards (meaning a subway trip was required). The fancy restaurant that I visited most often was one that was just below and to the northwest of my room - I could look down from my window and see it. This was also the fanciest place that I visited in Beijing, and I went there at least four times. At this place, the “passing around of the menu” is generally employed (like previously described). The first time I went there was for Pimpan’s going away party. She graduated and therefore was heading back to her home in Thailand. We went and had a bunch of different dishes, as was customary, and with everyone picking a dish. Then when those dishes were finished, Mr. Pan ordered some more. There was a great dish with baby cucumbers in it and several other dishes I enjoyed. There were also some not so awesome items like the “leftovers soup”, or at least that is what I called it. I referred to it as such because it seemed to contain everything that would normally go in our refuse bucket at home. It had coagulated blood, seaweed, chicken neck skin, bean sprouts and other mysterious ingredients. I think that I may have even gotten a piece of spam or bologna in my initial taste (yes, I tried everything at least once). It is supposed to be very good for you, but I reserve judgment on that based on what is in it. They eat a lot of things in China that normally we would not (like chicken feet). For my other three visits, the foods were great.

The 3 hour ordeal

One of the last major events that took place near the end of my internship was a big going away party for Leo. Leo was working in the lab over the summer and was leaving to visit other places before heading back to the USA for college. He is a native Chinese but is going to college in the United States. Because he was going away, it was required to “have a party”, a lunch party to be exact, at one of the fancier places. At this place, we all went in, everyone in the lab, and sat down at the lazy Susan, and instead of passing the menu around, Wendy ordered for everyone. In my opinion, this was a huge mistake. The first thing that came out was cold goat’s stomach (which was not extremely tasty) along with some other dishes that were either lukewarm or cold. The worst was the fish. They were small fish fillets with the bones, of course, that had been fried and were served warm on the outside, cold on the inside. This was followed by some other dishes including the infamous “leftovers soup”. There were some very good boiled peanuts, but that was about all from that meal that I enjoyed (or could stomach). The entire process took **three hours** after which we went back to the lab immediately. Since we had gone straight through the nap time, it was time to work. I got there and was ready to work. Everyone else had fallen asleep (in the lab) so I had the opportunity to play solitaire for an hour while they took their naps.

Fish were a major point of contention while I was in Beijing. The style of cooking calls for keeping the fish whole – so all the bones are there, including pin bones. This led to some interesting eating situations because I would take a bite and get stabbed by a very sharp bone.

The fish is actually really good and all but really? Do all of the bones have to be in it? And then the challenge of eating it with chopsticks!? It definitely is a taste and ability acquired through the culture. The flavor of the fish is one thing that I will miss, but the bones are one thing that I will not.

Recreation

Having talked about foods now I think it is time to turn to how I burned off the calories that I consumed. Most days the air quality was too poor to do any serious outdoor workouts, so I just tried to do the minimum that would be needed to maintain my endurance and strength. It was a huge challenge for me, especially with coming off my last season of competitive swimming where my workouts included four hours of swimming a day plus weight-lifting. It was a definite struggle for me. Mr. Pan showed me where the pool was and helped me to get my Deep Water pass. This is a Chinese water pass that people have to have in order to swim in the “deep water”; more than 1.5 meters deep. I passed with flying colors. I was not able to do much fast swimming as the air made it hard to go at a competitive pace, but swimming helped me to stay sane in the first three weeks. During those weeks I was experiencing heavy culture shock, and the swimming was something familiar that I could do to calm myself down.



The Olympic size pool I swam at for the last part of my stay.

During the last 4 weeks in Beijing, the pool that I normally swam at was closed for repairs and so Wendy showed me where the Renmin pool was. Renmin is a Chinese university that is very near the CAAS. Swimming there was very nice; the pool was the Olympic size (standard) as opposed to 25 meters long. (Olympic is 50 meters long) When Wendy showed me this pool, I noticed a very large green field, an athletic field basically being used as a recreation area. That was an awesome place to go. I love to play Frisbee and so the green field gave me a place to play for the first time in weeks. I went there many times over the next four weeks and threw the Frisbee with whomever I could find from the

international student dorm that would go with me and random people that were sitting around the field. I introduced Frisbee to many of the Chinese at that university. In twenty years if there is an insatiable demand for Frisbees in China, you know who to thank.

