WISEST SUMMER RESEARCH PROGRAM 1991

STUDENT REPORTS

WISEST, Women in Scholarship, Engineering, Science and Technology is a committee of the Vice-President Research at the University of Alberta. It was founded in 1982, with mandates to investigate the reasons why few young women are choosing careers in the sciences and engineering, to take action to change the situation, and to work to increase the percentage of women in decision-making roles in all fields of scholarship. It has a current membership of thirty scientists, engineers, scholars, educators and students from the University of Alberta, the Alberta Government, the school boards, and the private sector.

Since 1984, WISEST has organized a Summer Research Program for students from grade 11. In total, about 250 students have worked for six weeks during July and August in research groups at the University of Alberta under the supervision of a faculty member. The girls work in the Faculties of Science, Engineering and Agriculture and the boys in the Faculties of Home Economics and Nursing. In the Summer Research Program, young women have hands-on experiences in the sciences and engineering and they meet and work with scientists and engineers, thus encouraging them to become interested in these fields and to consider careers in them. Likewise, the young men in the program experience the non-traditional fields of home economics and nursing. Students who have completed grade 11 in Alberta High Schools are chosen for the program since they are making choices about careers and about the courses which they will take at University. They will also have contact with their peers during grade 12 and WISEST encourages the participants in the summer program to share their experiences with their friends. This sharing has been shown to be an effective way of interesting other young women in the sciences. The Edmonton Public School Board and the Edmonton Catholic School District are very supportive of the program as are many science teachers in high schools across the Province. The success of the program has been very dependent upon them and we express our appreciation to them.

It has been a great pleasure for me to work with the co-ordinators of the Summer Research Program without whose hard work and dedication the program would not have been able to continue. Each co-ordinator has brought something unique to the program. Dr. Dorothy Tovell, this year's co-ordinator, has continued the tradition of doing an outstanding job and I thank her on behalf of the members WISEST. This is the first time that the students' reports of their work have been collected into a booklet; I believe it is an excellent idea and hope it will be an on-going publication, both as a memento of the summer for the students and their supervisors and as tangible evidence of some of the work of WISEST.

Margaret-Ann Armour
Vice-Chair WISEST

Dr. Margaret-Ann Armour (right)
in conversation with Dr. Pamela Willoughby (left) and Patrycja Siembab (centre)

This booklet contains the reports as written by the students at the end of their six weeks in the WISEST Summer Research Program 1991. The students describe their work in the research labs, and also refer to the group sessions which were held each Wednesday afternoon. These sessions included a campus tour, an informal discussion with people who have chosen non-traditional careers, a visit to another lab at the University of Alberta, and presentations by the students of their own work. Finally, the students attended a luncheon, with their supervisors, as a concluding event for the summer program. I would like to thank the numerous people whose participation made these sessions such good opportunities for learning.

Each student report is accompanied by a photograph of the student, "at work" in most cases. These photographs were taken by Angel Figueroa, and I would like to acknowledge his competence and good humor. It was a pleasure to work with him.

Dr. Margaret-Ann Armour, Vice-chair of WISEST, was once again instrumental in ensuring that the program continue. Her support has taken many forms, not the least of which was to ensure that funding was there for the students' salaries. In this regard, we would like to acknowledge the financial support of STEP, SEED, Science Alberta Foundation, Science City Fund, The Winspear Foundation, The Edmonton Catholic School Board, The Women's Secretariat, and Proctor and Gamble.

I would also like to take this opportunity to recognize the supervisors and their technicians, research associates and graduate students, for their invaluable commitment of time in training, supervising, and encouraging the students who worked with them. I am pleased to be able to add my thanks to those expressed by the students in their reports.

This was my first experience with the WISEST Summer Research Program. It was indeed a pleasure, and a learning experience, for me to coordinate the 1991 program. I was very impressed with the students, from the beginning (as I read their application forms) to the end (as I read their final reports) and I very much enjoyed getting to know them and many of their supervisors. I wish them all the very best as they pursue their education and work towards rewarding careers in the future. I invite you now to read about the program in the words of the students.

