Beijing: Summer 2008

My experiences as a Borlaug-Ruan Intern

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Introduction

I saw the motto for the 2008 Beijing Summer Olympics everywhere I went in China. The words "One World One Dream" could be seen in ads, on signs, on the street, and even on the mountains near the Great Wall. The excitement for the upcoming Olympic Games was everywhere! Many people saw these games as a triumph for China, so the city was meticulously prepared to take the world as its guest. The four word motto refers to the dream of all people across the world "to strive for a bright future for Mankind." This motto not only fit for the Olympic Games, but it also described why I was there this past summer. The World Food Prize Foundation strives for increased food security across the world, and I was doing my part by helping in the lab to create a bright future for mankind while gaining a cultural understanding that will help me in every aspect of life. Through the World Food Prize Foundation, I saw the world and began to understand this universal dream.

Background Information

The World Food Prize was founded by Dr. Norman Borlaug after he won the 1970 Nobel Peace Prize for his work in starting the Green Revolution. He wanted a way to honor other people across the world for their work in reducing hunger through agriculture, so he created the prize and began honoring those people in 1986. The World Food Prize Foundation was created with the help of businessman and philanthropist John Ruan in 1990 and is located in Des Moines, Iowa. The Youth Institute of the WFPF was founded by Norman Borlaug and John Ruan in 1994 to promote agriculture among Iowa youth. Participants in the Youth Institute during the Norman E. Borlaug International Symposium each October are eligible to apply for the Borlaug-Ruan International Internship which sends students to study agriculture across the world each summer. In 2008, I was one of 13 students selected to travel to either Mexico, Brazil, Peru, Egypt, Ethiopia, Bangladesh, India, the Philippines, Taiwan, or China.

One year prior to my internship, I was selected to represent Cedar Falls High School at the World Food Prize Symposium Youth Institute in October of 2007. For the paper I wrote for my internship, I studied the African country of Mali and proposed the use of Jatropha seeds as a biofuel there due to the

plant's abundance in the area. By supplementing farmers' incomes with money earned from creating this biofuel, farmers would hopefully be able to afford more food for their families. While working on my paper, I realized that food security cannot be obtained by simply increasing the amount of food aid given to developing countries or by only using genetically modified crops. To make any significant change in people's lives, all aspects that contribute to the amount of food a family can afford need to be understood.

The symposium was an amazing and inspirational experience for me. I heard about the many world food issues relate to biofuel production, watched the impressive laureate ceremony, and discussed my paper with top researchers from around the world. During meals at the symposium, I talked with other attendees and found that everyone, including top researchers in areas of food security, was willing to listen to a young person's take on the issue discussed throughout the symposium. I once heard one scientist say to another how excited he was to be with a group of students who are the future in agriculture. As he said this, I was thinking about how exciting it was to be with a group of such distinguished scientists. Everyone I talked to seemed excited to see what discoveries my generation will make that may someday lead to food security on a global level. On the last day of the symposium, all participants in the Youth Institute presented their papers in small groups. I was lucky enough to be in Group 1 where I presented my paper in front of Dr. Borlaug himself as well as Dr. Andrew Manu and Dr. Chris Dowswell. It was an honor to be able to explain my findings to such a prestigious audience and receive helpful critiques of my work. After all the paper presentations, we were able to listen to the former interns describe their experiences overseas.

2007 WFP Youth Institute: Group 1

Throughout the application and interview process for my own internship, I did everything possible to explain why I wanted this opportunity to see the world and experience other ways of life. The weeks between the interview and discovering that I was going to China were some of the longest weeks of my life. I was one of the last interns to find out where I was going due to some communication

problems between the WFPF and The Chinese Academy of Agricultural Sciences (CAAS), but in March 2008, I finally discovered that I would spend the summer in Beijing, China working at CAAS. Even after months of dreaming about this internship, I didn't know what to expect as I left my home in Cedar Falls, Iowa.