Air Quality (or lack thereof)

One of the biggest and hardest things to adapt to was the air quality. Most of the days, the air was extremely poor. The way that the air quality is measured by the ppm (parts per million) and particulate size of the particles or PM (particulate matter). A measurement of 2.5 is considered most dangerous and unfortunately, it was a very prevalent reading in the Beijing area. The 2.5 refers to the size of the particle in nanometers, anything below 2.5 nanometers is classified as PM 2.5. On a “bad” day in my hometown of College Station, Texas, the PM 2.5 count is about 40 PPM and this is mostly due to dust. In Beijing, on a very good and very rare day, the PM 2.5 count will drop to 50 PPM. The average while I was here was about 180 PPM. There were days where the PM 2.5 count exceeded 350! I have learned to tell the difference between a good day

and a bad day just by looking out the window; at about 120 PPM of PM 2.5, the sun becomes hazy as if viewed through smoke; at 200, the sun is barely visible; and at 300, it is not visible at all. Another method to assess the air quality was to look for specific landmarks - if I could see the cranes, the number was at the very least below 125. It is very unfortunate that the air is so bad. There are quite a few areas of wilderness in addition to the parks, the Forbidden City, and all of the other ancient structures – all of which are so beautiful even with the bad air surrounding them. I cannot even imagine how beautiful they would be if the sky was blue and one could see all them better (plus a day-long outdoor excursion would be much healthier with breathable air).

Work and Such

My first two weeks at work served as an initiation period where I had the chance to learn the basics of what people were working on in the lab. For my project I attached myself to one of the more interesting projects which coupled itself with one of the better English speakers in the lab. Yulan was and currently is working on pairing the fungus (*Verticillium dahlia*), phenotype with a specific gene. She is working to identify the gene's function within the plant. I worked with her on her project for the rest of the internship (more details to follow on this).



Mr. Chi, Yulan, Chungli, Su, and Pimpan

Within the lab I learned about many of the different processes for genetic manipulation, specifically, gene silencing as this is what Yulan was working on. During the time I spent in the lab, I certainly had my share of mistakes. It is, of course, from these mistakes that great learning takes place. Here was one of my better ones:

On the last week I was there, Yulan had me doing a PCR (polymerase chain reaction); not even for her, but a friend who needed to know whether a gene was inserted or not. Yulan gave me the samples to do PCR with: the primers, the DNA bases, the buffers, and the water. I prepared everything just fine and was doing great. I had got everything into the tubes and everything mixed. The mixing had caused bubbles in the PCR tube and so, naturally, I centrifuged the tubes to ensure that an accurate amount was put into the other tubes and not air. Before centrifuging we normally would write on the tubes so we are able to identify them. I forgot to do this and centrifuged away. Needless to say I was not able to tell which one was which afterward. We



Enjoying watermelon in the lab.

went ahead and ran the gel as if everything came up positive or negative it would have been fine, but alas, that was not the case.

Everyone in the lab was pretty awesome. On several days, people brought watermelon or some type of cantaloupe. These were always good; we cut them up with a cleaver. The cleaver seems to be the utensil of choice for slicing and dicing large food items - I have not seen carving knives or many regular knives since I have been here. At one point, I had to use a cleaver to

peel and cut up potatoes which was pretty challenging I might add. And speaking of melons, more specifically watermelons, I loved them there. Every watermelon that I purchased was sweet, scrumptious, and juicy. I probably spent more Yuan (Chinese “dollar”) on watermelon than any other food item as I bought and ate at least a dozen of them while I was here. When I needed a break, I would take them, cut the top off and sit with a spoon and dig the watermelon out. The guys on my floor loved this. They could always tell when I had eaten watermelon as the entire rind “bowl” would be in the trash can. I had a bowl that I put the watermelon seeds in – my goal was to see how many I could collect before leaving for home. I almost was able to fill it - the seeds from more than twelve watermelons takes up more room than one would expect. The spoon I had received from Pimpan, and it was the best spoon ever for eating watermelon. It was perfectly curved to create a watermelon ball of just the right size. At the Sesh Wan Place sometimes they would give out plates of watermelon to good customers. There was nothing better than a few small slices of cool watermelon for a dessert after eating lamb ka-bobs and fried rice.

Now returning from that tangent train of thought to the point of origin, (only way to get back from a tangent path onto the original path is at the point of intersection provided one does not want to blaze new paths) - the people in the lab. When I first got here everyone introduced themselves, and I promptly forgot all of their names. I gradually learned their names as I worked in the lab. Most of them had two names - an English name that I could remember and pronounce and their Chinese names (which I struggled with). Wendy, the one who picked me up from the airport, graduated while I was here and is now working on a post doctorate. Mister Chi was another guy in the lab, and he had me call him Mister Chi. He was working on a PhD. Lili was kind of the lab manager, I think, so she was working on everything and restocking stuff in the lab. Chungli was a master’s student and Yulan was as well.



I successfully made my first dumpling.

After the first week we had a dumpling party at the international student’s dorm. This party was where most of the people in the lab got together, and we made dumplings. This was done downstairs in the kitchen of the place. Everyone brought stuff to make a dish with and we had multiple dishes made. This was my first experience with cooking Chinese style. Pimpan also taught me how to make a type of soup that is popular in Thailand. This party was where I met Jay Jay for the first time. We made some awesome food and great rice and settled down to eat a good meal. I had to borrow a plate and a spoon (these Pimpan eventually gave me). The dumpling party was great fun and I learned a lot about Chinese cooking by watching. At the same time that we were cooking the Chinese food, I watched Salma, the mother of the Bangladeshi family, making her curry. I watched this with great interest.