Dorothy Tovell
WISEST Co-ordinator

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1

Well, my six weeks at the University are up, and it's been quite the summer. I have learned everything from soldering to how to use a helium leak detector. I've been working in the area of low temperature physics with Dr. Beamish and his graduate student Eric. Since they have both just recently moved here from the U.S, they haven't had time to give me a set research project. Instead, I've been helping them set up their lab. This may sound like nothing, but it has given me a real "behind the scenes look" at how much work actually goes into setting up a lab so it is ready to use. On my first day there, I walked into a pretty bare lab. Now, there is equipment set up, ready to use for research and experiments.

I worked a lot with dewars. In low temperature physics there are many liquefied gases that are used, and are very cold at room temperature. To hold them, they are put into dewars, which can be thought of as a big, 6 foot thermous. The dewars are very sensitive and they had to be checked to see if the trip hadn't damaged them. This is where the helium leak detector came in. I leak checked to make sure the vacumn wasn't damaged by spraying helium around it. If it was detected on the other side by the leak detecter, then there would be a big problem. Thankfully though, all were fine. After I finished this, I got a chance to make up a computer program involving how well the dewars hold their liquid helium. I also plotted some graphs.

I really enjoyed working in this lab because there was always something new to see and learn. I worked with liquid nitrogen, which was really neat. It's very cold and as soon as you stick something in it, it freezes. I tried everything from pencils to balloons. I got to see a whole pumping station be put together. It started out as a bare frame but slowly it began to take shape. Now there is a whole network of pipes, valves, meters and control panels that I helped assemble so now they can be used to put something under vacumn. I even learned how to solder. At first I thought this had nothing to do with physics, but it's important to know how to do. Lots of times it's both faster and easier to build or fix something yourself, rather than trying to get someone else to do it.

So, in the science aspect, I learned a lot. Yes, lots of things went right over my head, but nonetheless, I picked up a lot.This is where a big thank-you goes out to Dr. Beamish, Eric and Don for being very patient with me and taking the time to continually explain things to me so I could understand it. I must say this was better than any science course I could take in high school. I got to actually use machines and substances that I've only heard of before. Here, there is real experimenting being done. In high school, you do the experiment, but someone already knows what the outcome is supposed to be. Here, the best you can do is take the information you have, and work with it.

The Wisest program had more than just science for me. Coming from a small school, going to the University is always a big thing. This summer gave me a chance to get to know the campus better and see what the U of A has to offer.Getting to know the campus was kind of a funny thing when you think about it. My school is smaller than just 2 of the floors in the physics building, and the campus is probably bigger than the whole town of Lamont. But, if I go to the U of A in a year from now, I know it won't be as scary as everyone makes it out to be.

The program gave me a chance to see more into different fields of science and some jobs that I might consider going into. As for the fact that I was put into a field that is dominated by men, well...I didn't really notice it at first until I had to go to the bathroom on the basemont floor. There was no women's bathroom, just men's. Otherwise, whether the field I get into is dominated by men or not, it's not going to bother me.

The thing I enjoyed the most this summer though, was meeting new people. The people in the physics department all made me feel very welcome and I had fun getting to know everyone. I also liked going for lunch everyday with some of the girls from the program. I've made some new friends that I hope I keep in touch with. All in all, it was a fun summer!