The Chinese Academy of Agricultural Sciences, founded in 1957, is a national research institute that includes thirty-nine smaller research institutes and a graduate school located in 18 of China's provinces. CAAS is China's largest national agricultural research institute based on the number of researchers and facilities. The research done at CAAS is both applied and basic, and it has the nation's most complete set of disciplines.

East Gate of Beijing Campus

First Impressions

On June 9, 2008 I arrived at the Beijing airport to begin my adventure as a Borlaug-Ruan intern in China. It had been a long three days as I flew with Patrice Metcalf-Putnam, another intern working at the Chinese Agricultural University (CAU), from Des Moines to Beijing. In an unfortunate series of air travel events, we were forced to spend a night in Minneapolis due to weather and a night in Tokyo due to mechanical problems before arriving at our destination a day and a half late. We arrived in Beijing and were each greeted by our hosts as we split paths and continued our respective journeys alone. As I left the airport, I was overwhelmed with the thought that I was alone in a foreign country surrounded by strangers. Luckily, the people I met didn't stay strangers for long and I found everyone to be welcoming hosts throughout my stay.

During my first few days, everything seemed so foreign and different. As time passed, however, I discovered that all the differences were on the surface only. Once I was able to look deeper into Beijing society, I found that most things were exactly the same. On the surface, the landscape and the people look

different, the food tastes different, the air smells different, eating with chopsticks feels different, and the Chinese language sounds different, but the differences go little deeper than that. I met many people and found many similarities in human nature.

Some things really shocked me when I first arrived in Beijing. The smog and lack of cleanliness in Beijing were worse than I was expecting, but I soon became accustomed to these sites. Restaurants weren't quite up to Western standards of cleanliness, but I never got sick from contaminated food. The driving was crazy, but I never got hurt. I stood out as a foreigner, but I soon became comfortable with random people saying "hello" to me on the street. I was caught off-guard the first time a stranger wanted their picture with me, but I eventually accepted the frequent requests. I had trouble communicating with strangers, but I soon realized that most young people know at least a little English from school. I missed the summer fun that was routine for me in Iowa, but I had so much fun in Beijing that I could not imagine being anywhere else. It took me a while to become accustomed to the new foods, but I grew to love the Chinese cuisine.

While in Beijing, I really began to notice some unexpected things I took for granted back home. I knew that people across the world lived on a lot less money and with a lot fewer luxuries than I do in the US, so that didn't shock me. What I really took for granted back home were the blue skies during the day and the starry skies at night. Before my internship, I rarely took time to appreciate the trees, the flowers, and the wildlife in Iowa. Even in Beijing's parks with green grass and beautiful trees, ropes were placed to keep people off the grass. I understand the necessity of that action, but it saddened me that children there cannot run barefoot across the grass, playing with their siblings during the summertime. While in Beijing, the days with the clear blue skies excited me due to their rarity.

Work

During my eight weeks in China, I spent my week days working in the lab. The head of the lab, Dr. Long Mao, decided that I would help two students, Danmei and Weibo, on their experiment involving the effects of the over expression of the AGAMOUS genes on Arabidopsis development. However,

Danmei spent the first two weeks of my internship finishing up her undergraduate studies, leaving me to help others whenever needed in the lab. These first few weeks gave me a good chance to get to know everyone in the lab while becoming familiar with the procedures I'd help with throughout my two month stay. I learned the protocols for plasmid preparations, *E. coli* transformations, PCR, and other procedures. One afternoon, I even rode a bike through Beijing traffic to visit the CAAS test field. I enjoyed this chance to see what tangible plants the work in the lab can eventually produce.

During the times I spent in the lab, I really began to appreciate my knowledge of the English language. Many people in the lab had studied English for ten or more years, but they still struggled. One day someone pointed out how lucky I was to be a native English-speaker. He was trying to read a scientific paper in English and was having trouble. I have trouble understanding much of the scientific jargon in those papers, so I can't imagine trying to interpret one in a foreign language. Everyone in Beijing, including taxi drivers, was trying to learn English before the Olympics so they could communicate with their guests. They were all learning English for the foreigners. That's the one major difference I observed between American people and Chinese people. In China, everyone is willing to learn a new language while many Americans expect others to learn how to communicate with them. During my two months in China, I felt bad about learning so little Chinese.