Working each day was always great apart from the times in the lab when we were waiting for something to grow. When this happened I would take naps in the back corner, there was very comfortable chair back there and a smaller stool that one could put their feet up on. This place was one of the best for taking naps. Speaking of naps; I do not know what it is about listening to people give lectures in Chinese, but almost every time, I found myself nodding off. I know this was mainly due to the fact that I could not understand a

word being said but still it was rather embarrassing. This happened to me at least three times while I was there.

During the last two weeks, a new intern from one of the Chinese universities came into the lab to work with us. She was native to Beijing and showed me a few new places within Beijing. She turned out to be a great friend while I was here as she was the closest to my age of any of the people in the lab. I introduced her to Frisbee and took her out to the Renmin University fields to practice. I ate Peking duck with her for the first time of the three times that I had it.

After I had worked in the lab for two weeks I went and talked to Dr. Cheng about my project. There was a good chance that there would be no results as everything that the people were working on in the lab took months and years to study and finish. I asked Dr. Cheng about what she thought was best regarding my course of research. She thought that my idea of attaching myself to one particular student in the lab and working with her on her project would be the best idea. I choose Yulan for previously mentioned reasons.

Excursions

Olympic Park

(7th day): The first excursions I took was with Dr. Hongmei, her husband, and son to Olympic Park. They showed up at 900 outside my building and we drove there. The traffic was crazy. On the way there I saw my first gas station and three McDonald's. Dr. Hongmei remembered my name by associating it with travel – Travis: Travel and when she says them they sound the same. We circled the park once before going into it because Dr. Hongmei's husband missed the turn the first time; it took us an hour to get there. Once there, we got out and walked into the park area. Let me be clear, we went into the park area, not the stadium area, so I did not get to see any of the buildings except from a distance. The Olympic Park was quite pleasant - there were lots of trails and paths for walking, and it would be a good place to run. But to be honest, the fact that it was cloudy and I still could not see the sun made me very depressed and made me miss home very much.

Forbidden City

(8th day): I met down in the lobby/"restaurant" and met Pimpan, Pimpan's boyfriend, and Chungli. We all walked to the subway station - it was pretty close. We were at the Weigongcun Station and were headed to Tiananmen East. I used my transportation card for the first time today to get in –that was pretty awesome. We got on line 4, and went a few stations down where we changed to a line 8, I believe, and waited for Tiananmen East. When we got there they ran us through a security check. There were a ton of police there. Pimpan's boyfriend told me that it was because they want to ensure that there are no protests against the government, which is certainly different from the USA.



We went through the security check and several others, every time onto a subway in fact. Before we went into the entrance to the Forbidden City, there was a gigantic "painting" of Mao

Zedong. We went into the main entrance courtyard; this place was huge in terms of area. The size of the buildings was not staggering but the complexity and design of each building was as well as the number of buildings there were. I probably saw 1/3 of the entire place that was open to the public, and I was there for about 4 hours. I walked around for a while, 2.5-3 hours with the electric tour guide then found some of the galleries and worked my way out to the exit from there. There were gigantic iron/used-to-be gold plated vats everywhere; these were filled with water and used by the fire fighters of that day. This was essential due to the structures being built mostly from wood. The galleries were good; there were some incredible intricately carved horns and jade. It was these galleries that relaxed me and stanchied my homesickness. Also the fact that the day was very clear for Beijing helped.

We made our way out of the east gate and walked through the “tourist-y” areas (my least favorite part of the day). We made it back to the subway after a good walk. From the subway we boarded a very crowded train to go to the music district at the Ping'anli station. After a short stop there, we headed back to the dorms.

Summer Palace

(15th day): On this day, I left around 850 to go to the lab to meet Wendy. I met him there, and we left to go to the train station. It was an easy ride there, no transfers, just a straight shot. At the correct station we got off and walked to the entrance of the palace. Wendy bought our admission tickets, and we went in at 1000. Our adventure would last 6 hours, and even with 6 hours, we did not even come close to seeing it all.

The first thing I noticed was an Italian-like canal town/village but with a Chinese flair. It had been built for one of the emperor's wives because she missed her South China home which had canals. So the emperor built it for her. We then kept on walking - there were some serious sloping stairs - it was pretty awesome. We saw one of the entrance gates and the soldiers' quarters, and then proceeded to a Buddhist Temple. It was huge - it is from this vantage point that I took most of my photos as we walked around the 750 acre man-made lake. We saw a Chinese opera house in the palace and gorgeous painting like I had seen in the Forbidden City. Most of the palace had been burned down in the 1860's, and the emperors of the last dynasties rebuilt it. We then entered an artifact gallery and saw some incredible jade work, bronze work and ceramics. After this, we crossed the 17 arch bridge to a central island and sat for a while. From there, we circled the lake, crossing many bridges as we progressed on the path. One was very airy and steep but breathtaking. There were many pretty willows and other flora around the entire place. Overall, the Summer Palace was spectacular ginormous and quite gorgeous.

