# PLANTING PERSPECTIVE:
# My Chinese Experience

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## Personal Remarks

I was introduced to the World Food Prize through my extraordinary teacher, Mr. Mike Bechtel. Towards the end of the 2006-2007 school year, Mr. Bechtel asked me if I was interested in participating in the Youth Institute of the 2007 World Food Prize Symposium that coming fall, with the chance of being selected for the Borlaug~Ruan International Internship. Before this opportunity was expressed, I knew nothing of the World Food Prize. Upon hearing of the program and what my involvement would entail, I was immediately excited at the prospects, and even the process itself. Writing a research paper—especially on such a forthcoming and controversial topic as biofuels—is a valuable learning experience in itself.

So, with such excitement coming home that day, I knew that I would choose to attend the Symposium in October representing my school, Central High School, and later apply for the internship. The Youth Institute was eye opening to say the least. Listening to the speeches and involving myself in conversations and activities was extremely beneficial to gaining a better understanding of the complexity of world hunger, including the difficulties and promises in improving food security. The Symposium was not only eye-opening, but motivating as well. I was determined to look further into the issues, and search for ways that I could make a difference. While I was not able to listen to the speeches given by those who participated in the Borlaug~Ruan Internship that past summer, I knew without a doubt that the internship was something for me.

I was sure of this for several reasons. First, I was considering majoring in dietetics. As a dietitian, communication and people skills are key. Working as an intern in another country and having to communicate with people whose native language would differ from my own would undoubtedly require effort and time, but at the same time inevitably improve my ability to work with people. Secondly, I anticipated this bilingual experience would also be a part of my future career and travel plans, as I planned to major in Spanish. Drawn to traveling, seeing and experiencing a different culture, perhaps having to undergo some hardships, would be a learning experience. Another reason was that aspects of food, in the nutritional sense as well as in terms of accessibility or availability are of interest to me. The internship would be connected to this in some way due to the goals of the host centers. Finally, I wanted to actualize results in the lives of my patients, and this internship would help me be a part of something that makes a real difference.

## Peking University

Founded in 1898 as The Metropolitan University of the Qing Dynasty, Peking University is the second oldest university in China. It was renamed Peking University in 1917, and shortly after became the largest institute of higher learning with the assistance of new President Mr. Cai Yuanpei. During the War of Resistance against Japan, it was relocated to Kunming from Beijing. Later, it was moved back to Beijing. With the founding of the People's Republic of China in 1952, there was a readjustment in which Peking University emphasized the teaching and researching of sciences. As both a National and Key University, Peking University is now one of the most prestigious universities in China.

## The National Laboratory of Protein Engineering and Plant Genetic Engineering

This center, also known as the Peking-Yale Joint Center for Plant Molecular Genetics and Agribiotechnology, is used for research concentrated in the basic biology of model plant systems, plant genomics and modern agribiotechnology. As a partnership center with Yale University, it allows for students and faculty to exchange between the two locations. Specifically, areas of embryogenesis and gametophyte mutantations are presently being researched in this laboratory.

The main goal of Peking University's Biotechnology Department's lab is to assist in the creation of new, transgenic rice varieties resistant to both biotic and abiotic stresses. This is done by performing experiments on *Arabidopsis thaliana* that lead to a better understanding of principles of the rice plant, and the functioning of flowering plants in general. Experimenting with rice leads to a direct impact on agriculture, and thus, on food security. Withal, studying *Arabidopsis* is more convenient and yields quicker results that are also useful in expanding knowledge of the model plant *Arabidopsis thaliana* for all scientists and those who benefit from their work.

## Experimental Project Work: Preface

There are three projects dedicated to the experimental portion of this internship. The reason for this is that, while I was initially assigned to assist one pH. D. candidate, I was compelled to be active when present in the laboratory and minimize down time. All of the students work very hard and some stay late into the night. The more help I could offer, the better. In addition, I feel that I was able to get more out of internship this way, and develop a better overall understanding of the workings of The National Laboratory of Protein Engineering and Plant Genetic Engineering where I was placed. None of the experimental projects were completed by the time I left the laboratory, but the expected results can be recognized through the given purpose of each project. In addition, specific data was not included due to the utter significance of the data to the students and their exclusive research.