Once Danmei came back to the lab, I began to work with her every day, observing and helping with her experiments. Although I didn't see the experiment from beginning to end, I was able to see almost every step since the process was repeated multiple times and with four genes. It was very satisfying to see the results of the experiments as the mutant plants grew. As time passed, I was able to do more and more to help Danmei, and by the end there were several procedures I could do on my own. Due to the nature of the work I was doing, there was a lot of downtime in the lab where I would be waiting for reactions to take place or for plants to grow. I learned to value those down times and I used them to work on my paper. The following is a detailed explanation of my research:

Purpose

To observe the phenotypic changes which occur when four different AGAMOUS genes from Brachypodium are inserted into the Arabidopsis plant.

Background

Wheat is a very important crop in the world today, and China is the biggest producer of wheat worldwide. In developing countries, people consume 85% of the wheat they produce. This shows that wheat is not grown to supplement income; it is grown to live on. Wheat has a large geographical range and the water consumption of the plant is more efficient than other cereal grains. Wheat is also resilient to changes in environmental factors that may come about due to global warming. Despite all these favorable characteristics, genetic research on wheat is scarce. The wheat genome is so complex that researchers do not yet have the knowledge needed to directly manipulate and sequence the wheat genome. So many people rely on wheat as a major source of food, however, that it cannot be ignored when looking for solutions to ending world hunger. To combat these problems, experiments are conducted in model plants and the findings are then generalized to wheat. In Dr. Long Mao's lab, Brachypodium and Arabidopsis are used to study the genes important to plant flowering time and organ development. These two plants were chosen as model organisms because of their small genomes and easy growing requirements. In the future, wheat may become easier to transform, allowing researchers to study the plant directly. Until then, these studies in Brachypodium and Arabidopsis will be very valuable. Due to the value of the research, the Department of Energy planned on having the entire Brachypodium genome sequenced by 2010, but due to the unknown complexity of the genome, that is unlikely to happen as soon as originally planned.

My project in the lab focused on the effects of the AGAMOUS (AG) gene in plant development. MADS-box genes like AGAMOUS are important to plant flowering time and organ development. Their expression is different depending on the part of the plant and the point of the lifecycle the plant is in. The name AGAMOUS means without gametes because when the AG gene is knocked out in plants, the carpel

and stamens fail to form, making the plant sterile. MADS-box genes relate to transcription factors, so knocking out MADS-box genes causes transcription to fail for some proteins as they determine when and where proteins are made. In this experiment, the over expression of the AG genes in *Arabidopsis Thaliana* were studied.

Method

Brachypodium AGAMOUS genes are used for this experiment. Once the RNA is extracted from the Brachypodium, the process of RT-PCR is used to convert the mRNA into cDNA to test for which stages of flower development the genes are used. The enzyme reverse transcriptase facilitates this reaction. RNA is extracted from the roots, shoots, leaves, the palea and lemma before pollination (sample 1), the carpel and stamen before pollination (sample 2), the palea and lemma after pollination (sample 3), and the carpel and stamen after pollination (sample 4). RT-PCR is used to convert the mRNA into cDNA and then amplify the amount cDNA. Gel electrophoresis is run after each round of PCR to determine if the concentrations of all DNA samples are the same. If the concentrations differ, the samples with strong signals are diluted and PCR is run again until the gel shows that all samples have the same concentration. If the concentration is too low in all samples, it may be an indication that the temperature during PCR is not ideal. To test this, a temperature gradient can be applied to the PCR machine so that each sample has a slightly different temperature. The sample with the highest concentration can be used to determine the optimal temperature. When working with the RNA, care must be taken to ensure an RNase-free environment since RNase (ribonuclease) breaks down RNA. Special pipette tips and DEPC treated water must be used.