Great Wall

(21st day): I got up this morning at 450 to go to the Great Wall. I was supposed to meet Yulan and her boyfriend at the west gate at 520. I was a little late getting there as I could not find the key card to my room. They were also a little late and thankfully later than me. In order to get out of their building earlier than 600, they have to register in advance and then the guard lets them out. The guard was not there so they had to wait for him/her (do not know which). Chungli also came with us.

The AQI was not good. It was in the 200's still so I wore a mask on the way there and back. At the Wall, I did not wear the mask even though the air quality was worse there. I wanted to enjoy the adventure, and I just did not worry about the air. We walked to the station, got on the subway, and went to the exchange line 3 stops down. At the exchange line, we exited the subway and walked into an enormous pavilion; the first train station that I had ever been in. There we boarded a train: it was not exactly a speedster. The wall was 60 km west, and it took us about an hour to get there, with three stops. We had to run to catch the train in the station but we made it and got seats!



Yulan at the Great Wall; She was my mentor for the summer.

On the train it was VERY roomy - there was about a meter of space between seats. On the way there we were facing backwards which I did not like, it was harder to see things out the windows. What I did see out the windows was definitely worth seeing. As we got into more rural places, there were gardens, for food not flowers, which were growing right up to the tracks. They had corn and cucumbers and what looked like pumpkins - I did not see rice though. As we got even farther out, there were mountains and hills that were very pretty. I could not see more than a few hundred feet clearly but the beauty of that area was not diminished by the poor visibility. The mountains were of greenery and rock mixed together, like one sees in the Chinese art. It was very beautiful, and I tried to get a few photos through the train's window. But the windows were not very clean so the photos I took look like they are in a haze.

On the third stop, we switched directions then went through a tunnel and arrived at the Great Wall station. We exited the train and walked into the area, stopped at a restroom, and bought tickets. We then went into an area and signed some papers certifying that we had been to the Great Wall - which was kind of strange. There was one area with messages from many people who had been to the Great Wall - the messages were on bamboo. We exited and went up to the entrance. The walk from the station to the entrance was about one km. We went in.

It was incredible to say the least. I wished that the air would have been clearer, not necessarily so that I could have breathed easier (which would have been nice) but so that I could have taken a photo and captured the portions that were miles away from the park area of the wall. There were some very steep slopes on that wall and some serious hills. It would have been fun to do a marathon on it like Lexie (my friend from the States) did.

Walking through the area I got separated for about an hour from the people that I came with. I thought that they were ahead of me - turned out they were behind me. I had almost walked to the very end of the place that was open (still miles of it rolling off into the distance) when I turned around and walked back in order to find them. At one of the towers, I looked



down and saw them (thank goodness). I then finished walking the Wall with them. We walked the south side of the area that was open. I would have loved to come back and walk the north side - it looked much steeper.

Once the "end" was reached we walked through the souvenirs place. There were a ton of people in the area and there were animals that tourists could pay to take photos with. There was a horse, camel, a musk ox, and peacocks. They were selling roasted corn, and I was kind of hungry. So I made a mistake and purchased an ear - the roasted corn here is **not** sweet corn. It is "normal" starchy corn. I gave it to Yulan's boyfriend; he enjoyed it.

We had to run to catch the 1150 train back. The next one would come at 100. We made it even though the boyfriend ran out of money on his card and quickly had to purchase a ticket. The way that the people on the platform press to get seats was rather savage. They just press forward. I can easily see how people could get trampled in such a press. When that was over, we sat and just kind of dozed on the hour long ride home. I took a few photos. I was trying to get some of the roadside agriculture, but it was moving by too fast relative to the train. We got to the station and made our way to the subway and headed back to the dorms. So ended The Great Wall adventure.

Ming Tombs

(29th day): At 900 I went down to the lobby and met with my "peoples". The husband of the girl from my lab took me; she went back home to sleep. I found that a little strange. But anyway, I could never catch the name of the husband so from now on he will be referred to as "the husband". We walked to the subway station and rode it, with a transfer at line two, and then a few stations more until we got on a bus. There was some confusion on getting to the bus. We had to cross the highway, and the crossing was pretty poorly designed. In order to get to it, one had to duck under some barriers and go over the feeder road to get to one of the bus stops then one could get to the flyover walkway. We went there and then tried to find route 315. It took quite a few "askings" to find out where it was.

Once we got there, we got onto the bus, and luckily there were seats, although not together. So we sat. The buses on the routes I was on today were very jerky, it seemed to be pedal to the metal whenever they were accelerating and the same for the brake. We were on route ### (forgot the actual number) bus for a long while, maybe an hour. At one point we got seats together, but I gave mine to an older lady and stood for a while before the bus cleared out again, and I got to sit down. The seats that we ended up in for the rest of the ride were near the engine block and were very hot. We got to our bus stop and looked for route 314. We soon found it and were on our way again, for another 30-40 minutes at least. We started getting into more rural areas. We passed a massive roundabout with a statue of a very important Chinese man on a horse on it. We started getting closer to the mountains and soon were in a valley. In this valley were the Ming Tombs: three of which have been excavated, ten of which have not along with other concubines' and princes' tombs that are undisturbed.