**Why work on *Arabidopsis thaliana:***

*Arabidopsis thaliana* is a model plant for plant molecular biology research used to study the rice plant. It is model plant because it has a small genome size (entirely sequenced) and it produces many seeds. It is also small, easy to cultivate and has a short generation time of six weeks. Easy transformation is an additional reason it is preferred to study in the lab. It has been compared to the Japonica rice plant and there is similar gene sequence. Since *Arabidopsis* has gene homology with rice, realized through Bioinformatic tools, *Arabidopsis* can be used to comparatively study rice.

## Project One: Over-expression of the Novel Salt Stress Responsive Gene in *Arabidopsis thaliana*

For this project, I worked with Siriporn Sripinyowanich (Mei). Siriporn is from Bangkok, Thailand and has received her Bachelors Degree in Agricultural Biotechnology from Kasetsart University. She is a PhD candidate for the Biological Science program of Chulalongkorn University and has spent approximately one year in China with an interest in Plant Physiology and Molecular Biology. The first portion of the project was completed by Siriporn before she arrived in Beijing.

**Purpose:**

The purpose of this project was to study the function of the novel salt-stress responsive gene that is found in salt tolerant rice lines through the introduction of the overexpression of this gene in *A. thaliana*. The salt tolerant ability of the transgenic plants was to be determined in relation to level of gene expression. In many countries, salt is becoming a problem in agriculture. This is because when salt accumulates in the soil from lack of rainfall and is dried at the surface, land is no longer arable. This problem is increasing globally. Rice in particular is a staple food product that is being affected by this situation. If rice is resistant to this salinity of the soil, then there will be a larger area for growth and greater supply

harvested. In this way, food security is improved.

**Method:**

First, the transgenic plants that have kanamycin resistance gene were selected on antibiotic medium (Kan+). The plants that could grow on this selectable medium were transformed into soil. When the plants reached a mature stage, we kept the leaf tissue for RNA extraction.

Once the RNA was extracted from the transgenic *A. thaliana* and cleaned so that only the messenger RNA or mRNA remained, real time polymerase chain reaction (RT-PCR) was used to determine the level of gene expression. Real time PCR allows for the the quantification of mRNA so that the amount of expressed gene at a specific time, temperature, and tissue type can be observed. Dnase was added to the RNA samples to eliminate gnomic DNA which could cause contamination, and thus misleading PCR results. Following the RT-PCR was gel electrophoresis to check the quality of the results. To check the concentration of the RNA we used the spectrophotometer. A noticeable difference in the mRNAs leads to the next step, reverse transcription.

DNA was transcribed from the RNA, allowing for the retrieval of cDNA. The RNA that was used as a template for transcription was translated to cDNA by RT-PCR. Then, specific primers for the amplification of the gene from cDNA were designed. The levels of gene expression were determined using Actin as the internal control primer.

The cDNA was inserted and transformation was performed, leading to an over expression of the designated gene in a general rice variety. This leads to a transgenic rice variety. The transgenic and wild type seeds were collected and put into MS plates containing different concentrations of salt (NaCl): 5oμM, 100μM and 150μM. The different lines that showed strength were then tested and the number of roots, root length and leaf size were all observed and recorded. A transgenic plant, containing the gene shown to control salt tolerance, will be larger, with darker leaves and a longer root length. Also, once the plant is grown, DNA is extracted from the leaves in order to confirm that the plant truly is transgenic. The Southern Blot hybridization technique is used for confirmation. This will confirm the existence of the DNA. If it truly is transgenic, the goal is achieved.

## Project Two: Analysis of Gametophyte Mutants of *Arabidopsis thaliana*

For this project, I learned from the following students and worked with them on analyzing their designated gametophyte mutants. Although not in order nor all on the same mutant, I was able to perform the vast majority of the tasks described in the following method.

**Mutant 209**

*Wei Ying Wang (Amy)*-Wei Ying is a first year PhD student at Peking University majoring in Biotechnology. She is from Haerbin, a city in Northeast China.

**Mutants 505, 305, 104, 801, 008**

*Kangtai Sun*-Kang Tai will be attending Peking University in the fall for his third year as a PhD student. He is from Chong Qin, a city in Southwest China. His major is Biotechnology.