Once the DNA after RT-PCR is the same in every sample, another round of PCR can be used to discover which samples express the specific gene. A primer specific to each gene is used to test for the expression of that gene. If gel electrophoresis shows a line in a sample, it means that the gene is used at that stage of development because the DNA was derived from the transcribed RNA. For example, AG 4 showed a line only in sample 2. Thus, it is concluded that the AG 4 gene is expressed in the carpel and

stamen of Brachypodium before pollination. These results showed that AG 1 and AG 3 are used at the same times of development and AG 2 and AG 4 are used at the same times of development. This can then be used to hypothesize that the phenotypic changes in AG 1 will be similar to AG 3 and that AG 2 and AG 4 might look similar.

To inject the gene into the Arabidopsis plant, agrobacteria is used. Agrobacteria naturally injects a portion of its genome into plants, making it a suitable vector for genetic engineering. In nature, this bacterium causes Crown Gall disease, a disease which results in the formation of tumors in plants. In the lab, the bacteria are engineered so that they insert a different gene into the plant's genome to study the effects of that gene on the plant. The Agrobacteria contains two plasmids, one that controls normal cell function and the Ti plasmid which causes the disease. The Ti plasmid must be engineered so that it does not cause the tumors but still injects the gene to be studied into the host. The manipulation of the Ti plasmid is performed in *E. coli* instead of in the Agrobacteria because *E. coli* is easier to transform and grows faster on media. The auxin and cytokinin genes in the Ti plasmid cause the formation of the tumor, so they must be removed. To insure the plant still infects the host properly, the vir genes, the LB (left border) and RB (right border), and the ori must be maintained. The vir genes control the insertion of the T-DNA (transferred DNA) into the host. The LB and the RB define which genes are inserted into the host, and the ori is the origin cite for DNA reproduction. The genome of the Ti plasmid is very large, and it would be impractical to maintain the entire plasmid since a larger plasmid reduces productivity, so some of it must be removed. The smaller the plasmid, the easier it is to ensure successful replication.

It is important to have the ability to select for successfully transformed bacteria and plants. To do this, two different markers must be inserted into the plasmid. The bacteria marker is inserted outside the T-DNA region. In our experiment, a spectromycin-resistant gene is used as the bacteria marker. After the plasmid is constructed and inserted into the Agrobacteria, successfully transformed colonies are selected for by streaking the bacteria onto a plate containing the antibiotic spectromycin. Those bacteria which were not successfully transformed die while those with the Ti plasmid reproduce to form a colony. These colonies are then grown in liquid media until their OD measures 1.5 or higher. The OD is measured using

a spectrophotometer, which measures the light transmittance to quantify the concentration of the bacteria in the solution. The bacteria can then be suspended into a buffer solution.

To prepare the Arabidopsis plant for transformation, the first florescence shoots should be cut off in the young plant to promote the development of more, taller shoots. Once there are many unopened buds on each plant, they are ready to transform. Before the drop-by-drop transformation, all developing seeds must be cut off. The agrobacteria and buffer solution is then dripped onto the unopened buds using a syringe. Plants are labeled and covered with a plastic bag and stored in the dark for 24 hours. After this period, they are moved to light boxes that subject the plants to 24-hour light at 22°C. The process is repeated three to four times. When the agrobacteria solution is dripped onto the unopened buds, the bacteria inject the DNA between the LB and RB into the genome of the Arabidopsis egg. These eggs are fertilized and develop into seeds containing the new gene.