As we were going along in the bus I noticed that we seemed to be passing a ton of peach trees. It turns out the entire area was a peach orchard (except of course for those areas protected because

they were tombs or had buildings). Throughout the entire venue, there were tons of people trying to sell peaches.



At the entrance to the Ming Tombs - notice that there is blue sky!

At the station, we disembarked and walked to the ticket area and bought tickets. We then entered into the Dingling Tomb area. We walked around and saw some of the buildings and the foundations that buildings used to stand on before reaching the actual burial mound. This was built like a castle, a round one, and inside the walls was dirt. The walls made a bowl, and it was full of dirt. There was a garden on top of the mound. We walked around the walls to avoid people. It was absolutely beautiful. The sky was very clear for here. Almost as good as home in College Station. There were mountains on all sides, and it was green, without much trash or people. We continued around the wall until we reached the tombs entrance. We walked down seven flights of stairs; it was a deep tomb and entered into the right hall. From there we walked through the burial room and saw the thrones that were put there. They were very well crafted. Even the doors in that place were extremely well crafted.

As people would walk by, they would throw money into the exhibits for some reason. There was a ton of money there. It looked like the people at the place just swept it into a big pile. It was not as big as I expected it to be. After a bit, we were headed back up to the surface again.

After Dingling we went and got the free lunch that was given to us for some reason (maybe it was part of the ticket price). It was okay but nothing great (it was not even as good as the cafeteria food here). We then walked to the Chingling Tomb. That is one that has not been excavated yet but had the largest entry way. We went and saw that which was pretty cool. There was a hall there that was absolutely beautiful. It was huge and gorgeous even without some of the decorations that had flaked away over time. There was also some jade work that was incredible.

After that, we were going to go see Spirit Way. Here we ran into a small hitch. We started walking and began to hear thunder. Then it started to rain - luckily, the husband had brought an umbrella. The rain cooled it off but made everything very sticky and humid. On one of the roads, a car pulled over and started telling us that we were going the wrong direction so we turned around. Then the husband thought that we had been going in the right direction so we turned back around. Eventually, we turned off the road and into a compound that the orchard keepers lived in and began asking for directions. We ended up taking the bus to the Spirit Way. It was route 67. Once on the bus, I started nodding off (I had been fighting fatigue for several days). Once we got to Spirit Way, we entered in and walked the wrong way through it. It was still very cool though. The size of the carving was immense. It seemed that special care had been taken to make sure that all the people and creatures on the carving were males. We got to the load bearing turtle and turned back the way we came to head back to the bus. It was awesome. It was impressive in a different way than any of the other things that I have been at. I still like the Summer Palace and the Great Wall, but this place was pretty amazing. We boarded route 67 and headed for CAAS after that.

Temple of Heaven

(35th day): Ben (my American friend from Virginia Tech) and I took the subway and arrived at The Temple by mid-morning. We made our way through the Temple - it was a large area, of



Looking toward the southern regions, in front of the Temple

course, so we walked around for 3 hours or so. It was very beautiful. There were some Chinese people doing traditional dances when we first walked in. It was rather strange as the men were in normal clothes while the women were in the traditional garb. There were also people playing some instruments on the way. We walked the opposite way through the Temple. The blue and green tiles on the buildings were stunning. The blue was especially beautiful. Walking around was quite enjoyable because the area was basically like being in a huge park.

We saw the Echo wall and the marble plinth. It was very cool and unusual. While walking through one of the gates, there were some hawkers yelling out their

respective wares. They sounded like seagulls. There were also many round holes for doors. We were joking about hobbits living there. When we saw that all of the emperors in the paintings looked rather pudgy, we realized that the doors were made that way to accommodate the actual shape of the emperors! After seeing the main section, we started walking around the grounds which were immaculately groomed. We came to a restroom facility. It seems they use a star system as a rating for the restrooms. This was a three star restroom, and it had American style toilets instead of the Chinese squatters. For only three stars (I have no idea how many more stars a toilet can be), it was very nice. We walked from there to the other side of the parks to the fasting palace. There was absolutely nobody at that area - a definite bonus in my book. I was able to take some good photos, photos without anyone in them for the first time - though they were taken on Ben's phone as my phone blitzed out for a few minutes before restarting. It was all good though. After the fasting palace we headed back out and went to the pearl market to look at the products. The people are very aggressive about selling. I had one lady grab my arm to try to sell me a bag. I just kept on walking. As we went up the successive floors, the places got nicer. I would need to do some serious research on buying pearls so I can spot a fake before I try to buy anything there. After that diversion, we went to the bakery and had lunch, a late one. I had a mango drink which was pretty good. I was also able to purchase a non-sweet bread - it was a bacon bread and totally satisfying. We then headed back to the dorms by route of the subway. I would end up making a second trip to The Temple of Heaven when my hometown friend, Rachel, came to Beijing towards the end of my stay.