*Crystèle Léauthaud-Harnett*-Crystèle is from Paris, France and worked at the lab for a six month internship for her Masters Degree. Her internship was for her school in Paris, AgroParisTech, an engineering school in Agronomy and Biology. Next year she will be majoring in Evolution, Ecology, and Biodiversity.

*Lei Ma*-Lei, only a senior in high school, was an intern during my stay as well. She lives in China but attends a private high school, Emma Willard, in Troy, New York. She spends her summers in Beijing with her family, taking part in various internships.

**Purpose:**

While *A. thaliana* has been entirely sequenced, very little is known about many of its genes. Since little is known about the genes and pathways involved in gametophyte development and function in flowering plants, the studying of gametophyte mutants in *A. thaliana* is a crucial area to study plant reproduction. Understanding which genes are involved in plant reproduction and the specific functions of these genes will allow for the manipulation of plants. This genetic engineering could result in various improvements in rice and other crops displaying gene homology with *Arabidopsis* depending on the specific gene and its function.

**Method:**

To begin, it is necessary to identify mutations affecting gametophyte development and function. Their distorted segregation ratio allows for this identification. If mutant a is affecting wild type gene A, then there will be a 1:2:1 segregation ratio (A/A:2A/a:a/a). If the mutant affects only the female or the male, then the ratio will be 1:1:0 (A/A:A/a). In other words, one half of the offspring will possess the mutation. If the mutant affects both the female and the male gametophyte, then it is not transmitted to the next generation. Using a T-DNA construction carrying a gene corroborating antibiotic/herbicide resistance, we screened the progeny of one plant and determine the Resistant:Sensitive (R:S) ratio. A ratio of 1:1 strongly suggests a gametophytic mutation. The T-DNA insertion with a phosphinothricin (ppt) resistance gene for screening was transformed into the wild type variety of *Arabidopsis thaliana* by Agrobacterium-Mediated Floral-Dip Transformation. Here, the tips of the flowers

just before flowering were placed into agrobacterium containing the T-DNA plasmid for a short period of time.

The seeds generated by these flowers, F0 generation seeds, were collected and placed into a medium containing ppt, put under 4° Celsius for two days and then grown at 20° Celsius under constant light. After two weeks of growth, the segregation ratio was determined. Those containing the mutant line show signs of resistance to ppt. Resistance is often distinguishable by leaves that are a darker shade of green and a longer root length. If the segregation ratio is 1:1, then a gametophyte mutation is suggested. This is how the mutant lines were chosen. The mutant seedlings were transferred to soil and grown under specific conditions. Seeds were collected to the F3 generation.

DNA was then extracted from the mutant lines. The DNA sequences containing the T-DNA insertion were amplified and further sequenced, to verify the insertion site and the possible gene affected. To isolate the gene and test whether it causes the phenotype of ppt resistance, Tail-PCR was performed with specific and non specific primers. In this way, the T-DNA insertion was used as a tag to identify an adjacent gnomic sequence. Tail-PCR is a method for amplifying an unknown sequence containing a known sequence. The samples went through three cycles, and then an agarose gel electrophoresis was run to check the results. In the case of a success, shown by two bands with a 100pb difference in the number of nucleotides and a relatively long band length, the extracts were amplified and purified to be sequenced.

To amplify the sequence for sequencing, the sequence must be transformed into E.Coli. Transformation into E.Coli was done by obtaining the DNA template by Tail-PCR, purifying it using a kit, and inserting it into a T-Vector. Through heat shock, the T-Vector (also containing an ampicilin resistant gene) was transformed into E.Coli. The E.Coli was then placed into a plate containing X-gal and a herbicide. X-gal was added because it metabolizes B-galactosidase into a blue color. B-galactosidase is only functional in the E.Coli without the DNA sequence because the insertion causes a disruption in the gene. Therefore, we chose the white colonies to test for the sequence insertion by PCR and electrophoresis. If the E.Coli contained the sequence as expected, it was put into a Lysogeny Broth (LB) medium overnight where it amplified. Then, it was sent to be sequenced by a sequencing company.