Performing Arabidopsis transformation

Once fully formed, the seeds contained in the mature brown siliques are collected. The plant marker used to select for successfully transformed plants is a kanamycin-resistant gene inserted between the LB and RB of the Ti plasmid. This gene is placed near the RB which is translated last to ensure the plants that show positive results have an entire copy of the T-DNA. Seeds from the transformed Arabidopsis plants are grown on a plate containing kanamycin. After cleaning the seeds and putting them onto the plates, the plates are placed in the refrigerator for two days to break the seeds dormancy. They are then allowed to grow in 24-hour light. Plants that have been successfully transformed using T-DNA form into tall green shoots with well-developed roots while other plants turn brown and die. False positives can occur when the concentration of the plants is too high for the concentration of the antibiotic. Therefore, only green shoots surrounded by brown shoots are used for the next step.

Once the shoots have four leaves, they can be transplanted onto soil. To do this, tweezers must be used to remove the plants from the media and carefully separate them from all dead and dying shoots. The

young plants are then put in water and all media is rinsed from the roots, being careful not to damage the root system. The media must all be removed because harmful bacteria can grow well on any media left on the roots. The plants are gently planted in the soil, four in each pot. They are then placed in the light boxes and allowed to grow. As flowers begin to develop, the phenotypic changes can be observed using a light microscope or the scanning electron microscope. The scanning electron microscope (SEM) uses electrons rather than light rays like in a traditional microscope to view images. The SEM has a greater depth of field than a regular microscope, so images can be magnified to a greater extent and still be seen as a clear image. The sample is placed in a vacuum to ensure that the electrons create an image of the sample rather than of the air particles in the machine. When preparing a sample to be viewed in the SEM, all water must first be removed and the sample must be mounted to a fixed surface. The SEM requires samples to be conductive to attract the electrons, so a sputter coater is used to coat the sample with metallic gold.

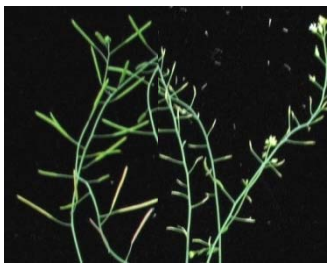
The flowers of the Arabidopsis plant are viewed at different stages of development so the changes over time can be studied. It is best to view the plant's early flowers because there is a greater chance that the inserted gene has been silenced the longer you wait. The Agrobacteria injects its DNA into a random site in the host genome, so differing degrees of phenotypic changes in plants with the same inserted gene can be observed. This is because some places in the DNA sequence are transcribed more or less often than other places. The differing degrees of phenotypic changes are observed to create a more complete picture of the gene's effects on the plant.

Finally, PCR is performed to confirm that the phenotypic changes were caused by the successful insertion of the gene and not by a random mutation. PCR is a process of DNA amplification that is used for many experiments in the lab. In this experiment, a primer will be used to make many copies of the AGAMOUS gene of interest. DNA will be extracted from the plant and placed in a tube with TAQ mix (a combination of enzyme and buffers), primers, and water. The tubes are placed into a thermo cycler and the enzymes make many copies of the DNA template. A pair of primer specific to the AGAMOUS gene being studied will be used to amplify only the gene of interest. Gel electrophoresis will be used to

determine if the correct gene is expressed in the plant. This final step of PCR is only used if the transformed plant is big enough. The AG 1 plant had big enough leaves, flowers, and seeds to perform this PCR but the AG 4 plant did not. It was obvious that the AG 4 plant was truly mutated, however, so the PCR was unnecessary.

Results

The differing degrees of phenotypic changes will be analyzed to determine the effect of the over-expression of the gene. Three of the AGAMOUS genes, AG 1, AG 2, and AG 4, had been successfully transformed into Arabidopsis by the time I left, and they each caused distinct phenotypic changes. After looking at the flowers under the microscope, it was concluded that the over-expression of the AG 1 gene causes the petals to form but disappear later in development. The leaves and siliques are also extremely short. Analysis of the AG 2 flowers has shown that the gene causes the petals and siliques to form very small. When siliques form on the AG 2 plant, they are much shorter than the wild-type siliques. Plants transformed with AG 4 have curled leaves unlike the wild-type leaves and the petals form very small or not at all. One transformed AG 4 plant formed very strange flowers with what appeared to be


WT and AG 2 siliques


AG 1 and WT leaves


WT and AG 2 flowers


Curly leaves of AG 4


Tiny petal of AG 4


AG 4 mutant flower

multiple carpels. The hypothesis that the AG 2 and AG 4 plants would look the same because of the RT-PCR results was disproved by these results.