Old Summer Palace

(50th day): In the afternoon, I left to go to the Weigongcun subway and waited for Faith. She showed up on time, and we went to the palace museum. It was very large and very beautiful. There were tons of lotus flowers and the ruins that remained after the Anglo-Allied forces burned the area down. Faith said that it was a good thing that I did not come here with Wendy. Also known as the Ruins of the Yuanmingyuan (the Garden of Perfection and Light), it is located

northwest of Beijing and to the east of the (present-day) Summer Palace. There was a huge watermelon statue at the exit of the Old Summer Palace – I had to get my picture by that, of course. There was also a model of the entire area - a very large scale model of the palace in an exceptional large room.

Olympic Park with Friends from Home

(55th day): I met the up with Rachel and Mrs. Scott (Mrs. Scott grew up in Beijing and was visiting for the first time in 20 years). We went the Sesh Wan restaurant as I was very hungry. I ate some fried rice while they told me plans for the following day. Rachel was in Morocco for 6 weeks before coming to Beijing. Once dinner was finished, we decide to go to the Olympic Green station to see the Bird's Nest and the Water Cube. The Cube was under renovation but it was still lit up, and the Bird's Nest was very cool. All around the park there were very interesting models of dinosaurs. They really like "How to Train Your Dragon" in China - there were tons of posters and stuff and even a live action version of it. "Kind of like a Disney on ice," Rachel said. I bought some lasers from one of the street vendors. We bargained with the girl and got two of the large ones for 100 yuan which is a good deal. The lasers look like they are meant for American vendors based on the warning label. The park was pretty fantastic.



My friend Rachel and I at the Bird's Nest.

They had a wall with all of the names of the medalists on it for the Olympic and para-Olympic games. We got to see the Water Cube light up - it was a blue glowing cube just like one sees in the photos. It was very cool.

We had taken the subway to the green, but we took the bus back to Mrs. Scott's parents' house. It was only about 1 km away from the park, and the Bird's Nest was visible from the window. They live on the 12th floor of a large apartment complex and their "home" was absolutely beautiful. They had some exquisite pieces of jade work and ceramics. When entering their house, shoes were left at the door and slippers were put on. They made some more food and I had kind of a second dinner while the Scotts had their first dinner. There was a sweet sticky rice dish and some soup with some fishes and sweet potatoes. After that course, we moved on to the meat, flour, and carrot burger patties. That is the only way that I know how to describe them. They were awesome, but I have no idea what the actual name of them is supposed to be. It was about 1015 and I needed to go in order to get back to the dorm before they lock it up for the night (with the customary bike lock) and also before the subway closed. I got onto line 15 which was above ground and then transferred to line 10. On the line 10, I did some pull-ups on the train. I got off of line 10 at the right spot to find that I had missed the last train that was heading to Weigongcun. I headed to the surface and managed to find a guy that could point to the direction of Renmin University. This was good. I kept calm in the situation and figured out what I needed to do. This made all of the difference. I ran along the road until I got into the areas I was familiar with and got back to the dorm without incident. It was about a kilometer and half that I ran back to the dorm, in flip flops. But I made it before the gates were closed. Thank the Lord!

Research

Abstract

Verticillium Wilt is a significant world-wide disease capable of infecting over 200 species of vegetables, fruit trees, and crops, including cotton (*Gossypium hirsutum*). It is caused by the fungal pathogen *Verticillium dahlia* which infects the cotton plant through the root where it colonizes the vascular system and interferes with the transport of water and nutrients within the plant. In severe cases, it can destroy the crop and its productivity.



At an extension location in the cotton field.

The severity of the disease is influenced by a variety of factors including cultivar choice, plant density, pathotype aggressiveness, inoculum density and climatic conditions. However complete immunity to the disease is not known in cotton. Genetic modification

using transformation provides a potential mechanism for immunity to the disease in cotton. Thus, I was working with scientists at CAAS who are evaluating the potential to develop cotton to be resistant to *Verticillium* spp. using transgenes and transformation systems. This is the final goal of the entire project.

As with any genetic manipulation project, the process to modify the plant is very complex and involves a team of people working for several years. Research in this area has been ongoing for multiple years at the CAAS. I worked with one M.S. student who is testing the efficacy of several potential transgenes to reduce the growth or development of the fungus. In order to do this, these genes have been engineered into vectors that are transformed into bacteria. The purpose of my work this summer was to transform the “knock in” vector from the bacteria to the fungus. This knock in vector will act as a gene inhibitor and prevent a certain genetic sequence from influencing the phenotype. From observation of the phenotype, the effect of the gene can be inferred; one can tell what the gene controls.

The knowledge of the fungi genes function is essential to producing the right vector to modify cotton that will be effective at resisting the wilt. Using the knowledge of genetic function, plants can be engineered to produce interference vectors that would block out or destroy the gene within the fungus. Another goal was to learn about molecular biology and the steps that go into the creation of a modified organism as well as the steps that go into making a modified organism that is effective at producing the desired effect; in this case, resistance to *Verticillium* Wilt.