Donna Malkewich

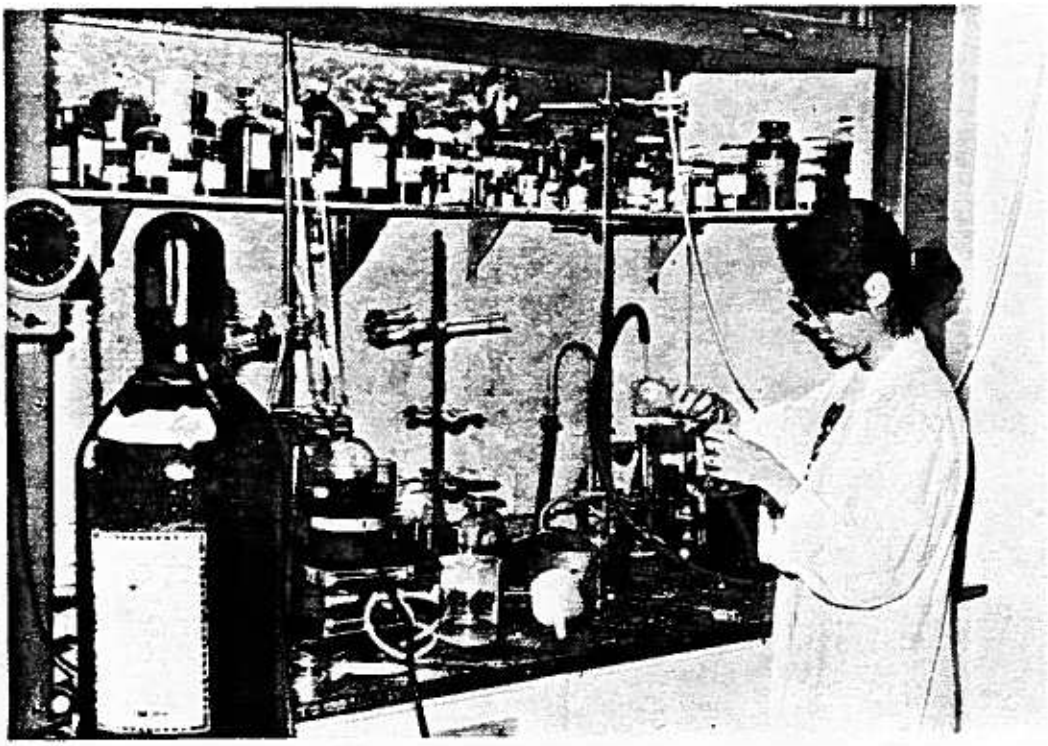
2 Under the supervision of Dr. D.D. Tanner, I worked in a Chemistry lab for the summer. I was immediately partnered up with Pollyanna Peters on my first day of work. The initial step to the research project we received was to react trans-2-phenyl-1-cyclopropanecarboxylic acid with quinine to make the quinine salt. Through the process of recrystalization, we purified the quinine salt to an optically pure state. The pure crystals obtained were then acidified with hydrochloric acid and treated with phenyl lithium to produce the ketone, trans-1-benzoyl-2-phenyl cyclopropane. Using column chromotography, we isolated the ketone. We then made a solution of the ketone in acetonitrile, and added a standard and a couple of catalysts. After putting the solution in a reaction tube, it was de-gased by using liquid nitrogen to freeze the solution and then using a mercury vacuum pump to remove the air. We sealed the tube, allowed it to thaw, and heated it to 61°C for 30 hours. Then Pollyanna and I ran a GC-IR (gas chromotography-infrared spectrum) and took the optical activity of the solution. When we finish, Pollyanna and I will be able to determine the reaction constants with the numbers we obtain from the analysis. If our constants are approximately the same as those obtained by one of Dr. Tanner's Ph.D. students, J.J. Chen, it will confirm that the reaction will not go to equilibrium. The result will be the publication of Mr. Chen's paper.

I will never forget my first day of work because it was one of my most frustrating days of my life. It was also Dr. Tanner's first day back from his holidays. Almost everyone had questions for him to answer, so I was caught in the midsts of theoretical discussions that were too complicated for me to understand. For once in a longtime, I felt small and incompetent. Unlike my spotless lab in high school, the U. of A. labs were over-cluttered with chemicals and equipments. The monotonous sounds from the vacuum pumps irritated my hearing senses. The smell of the room gave me a headache. I can still remember Pollyanna say, "Everything in this lab is deadly to your health. They'll either kill you, blind you, or destroy your brain cells." I knew then that she was only kidding, but it wasn't very comforting the first day on the job. Fortunately, things started to look much brighter the next day, and improved as the days went by. Being a "poor deprived child", as Dr. Tanner and Pollyanna love to call me, I have never seen mercury, liquid nitrogen, dry ice, and other neat and wonderful things until I got this summer job.

Our weekly group meetings were always learning experiences for me. I especially enjoyed the session when people in non-traditional fields came and talked about their lives and careers. At another meeting, each student was allowed to visit a department of his or her choice. That day expanded my knowledge of the kinds of jobs availabe to a scientist. At two other gatherings, students did presentations about the work they've done this summer. That experience was very valuable to me because it was the first time I spoke infront of so many people I knew nothing about.