Fragments of the T-vector sequence, some of the T-DNA sequence, and sometimes part of the original sequence from the mutant plant were all contained in the sequence received from the company for analysis. This means that removal of contamination by the vector was important to remove the possibility of wasting time analyzing the wrong sequence. VecScreen is a program developed by the National Center for Bioinformatic Information (NCBI) that informs us of the vector contamination of the sequence. A program titled BLAST was then used to locate the T-DNA insertion and therefore the interrupted gene. By plugging the gene sequence into the The Arabidopsis Information Resource (TAIR) database of the *Arabidopsis thaliana* genome, information on a specific gene was received.

Since the Tail-PCR yielded more than one potential T-DNA insertion, we had to find which insertion was truly responsible for the mutant phenotype (1:1 R:S ratio). To do this, we performed co-segregation PCR. We know that the gametophyte mutant cannot be homozygous (aa) because the offspring would die. The Wild Type (WT) is homozygous (AA). Knowing this we were able to determine whether or not the insertion affects gametogenesis. For co-segregation PCR, primers were designed: one specific to the T-DNA insertion, and two specific to the gene. This generated too bands through gel electrophoresis. The WT plant (or any plants not containing the insertion) should not have the band specific to the heterozygous, T-DNA insertion containing plants while all contain the gene.

Still, further proof was needed. For this, Real-time PCR was used to quantify the genes adjacent to the T-DNA insertion, because they could have been over expressed causing the phenotype. RNA was extracted and purified from the chosen mutant line, and translated into cDNA through a two step reaction. Using the cDNA as a template, Real-time PCR was run to quantify the amount of cDNA.

A reciprocal cross was then performed to see which gametophyte, male or female, was being affected. A reciprocal cross is a phenotype analysis though a breeding between Wild Type and mutant lines. The 1:1 Resistant: Sensitive ratio was once again brought into play here. This ratio tells us that:

If it is a female gametophyte mutation:
Mutant ovules fertilized with WT pollen=>All pptS
Mutant pollen fertilizes WT ovules=>1/2 pptR

If it is a male gametophyte mutation:
Mutant pollen fertilizes WT ovules=>All pptS
Mutant ovules fertilized with WT pollen=>1/2 pptR

Once it was determined whether the mutant affected the male or female gametophyte, analysis followed accordingly. Male gametophyte mutant phenotype analysis involved pollen staining and looking at anther development by taking transversal sections of the anthers at the 14 different stages of development and comparing them to the WT development. Female gametophyte phenotype analysis involved looking at the seeds under a dissecting microscope. We expected one half of the ovule's seeds to be aborted, and the other half normal. Other analyses such as embryo sac morphology have yet to be carried out for female gametophyte phenotype analysis. A complementation test in which the WT phenotype is restored will confirm that the mutation is causing the phenotype. To restore the phenotype, the WT gene is inserted into the mutant line. With positive results, the gene can begin to be characterized.

## Project Three: Analysis of an Embryogenesis Mutant of *Arabidopsis thaliana*

For this project, I helped third year post-graduate student Jia Wei (Jane). She is from a small town in Northwest China, and is majoring in Biotechnology at Peking University.

**Purpose:**

Embryogenesis mutation in *A. thaliana* is being studied for a better understanding of the developmental process of plant cells, as well as for applications in crop varieties. Understanding the developmental process will help to eliminate problems with viability in seeds. Characterizing specific genes involved in embryogenesis will allow for the genetic manipulation of germination and growth problems in crops such as rice. Information on basic mechanisms involved the biological pattern though which plant cells are organized could be revealed by the *A. thaliana* embryo. Pattern formation of plant cells in tissue could through the study of embryogenesis be controlled and possibly allow for individual cells to regenerate plants.

**Method:**

*Note: Except for some differences in the mutant screening and phenotype analysis, this project's method is the same as gametophyte mutant analysis. It is for this reason that I will only be explaining these two sections of the process.