Conclusions

As hypothesized, the over expression of the different AGAMOUS genes cause different phenotypic changes in the Arabidopsis plants, even though RT-PCR showed that some of the different genes were used at the same points in development. Since the MADS-box genes impact transcription factors, it is likely that the AGAMOUS genes interact with other genes to cause the phenotypic changes we observed. There are many follow-up experiments that can be used to discover which genes interact with the AG genes. Once all four AG genes have been observed in plants, Danmei and Weibo will use yeast-2-hybrid to discover these other genes. Yeast-2-hybrid is a method where two genes are transformed into yeast cells and grown on selective media to see if the two genes interact. Once the genes that interact with the AGAMOUS genes are discovered, they are sequenced and then studied further to discover the function. Danmei and Weibo will also study where in the Brachypodium plant the AGAMOUS genes are used.

Reflections on Lab Work

During my first few weeks in the lab, I found myself mixing chemicals and following protocols with little idea of what was happening inside the tubes. Studying the AGAMOUS gene in Arabidopsis is interesting and the findings can be applied to wheat, but I didn't see the impact at first. I have since realized the importance of understanding everything possible about the crops that feed China and the world, and I began to take more pride in the work I was doing. Each study leads to a further understanding of important crops. When considering the huge population of Beijing, I couldn't help but think of all the food that must be consumed. China is considered food secure but not every family in the country has the food they need. If something were to happen to reduce the abundance of Chinese crops, many people outside of China would starve since China is a net food exporter. Crops grown in China feed

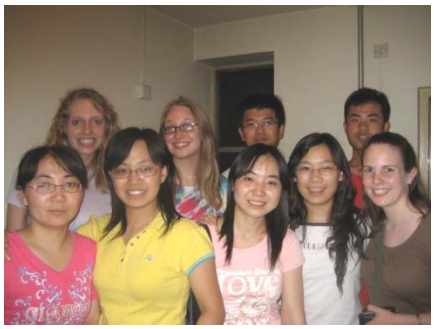
many people throughout Asia and Africa. The largest consumers of Chinese wheat outside of China are South Korea, North Korea, Vietnam, Hong Kong, and the Philippines. Any study that can lead to more productive crops can ensure that these people will be fed for another day.

China has improved its ability to feed its people over the past few decades, but the current use of land and water resources in the country is not sustainable. Farmers continue to look for ways to increase yields, but many obstacles prevent them from doing so. As China's economy increases, more people and companies are competing for the same land and water. None of the farm land in China is owned by the individual farmers, so there is little incentive for them to invest in ways to preserve the land for future use. A lot of China's productivity success comes from labor-intensive farming practices. However, due to the availability of higher-paying jobs in the cities, laborers are moving away from rural areas. In urban areas, people can earn four times the income as in rural areas. This drop in workforce may lead to lower yields if not compensated for in other ways. China has already seen a rise in food prices, and the government is doing what it can to keep the problem under control. New regulations have also been implemented that try to reduce the resource degradation in hopes that farming practices can be sustained. Money has been invested in research that will increase the productivity of crops while reducing water waste. The Chinese government is taking steps to maintain its food security, and a large part of that is increasing funding of research like the research I helped with over the summer.

Weekend Fun

My work in the lab was the purpose of my time in China, but my weekends were full of fun explorations of Beijing. There was a group of students visiting CAAS from Ohio State University, and they invited me on their Saturday sight-seeing trips around the city. With them I saw the Olympic Stadium, the Summer Palace, Beihai Park, the Hutong district, the Temple of Heaven, and, of course, the Great Wall of China. These trips were a fun way to see the numerous historic sights of Beijing, but some of the less formally organized adventures were my favorites.