Although I am no closer in deciding on a particular career, I know that the encouragement from the people I worked with these six weeks will be of great importance when I register for university. To all those who has made WISEST possible, thank you for giving me this wonderful learning experience.

Quan Thai, August 7, 1991.



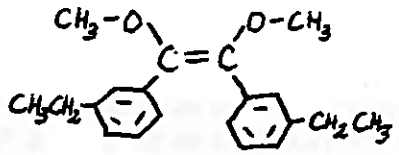
3

WISEST Summer Research Program
July—August, 1991

Department of Chemistry
Dr. Kopecky

Linda Lee

For six weeks in the months of July and August of 1991, I worked in the Department of Chemistry under the supervision of Dr. Kopecky as part of the WISEST Summer Research Program. The project I was working on was the synthesis of 3', 3"-diethyl-1,2-dimethoxystilbene, as shown here:



I attempted to make the above organic compound by performing a series of chemical reactions. I obtained the desired product by processes of extraction, steam distillation, evaporation, recrystallization, and/or filtration. There were several frustrations and worried looks when the experiment didn't proceed too well; sometimes the desired product was impure, some of the solution was spilled, or glass was broken. There were also some happy and proud moments when the reaction was successful.

The WISEST program was a rewarding and enjoyable experience. I received more than I gave; I gained hands-on experience in chemical research and learned how to separate products using a variety of methods. Now, after applying these techniques to nearly every reaction that I did, I realize their importance. In addition, I learned the purposes of different equipments. I was very impressed with them. For example, the several kinds of automatic stirrers, the steam distillation apparatus, and the evaporator. Furthermore, I found that many pieces of information that I learned in high school really came in handy. Yet, I discovered that the reactions weren't as simple as they appear in chemical equations.

The WISEST program gave me an opportunity to explore what other science departments were doing. I visited the Department of Botany where I learned how they fertilize corn seeds, how corn reproduces, and what their sperm and eggs look like, with a tour of the impressive greenhouse that had other extraordinary plants. I wished there were more visits, not just one department. I'm curious as to all the other departments' projects, especially the departments of Medicine, Astronomy, Genetics, and Mathematics.

Fortunately, there were the individual presentations which gave me a brief idea what projects were done in that particular department. However, some of the more detailed descriptions of the procedure involved were too technical for me to understand. I thought that after hearing the reports in the vast field of science, I would be more decisive about which field I want to specialize in. However, I discovered I was interested in nearly all the projects and thus, increased my curiosity even more.

I feel more comfortable about going to university and I made some new friends. I'd like to take this opportunity to thank Dr. Kopecky for his patience and assistance. I'd also like to thank WISEST for giving me the opportunity to absorb the university's scientific atmosphere. The program broadened my outlook and despite the frustrations and failures, I had a fabulous time.

WISEST PROGRAM - PHYSICS

4

Working in the Physics Department at the University of Alberta has broadened my knowledge of scientific research. Under Dr. F.L. Weichman's supervision, I conducted two experiments with a vacuum system and a variety with a photon luminescence apparatus. I also undertook several small projects and toured various facilities.

Upon my arrival the first day of work, I was faced with a vacuum system. I did, in fact, finally figure out how the mechanism worked. (*See fig 1a and 1b*) A mechanical or roughing pump (RP) brings the system from atmospheric pressure down to 10^{-2}mm Hg. The high vacuum pump is then isolated between valves A and C. Next, we open valve B so that the roughing pump can deal with gases in the main chamber. A low vacuum or thermocouple gauge (TG) monitors the operation of the roughing pump. A cold cathode gauge (CG) monitors the high vacuum end. Valve D is an air inlet. After the pressure drops to about 25 millitorr, valves A and C are opened and valve B is closed. The diffusion pump is then engaged.

Our first experiment dealt with vacuum deposition, in which a thin metal coating is made on a glass slide by vacuum evaporation. In the bell jar we suspended a piece of aluminum covered tungsten wire between two copper bars. Above the wire the sample to be covered was placed. After replacing the bell jar and restarting the vacuum, we applied strong current, but low voltage, to melt the aluminum. Temperature was increased further to evaporate the aluminum onto the sample. Our second adventure was thermionic emission. We heated a piece of tungsten wire which was centered in a nickel tube in order to measure resistivity. We still haven't perfected this procedure. Therefore, I will not expand on it.