*Mutant Screening:*

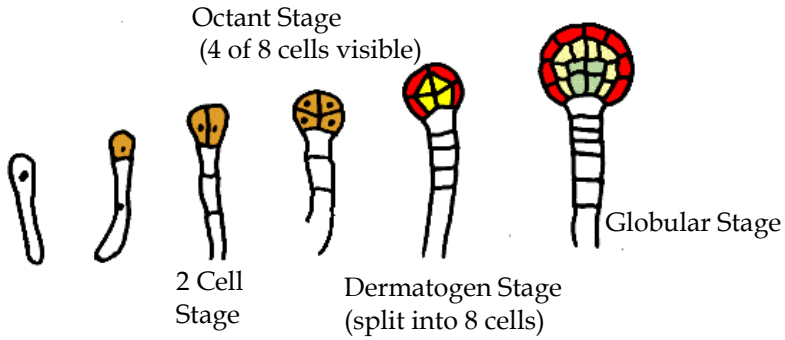
While gametophytes are haploid, only containing one copy of the genome, the embryo is diploid. The embryo develops after the gametophytes develop. The embryo mutant does not affect only the male or the female gametophyte, but instead the development of the embryo at a specific stage. The offspring segregation ratio is therefore normal for a mutated plant (Aa) (A/A:2A/a:a/a). Therefore, the Resistant: Sensitive segregation ratio is different. Rather than 1:1, we looked for 2:1. In other words, there were twice as many seedlings showing herbicide resistance (i.e. containing the T-DNA insertion with the ppt resistant gene) than those not showing resistance.

There was also a second screening to confirm that there is an embryo development mutation. 25% of the embryos were aborted (aa). To screen for this, we cut open the leaves and viewed the embryo of the transgenic plant using a microscope.

*Phenotype Analysis:*

Mutant lines affecting the embryo have different phenotypes than gametophyte mutations. To look for the phenotypes of our mutant, we had to do two analyses: seed development and Differential Inference Contrast (DIC). For the analysis of seed

development, we cut open five developed leaves from each plant and viewed the embryo under a microscope. We recorded the stage of the embryo and number of aborted embryo. The stages move as follows: (a) 2 cell (b) octant (c) dermatogen (d) globular (lollipop) (e) heart (f) torpedo (h) curly cotyledon (g) walking stick. A fully mature embryo is at the walking stick stage of development. In the WT plant, there was each of these stages of developmental characteristics. In examining the embryos of the mutant plants and the WT plants, we looked for a difference in the stage of the embryo and the development. The mutant embryo appeared smaller and white, rather than green. About one forth of the embryo in the mutant plants were aborted, at the 2-cell stage. This means that the mutant assists in this stage, which comes before the octant stage (see Figure).




Ingram, G.C. Institute of Molecular Plant Sciences. University of Endinberg.
<www.biology.ed.ac.uk/.../G_Ingram_staffpage.htm>.

A second way we analyzed the phenotypes of our mutant was through DIC. Here, the embryo were taken out of the leaf and put into Hoyer's Solution. The purpose of this is to make the embryo structure visible when viewed under a DIC or Nomarski Microscope, to see further effects of the mutation on the embryo.

## Improving Food Security

Manipulating genetic material has useful world-wide applications, arguably the most useful of which include: improving the biological protection of crops against insects, weeds, and fungi; increasing the level of vital nutrients; obtaining better control of ripening time and post-harvest storage life; and modifying genomes to produce a specific product. Through these different methods, which can also be viewed as subgoals, crop genetic engineering attempts to improve food security.

Biological protection of crops and specific modification of genomes have the potential to create genetically modified crops that are cheaper, easier, and safer to harvest. In addition, they can be used to create higher yields. Crops with modified nutritional aspects could help to alleviate some of the diet deficiencies prevalent in the world. Controlling ripening time and post-harvest storage allows for the minimization of waste. All of these contribute to the creation of more food with better nutrition, needed for serving a growing global population.

Political and societal groups who rally against genetically modified organisms (GMOs) perceive ethical issues with crop genetic engineering, and genetic engineering as a whole. One of these is the long-term environmental risk of horizontal transfer, or the transfer of genetic material from one species to another in the wild. With viral and bacterial genes, this could be especially dangerous because of their ability to spread and mutate quickly. Another ethical concern is over the right to patent genes. Currently, genes are patentable, but this limits the possibilities of equal access to GMOs and the cost of their products. There is no specific regulatory agency for this, nor the safety of GMOs. Protesters demand more testing and controls, especially with the Bt gene which is believed by some to poison humans.