One especially enjoyable Sunday, Patrice invited Dee, the intern at Peking University, and me along with our Chinese friends over to her apartment to enjoy a meal composed of a variety of American foods. The three of us cooked an eclectic meal of pancakes, French toast, snow peas, and garlic mashed potatoes and served them with a bottle of Coke. I brought my two best friends from CAAS, Selina and Danmei, and taught them how to make the garlic mashed potatoes. As I washed, peeled, and mashed the potatoes, I told my friends about the different Norwegian potato dishes served in my family and the importance of cooking together during large gatherings. Selina told me that she had served Chinese food to foreign guests multiple times before, but this was the first time she was able to cook and eat traditional American foods. I was happy to share some of my culture with the people helping me adjust to theirs. We ended the evening with a card game familiar to us all.


Guests at Patrice's dinner party

My final two weekends in China were my favorite. I spent the second to last weekend in China traveling to Beidaihe, a city on the coast, with a friend from the lab and a group of her friends. It was wonderful to be able to spend a relaxing weekend on the beach while spending time with a group of people surprisingly similar to my own group of friends in Iowa. Although we often had trouble communicating, they made me feel like a welcome member of their trip. After our last meal together before returning to Beijing, one of the friends pointed to each of the people around the table, calling them "gege" or brother. I felt as though I was among my brothers in China.

My last weekend was spent tying up loose ends, sharing meals with my new friends in China, and enjoying the sights one last time. My favorite part of that weekend was standing outside watching the fireworks during the rehearsal for the Opening Ceremonies of the Olympics. I went to stand on the street with the Bird's Nest and Water Cube in front of me to watch the spectacle. I was among possibly millions of people out watching the show that night, and it was a ideal way to conclude my journey. I left Beijing four days before the Olympics began, but I did get to experience much of the excitement.

During my two months in China, Beijing became my home and it was heartbreaking to leave. I had made great friends despite my short time in the country and our occasional language barriers. I returned home thinking about when I would be able to return to the country I grew to love. I know that someday I will be able to return to Beijing to visit my friends and I hope that my friends will make it to the United States to visit me. I did as much as I could during my time in China, but there is still much more to see. During weekend adventures, I often found myself thinking about what I will do the next time I visit those places. Once I decide when to return, I will have many people and places to visit.

Returning home was bitter-sweet. Danmei and I wore matching "I ♥ China" shirts to the airport as we said our final goodbyes. When I got off the plane, I was happy to see everyone back home in the United States, but I was leaving the sights and the people I came to know and love in China. I sat at home watching the Olympics from my comfortable home, but I missed the streets I saw the marathon runners pass. I missed the language I heard the announcers speak. I missed the food the news anchors discussed. But most of all, I missed all my new friends who I will never forget.

Final Thoughts

"*Welcome to Beijing, dreamers are forerunners. Miracles are for those daring to try*." As I returned home from Beijing I will forever take this message from the final line of the song "Welcome to Beijing" with me. During my time as a Borlaug-Ruan intern in Beijing, China, this song became a sort of theme song for my stay. It was written to help countdown the final 100 days before the 2008 Beijing Olympics and was performed in Chinese by various artists. A friend from CAAS translated it for me. After hearing this song the third week of my stay, the melody rarely left my mind as I observed its message everywhere around me. I dreamt about the possibilities of this internship but never imagined how amazing it would turn out to be. I will forever be inspired by dreamers and forerunners such as Dr. Norman Borlaug and all recipients of the World Food Prize for their work in reducing hunger. Across the world, people have one common dream: to live life without worrying where their next meal will come from. Despite being completely overwhelmed when first stepping off the plane, I found Beijing to be a

welcoming home. I dared to stay alone in Beijing for eight weeks and miraculous things happened while there. I will never forget my time in China, and I will never forget the importance of daring to try.

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