Not only did I learn about metal coatings and resistivity, but I also learned about vacuum technology, vacuum pumps and gauges, and leaks. Leaks meant a poor vacuum and poor results in experimentation. After weeks of pondering, a leak was finally discovered. A rubber ring had always been placed in between the bell jar and its aluminum base. The ring was covered with Apiezon N vacuum grease to create a better seal. Upon the removal of the ring, we found the vacuum to improve incredibly. We reached the 10^{-7} scale in a few hours, whereas before it would take all night before the pressure would drop to the 10^{-5} range. Unfortunately, our center diffusion pump flask occasionally bubbled and we were unsuccessful in discovering the cause.

Next, I was introduced to a very scientific looking machine complete with multicolored lights, shiny metal boxes and a tangle of electrical cords. After a few days I became more familiar with this highly sensitive light detection system. (*See fig 2*) A light tight box houses the 2kV photomultiplier and a sample box beneath. A Peltier junction can heat or cool the sample. The electronics consists of a high voltage power supply with the positive

terminal grounded and the negative terminal floating. A 50 ohm resistor takes the output from the photomultiplier for high speed response and to match standard coaxial cables. These pulses are amplified 100x and then are transmitted into a discriminator. Here, some background noise is filtered out. A counter-timer shows the number of light photons emitted over a given time. A millivolt oscilloscope displays the amplifier and discriminator output.

Originally, we wanted to prove luminescent decay laws and study the photon character of light. We decided to attempt creating a scintillation counter, and we succeeded. Although we encountered several problems, we did make some discoveries such as equipment capabilities, light leakages, heating inconsistencies, and optimum settings.

Besides doing experiments, I also built nickel tubes for thermionic emission, learned how to replace frayed cords, read and wrote scientific papers, and cleaned lab equipment. As well, I was lucky enough to receive tours in the microelectronics center and other physics labs. WISEST has truly shown me a lot about research; the breakthroughs and let downs. The program also lets one experience the 'real world' and make some new friendships. It is definitely an excellent learning opportunity.

Larissa Fedoriw

5

WISEST SUMMER RESEARCH PROGRAM

This summer I worked in the Department of Forest Science with Dr. Ellen MacDonald. During this time, I worked with different graduate students and helped them with their projects. The most enjoyable experience was going out to the field since I like to work outside. In the course of the six weeks, I went to a variety of places. The first place I went to was Fox Creek. There were four different sites I visited where I collected data from the photosynthesis machine. This machine also measured relative humidity, light potential and temperature. I quickly learned how to read data off this machine. Next, I went to the peat bogs which I visited three times. This area contained Black Spruce and Tamarack. I had never been to a peat bog before, and I therefore found it quite interesting. One side of the peat bog was drained, and this graduate student was studying the effects of drainage. He was also studying the growth rates between the two trees. During my time there, I marked and flagged trees. I also helped in collecting cones and in cutting down the different trees. This happened to be one of my favourite sites, despite the many insects. Next, I went to Fox Creek with another professor and helped collect data from the photosynthesis machine. Another new and interesting experience for me was visiting the nursery. I could not believe how many trees the place had and the operation that was involved with shipping the trees off. I also enjoyed working in the green house. I helped in organising the trees and moving them. Later, I potted new trees that we had collected from the nursery. One graduate student had brought roots, from Aspen Trees, down from the Yukon. I placed these roots in trays in hopes that they will eventually grow. I spent the rest of my time in the lab doing a variety of jobs. I learned how to work

some new and different equipment. Furthermore, I washed roots, weighed needles and measured leaf area for a variety of experiments. One of these experiments was trying to see the similarities between the families of pines, and finding out more about the genetic make-up of them. Through the six weeks I broadened my knowledge with working with the different equipment and through helping the graduate students with their projects.

I felt this was a valuable learning experience for me since I learned more about the Department of Science. During this time, I also enjoyed meeting and working with the different people in the Department of Forest Science. Furthermore, I gained more knowledge about going to University through talking with the students. I am looking forward to attending the University and in taking courses involving science.