Individuals must weigh for themselves the beneficial aspects of genetic engineering against the risks. There is one undeniable issue at stake, however. With a rapid population increase and the decrease of arable land at the same time, something needs to be done or the number of people in hunger will only increase.

## Reflections

*"The real voyage of discovery consists not in seeking new landscapes but in having new eyes."*

-Marcel Proust

The moment I stepped out of Beijing's international airport and hopped onto a shuttle bus, and then into a taxi to the dormitory where I would be staying for eight weeks, I knew that my experience as a Borlaug~Ruan intern was going to be more exciting than I had ever imagined. Looking out the window, I felt like a child, entertained by even the slightest things. The heat, big city lights and fast conversations in Chinese were together overwhelming. Dr. Dingming Kang, my supervisor for the summer, helped me to arrive safely at my dorm on campus. Traveling from the small city of La Crosse, Wisconsin, everything was new to me; from slight differences like the smell of the city, to the smoggy sky, to huge differences like being a minority.

Soon I met my roommate, Siska, who quickly became a good friend and mentor to me. Although she was Indonesian and spoke her native language, she was also practiced in both Chinese and English. In addition, she was familiar with Peking's campus and the city of Beijing. How incredibly lucky I was! As you can imagine, throughout my stay, Siska was unbelievably helpful. She knew where I could go to get anything I needed, and would often go with me. While the subway system in Beijing is relatively easy to utilize, the bus system requires knowledge of Chinese characters and is difficult to use on one's own. One of the most unique aspects of knowing Siska was being introduced to her friends. I was able to meet new people from a variety of culturally diverse backgrounds. In fact, Siska is perhaps the most culturally diverse person I have ever met. Daily, she interacted with friends from Brazil, Mongolia, Singapore, the US, China, Indonesia, and other countries. She spent about one half of her life living in Indonesia, and the other in China. She listens to English music and

majored in International Relations (she graduated before I left). Although she may not be aware of it, my roommate taught me a lot about appreciating and integrating cultural diversification and understanding into my own life. I now know how daily fun activities with friends can be such a learning process.

Indeed, all of the people I spent time with impacted me in some way. Dr. Kang was another mentor whom I constantly learned from through our daily conversations. We often compared his insight into the customs of the Chinese people to those of the US so that we could learn from one another. He also knew bits of intriguing historical information brought up at sites or museums around the city. Of course, he also gave me explanations on some of the processes I was assisting with in the lab. Dr. Kang gave me an overview of both China's culture and plant genetic engineering.

Apart from individuals, there was a group of people that also opened my eyes: Mei, Jane, Amy, Crystelé, Kangtai, Lei, and all other friends at the laboratory. Most of all, they made me realize how lucky I am. The education system in China requires that students choose one of two paths: humanities or science, and then follow through with that path. Their choice of major if they decide to attend a university cannot be changed. Students in the US often change their majors several times before finding the 'right one.' One of the students I talked to was not happy with their choice of work, but they had to continue research in the lab because there was no other choice. Another way in which I feel lucky is because I have siblings. There is a restriction on the number of children families in China can have due to overpopulation reasons, so the first child is often the only child. I value growing up with three siblings, because I feel it has impacted who I am today in a positive way. Besides making me more thankful, the students I worked with have shared with me a deeper meaning behind their work. The research they do would not be considered 'fun' by most people. There is a lot of repetition, waiting, and discouragement when results are invalidating. Yet, the purpose behind it is so motivating that they are willing to come in every day and continue with their experiments. The chance of playing a role in changing the lives of others is a powerful drive for individuals everywhere that, collaboratively, does make a difference.

Not all of my realizations came through others. Much of the information I absorbed during my stay was through pure observation. Those on bikes riding with masks to keep from breathing the small particles of dust that pollute the air, for example, shows me how living conditions can be pestiferous in such a crowded city. The large population posed other problems as well. When it rains, much of the biking lanes become flooded due to the poor drainage system. The already crowded sidewalks are then bombarded with bikers hastily on their way. I was one of these bikers, and I can assure you it is not an easy mode of travel. The large number of people was obvious on the streets, especially when you can expect no seat on the bus but instead to pack in tightly with strangers. An amusing thing about these strangers was the T-shirts many of them wore. Most were designed in nonsensical English writing, often with grammatical errors. I was told that people buy these shirts unaware of what the