Introduction

Verticillium Wilt is a significant world-wide disease capable of infecting over 200 species of vegetables, fruit trees, and crops, including cotton (*Gossypium hirsutum*). It is caused by the fungal pathogen *Verticillium dahlia* which infects the cotton plant through the root where it

colonizes the vascular system and interferes with the transport of water and nutrients within the plant. In severe cases, it can destroy the crop and its productivity.

The severity of the disease is influenced by a variety of factors including cultivar choice, plant density, pathotype aggressiveness, inoculum density and climatic conditions. However complete immunity to the disease is not known in cotton. Genetic modification using transformation provides a potential mechanism for immunity to the disease in cotton.

There have been several studies to access the effect of genes on the phenotype of *V. dahlia*. These studies have identified the characteristics that each of the genes studied are affiliated with in the phenotype. This focused on five unidentified purpose genes within *V. dahlia* in order to determine if the interference of these genes would be effective in preventing symptoms of infection, reduce the virulence of the fungus, and prevent infection of crops, specifically cotton, in the study.

Materials and methods

Five knock in vectors were constructed using specified enzymes; each vector was different as each one was to silence a specific gene independently by replacing the gene. These knock in vectors were constructed of an up sequence, the gene to be inserted, and a down sequence. On the outsides of this there was an enzyme and a strand of DNA on either side that was identical to that of the fungus in the before and after gene in the fungus that was to be replaced. This would



allow for seamless transferal into the fungus after several other steps. Each vector therefore had the same gene to be inserted but different locations that it would be inserted at. The vector was in the form of a plasmid extracted originally from *E. coli*, which is a circular strand of DNA that allows organisms like *E. coli* to transfer DNA from one to another without the need for sexual reproduction. In this way the *E. coli* can adapt quicker than by mutation. The up and down sequences are sets of codons within the DNA strand that tells the RNA polymerase to start transcribing at this point. The gene to be inserted was a gene of antibiotic resistance (inserted and hence “knock in” vector). The down sequence is the same as the up sequence except opposite. While the up sequence indicates a point to start transcription of the RNA polymerase, the down sequence tells the transcription process to end. The antibiotic resistance gene sandwiched in the middle of the up and down sequence would provide antibiotic resistance to allow for selection of the *E. coli* that had been properly transformed. Each one of the five vectors was created separately and inserted separately from the other.

These five different vectors were created and then transferred into Competent *E. coli* cells. The competent cell is a cell that will readily accept extracellular DNA, in this case, the vectors in the form of a plasmid. The competent cells were treated with heat shock therapy to insert the vectors into the Competent *E. coli* cells. This is done by culturing the *E. coli* in a solution of 20 millimoles/liter of magnesium at cold temperatures. The magnesium and the cold temperatures are thought to make the cell membrane more permeable to DNA strands. When treated with a

heat pulse a thermal imbalance is created on either side of the cell membrane. This imbalance is thought to force the DNA through the Bayer's junction, or zone of adhesion which is simply the areas of the membrane that are permeable to DNA strands. The OD (optical density) of the bacteria is used to determine the competence of the bacteria. This is done by using a colorimeter and comparing the cultures to a blank of distilled water.

Once treated with the electro shock therapy the *E. coli* are grown on a plate with antibiotic. The successfully transformed bacteria are able to survive due to the resistance gene. Samples are taken from this and analyzed with gel electrophoresis after Polymerase Chain Reaction. (PCR) Within the PCR, a primer is used to cut the DNA sequence at the up sequence and the down sequence and separate it from the chromosomal DNA. Because the vectors were created, the length that each sequence should be is known. Gel electrophoresis is a method of separating out different length DNA strands using a gel made from agarose and a buffer system. The gels are created with wells within them for the results of a PCR to be inserted into those wells. Electricity is then run through the gel - it requires more energy to move longer strands and therefore the strands will order themselves from largest to smallest with the flow of electricity. The results of the gel can be looked at next to a Gene Ruler Mix. The Gene Ruler Mix is a mixture of different lengths of DNA strands with known lengths and known behaviors in the gel (due to the separation with electricity). If successful, the length is close to what it should be. The specific length DNA can then be cut out of the gel and sent to a company to be sequenced and to ensure that the correct gene is indeed within the bacteria.

This process of inserting the gene into the *E. coli* is to ensure a cheap source of plasmid. The *E. coli*, now that they have the vector in their genome will produce plasmids of an identical nature to the original plasmid. The cost of producing the original vectors is very high due to the enzymes and the different components that must be designed in order to create the artificial vector.

Once the process of vector insertion into *E. coli* is successful, the *E. coli* are cultured in liquid medium at the appropriate temperature and shaken in order to ensure a colloidal dispersion of the bacteria within the medium. Once allowed to grow for several days, the plasmids that are produced by the bacteria are extracted and tested for the gene. If the gel test reveals correct length portions of DNA after the genome is cut with primers, the portions are again sent off to a company for sequencing. This ensures that the *E. coli* are producing the correct plasmids.