Elaine Guzik

Department of Forest Science

6

My participation in this year's WISEST program has been unusual because of certain circumstances, which were very unpredictable. These circumstances allowed me to spend my first three weeks in Forest Science, then my last three weeks in the Endocrinology Department in medical sciences. This moving about did have its advantages though it was a move across the entire campus. Although these two fields are almost exact opposites of one another, I did learn something similar in each dealing with science and the nature of science research.

In forest science I got a first hand look of what laboratory work is like. When people think of forest science, laboratory work is not something that is as evident as when they think of chemistry, but there is, in fact, laboratory work involved. Laboratory work is of a slightly different nature, as I found out, because there were no beakers or highly technical equipment used (at least not any that was needed in my project, although some are used in other projects).

Most of my first three weeks were spent in a lab weighing jack pine seedlings and roots. This, I was told, was the tedious and mundane task that all researchers must endure to get the results which they worked so hard to achieve. I also learned that it was not so much the work that was the satisfaction, but the results. After collecting the mass of the specimens, they were recorded into the computer then the print out was double-checked for errors afterwards. I also had a chance to use a microscope to measure the lengths of stomata in the jack pine needles. These results were also recorded and used as part of the data to answer the question of the project, which was: Why are there jack pines growing in wet areas when they are usually found in dry areas?

My three weeks in endocrinology seemed to go by faster then my first three weeks because I was doing different tasks each day. Endocrinology dealt with the use of different hormones in various experiments. The difference that I noticed between forest science and endocrinology was that endocrinology went through many different experiments and projects in a short period while only one project was the main focus in all the three weeks that I was in forest science.

I learned a lot in the three weeks I was in the endocrinology lab. Although I really was not allowed to do any projects alone, I watched and participated in the small things that had to be done. I learned how to make different solutions that were needed for different projects such as buffers and antibody solutions. The change in the atmosphere and surroundings broadened my view of science both in medical science and forest science, or even science in general.

One of the projects in which I had a chance to observe and aid in included the use of rats. These rats were injected with radioactive iodine to see if specific proteins bounded to certain cells inside the rat's body. The rat's blood and urine were taken as samples to test if the protein bounded to specific sites inside the rat's body. If it did not bind, then it was released from the body, which would be evident in the rat urine. The urine was tested for radioactivity by using a gamma counter that read the radioactivity in the urine from the iodine. The radioactive iodine

did not have any ill effects on the rats.

I believe my time spent at the University over the summer was worthwhile and beneficial to my future plans. This experience will aid me in the future when choosing my path in University and my future. All the knowledge I have gained about certain chemical procedures, and the adaptation of working with different people in different research areas will help me to excel in my senior year of high school as well as maybe my post-secondary education. The chance to tour the campus has prepared me for University here in a couple of years which will definitely be beneficial to me as I enter my first year of University with less confusion. The science I have been exposed to this summer has opened new options for me that I had not known of or considered previously. I believe anyone who is considering to apply in future WISEST programs will not regret it if they should be lucky enough to be given the chance to participate.

Tram-Anh Ly

7

WISEST Summer Research Program - FINAL REPORT

Being a part of the WISEST program has been both a challenge and an excellent experience. I have been introduced to many areas of study, which I didn't know existed and I've learned even more about areas I knew about, already.

I went through the program differently than most of the other students. Instead of staying in one area and working on a single project, I had the opportunity to move to several different areas.

I started working in Forest Science on a project dealing with jackpines. The basic questions we were trying to answer were: What is the spacial scale at which evolution can occur? and a more practical application was; how can one grow a better jackpine? I found this work to be tedious but it gave me a better appreciation of the care taken in research to gain precise results, and I found that my supervisor took the time to talk to me and he gave me advice on career areas that I was interested in.

From Forestry, I was moved to the department of Anthropology. First, I worked on a field project at Elk Island Park. We were studying the advantages of regrowth vegetation in a burned area over a non-burned area. This burning, the Indians found, attracted the buffalo to certain areas, which prevented migration and supplied the Indians with a winter food source. I really enjoyed working on this project; it appealed to me as an area I would be interested in pursuing when I attend university.

My third project was in the same department but under an osteologist. I spent several days organizing and taking inventory of a room full of the bones of humans and their predecessors. This taught me a lot about anatomy and the change in human bodies over time. After this, I set up a database dealing with how diseases have affected bones. This further expanded my knowledge of bones and the computer.