writing on them means. It is not always about meaning, however. Young people especially simply seem to want to be more American-like in the way they act and dress. At nice malls and at night clubs, the music played is in English. It was also easy for me to view the way Westerners are treated. I felt that I was very curious to them, and was often stared at or sometimes asked questions by strangers. Although they may not be familiar with Westerners themselves, the Western culture is present within this metropolitan city, such as the McDonald's and KFC fast food restaurants. Overall, though, the differences in food were tremendous. Ice water here, hot water there. Rice, rice, and more rice. Many of the differences have reasoning, however. Typhoid can be spread through the water, and so it must be boiled before use. Foods that are naturally grown in a region are, and should be, eaten more there.

Along with my consistent cultural observations and the people I met, the places I visited helped to give me new eyes. Visiting the small farm town Wuqiao gave me a perspective of the rural area of China. We went to Wuqiao to see an experimental station of China Agricultural University (CAU). Viewing the lifestyle and work of the cotton farmers that CAU cooperates with was interesting. The people work very hard all day, and then at night have small festival-like activities for the whole town, with dancing, music, and rides. Despite the fact that the farmers work hard, they don't earn very much money. Most cars and trucks have only three wheels, because they are cheaper. Also, while I thought a foreigner seemed noticeable in Beijing, I was even more noticeable in a rural area where most of the residents have probably never seen a foreigner.

Besides living in Beijing, visiting Beidaihe with another intern located at the Chinese Academy of Agricultural Sciences (CAAS), Sarah, and her friends exposed me to tourism in China. Unique to Beidaihe was that it was a strong attraction for Russian tourists. Instead of signs in English and Chinese as seen in Beijing, there were signs in Russian and Chinese. I was spoken to several times in Russian, and came to realize what it felt like to be misunderstood in terms of others making assumptions about me. Allegedly due to the upcoming Olympic soccer matches being held in Beidaihe, there were regulations on which hotels different nationalities could reside. Americans, in particular, were highly discriminated against and we had trouble finding a place to stay. The experience was a quite exasperating new position for me.

My experience as an intern has changed who I am today. It has inspired me, and it has propelled me. I have become more sensitive to those around me on Iowa State University's (ISUs) campus due the extreme sensitivity that I felt abroad. Not only am I more sensitive to those around me, especially foreign students, but I am more likely to treat them with an understanding that getting by alone in an unfamiliar place can be difficult. At one point, I had to travel from one location in Beijing to another through pure communication. After getting lost searching for a particular bus stop, students directed me to another bus stop where I had to ask which bus to take to my desired endpoint, since my old directions no longer applied. Trusting the young lady and jumping onto the bus, I then had to find when to get off. Once I arrived safely, a wave of relief came over me and I realized the sort of independence I had

gained in just weeks on my own. I found myself to be more independent with my decisions, as I had to ask myself: What I was going to eat for dinner? What was necessary to buy and what could I live without (even if only for eight weeks)? How can I get from here to there? From being placed in these situations and others, such as using chopsticks to eat (it's amazing how quickly one picks this skill up when one has to), I have learned skills that have prepared me for my independent life now at ISU.

This independence has rolled into a newfound sense of confidence in what I can achieve. Furthermore, I am less intimidated by the unknown and the fears associated with it. A little bit of understanding and a little bit of practice is sometimes all it takes. Now I can follow a map in Chinese, use chopsticks, and bargain at a market like a Chinese person to avoid getting taken advantage of. Taking the time to understand the differences in values between cultures can make things more clear. In terms of looks, light skin is considered beautiful there, while tanned skin is often preferred in America. So this is why they use umbrellas on a nice, sunny day! Or, why the abundance of red? For good luck, of course. My sensitivity, my independence, and my confidence have all grown tremendously from being in a foreign country, far from home, over the course of two months as an intern.

In a sense, the experience could be seen as what Thomas Friedman might call a "flattener." It has globalized my life by flattening the obstacles that prevent me from leveling with the rest of the world. Communication and exchange of ideas has been made easier for me than ever before, overseas or not. The experience has made my world smaller by allowing me to perceive foreign things as, well, less foreign. We are all, after all, more alike than different.

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