Grinding samples.

The plasmids are then taken and inserted into competent agrobacteria cells. The competence of the agrobacteria is ensured using the OD as mentioned above and the correct treatment. The plasmid was inserted into the agrobacteria by using electroporation. This is done by inserting agrobacteria into an electroporation tube (a cuvette with a capacitor within it). The capacitor is usually aluminum and can be set to discharge when certain levels of electrical potential builds up between the plates. The level of difference can be set using the machine that regulates the electric flow known as an electroporator. This leads to the incorporation

of the plasmid into the bacteria. The bacteria are then grown on a petri dish containing the same antibiotic, and the colonies that survive are the ones containing the plasmid as they have had the antibiotic resistance incorporated into their genome. These cultures are then tested in the same way as the *E. coli* to ensure that they contain the plasmid and did not naturally develop the resistance.

The bacteria are selected in such a way from the petri dish as to select only one line of the bacteria; the bacteria used in the later parts of the study were all identical within each Petri dish (they differed across the dishes, but within the dish, they were identical). If storage of the agrobacteria was needed, the samples were frozen and stored at -80 degrees Celsius. The next step was the co-cultivation of the bacteria and the wild type fungus of *Verticillium dahlia*. The spores of the fungus were collected and a density count was done by using a sampling and viewing technique through a microscope. The spores were then diluted down to the desired densities.

The stored transformed agrobacteria was prepared for co-cultivation by thawing and petri dishes were prepared using a PDA (potato dextrose agar) and agar mix. There was no antibiotic in this medium. A membrane was then placed over the medium in the dish, and the bacteria and fungus were cultured on top of the membrane. After allowing the dish to stand for two days, the membrane was transferred into a new petri dish with IM medium, including the antibiotic. The two days on the clean medium give the fungus a chance to be transformed by the agrobacteria and then the transference onto the antibiotic medium kills that fungus that was not transformed. Once transferred, the cultures were allowed to grow for ten more days.

Agrobacterium are used as they have been well documented to cause mutation in plants through horizontal gene transfer. With the new plasmid that the agrobacterium will produce, the fungus will be changed not with a random mutation as the normal agrobacterium would produce but with a specific mutation. In this case, the knocked in resistance genes in the place of the old genes.

After the growth period, individual fungus colonies were selected and cultured in liquid medium. These were tested for gene insertion, and a spore count was done on each. The ones selected and the ones that tested positive for gene insertion were cultivated again in order to ensure that the gene will not come out of the genome in future generations and to isolate one genetic line of the transformed fungus. This process of selection and growth will continue for 3 generations. The DNA extraction and testing in order to confirm gene transfer was done by grinding fungus mycelium in liquid nitrogen and then using a DNA extraction kit to isolate the DNA from the ground mycelium.

After the genetic isolation and the assurance of insertion, the knock in organism (fungus) will be used to infect a model organism, in this case, tobacco. The differences between it and a control wild type fungal infection will be observed both qualitatively and quantitatively.

Results

These types of projects take years to complete and over my time at CAAS this summer I helped in transferring 4 of the five vectors into the agrobacteria and was successful in creating the first generation of one of the vector's knock in funguses.

Works Cited

The material above I got through interviews/consultations with Dr. Hongmei and the graduate students I worked with (mainly, Yulan...and I do not even have a full name for Yulan). The abstract can be credited to Yulan (as she provided a summary for me). There were no formal papers that I referenced as most of the information relates to procedures that were performed in the lab. I did read several research papers but that information did not relate to my particular project nor was it reference in my writings above.

Overall Reflections

As much as I would have loved to have completed this research project and written a scientific paper for publication, I think the true value of the internship lies in the experience gained in working in another country, with a very different culture, and with a different set of parameters (language, science background, work hours, team dynamics, etc.). I certainly recognize that work on improving cotton disease resistance impacts a number of areas including: food, forage, fuel, and fiber, and that these four areas impact food security. Disease resistance protects yield potential and increased yield means increased food, forage, fuel, and fiber. It will be a number of years for the team I worked with at CAAS to achieve results from the project. My personal growth I felt was exponential. I learned that I could overcome debilitating homesickness, adapt to a very different environment (from country to large city), deal with a significant language barrier, learn about the Chinese culture as well as some cultural history, and network with the Chinese and international graduate students. Many of the students I worked with could not believe I was just starting my college education – I think that says something very positive about my American public school education. I would not have been a participant in this life-changing internship had I not been asked to apply by my high school physics teacher. I also found great comfort in documenting the entire experience by writing to a blog every day (yes, I wrote over 57,000 words and added 600 photos at <http://beijingchinawhatshappeningtome.blogspot.com/>) and would make the recommendation that future interns do the same (if they have not done so in the past). I was also very happy to be connected to the United States via a VPN (virtual personal network) which allowed me access to all information without censorship by the Chinese government.

I certainly am still driven to continue on my current path in agriculture and agricultural research and will find a way to contribute to “feeding the world.”