The fourth and final major project I took part in was with a primatologist. We spent a few days working in the zoo observing monkeys. This was in order to determine the amount of energy that is lost in the process of obtaining their food as a ratio to how much is gained from the food. This relates to a field study project being done in Costa Rica with Howler monkeys.

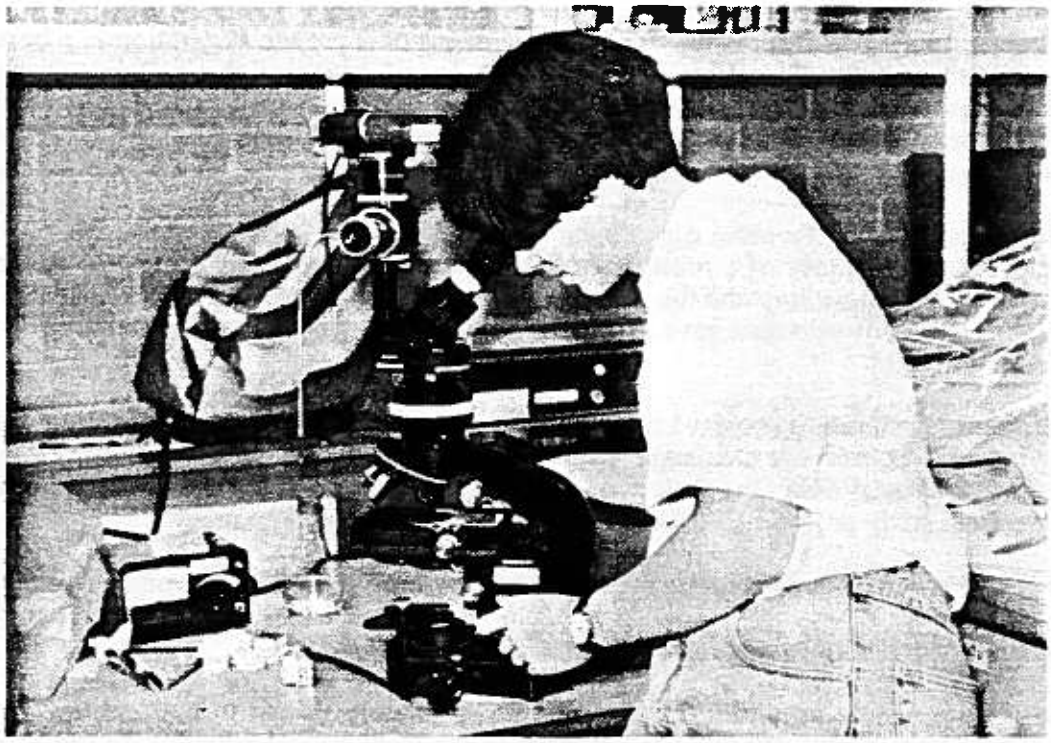
I went into this program sure that genetics was something I wanted to study. I came out positive it wasn't. Now, I have no idea what my future holds but I feel I am more prepared to make that decision with the knowledge I've gained.

I found all the people around me took the time to explain things to me and they were interested in what I had to say. WISEST is not only an excellent opportunity but it's fun as well and I would recommend it highly.

Supervisors
Rob Wright } Forestry
Art Schwartz}

Grace Morgan}
Pamela Mayne} Anthropology
Francois Larose}

by Heather Nicholson



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WISEST REPORT

My name is Patrycja Siembab and in the summer of 1991 I was a part of the WISEST Summer Research Program. My supervisor, Dr. Pamela Willoughby is an archaeologist who specializes in the technology of the Palaeolithic or Old Stone Age, the period of cultural development from the beginning of technology until 10,000 years ago. I did not have an individual project but worked with Dr. Willoughby in preparation and analysis of the stone tools and other artifacts such as pieces of pottery and fossilized bone fragments, that were collected during an archaeological survey in Tanzania, East Africa in the Fall of 1990. Recent study points to Eastern Africa, about 200,000 years ago as a possible centre of the appearance of the first modern humans. The study of their stone tools may give some insight into what exactly was happening to the human beings at that time; by examining the stone artifacts collected from the East African sites, such as the ones in Tanzania, one can trace the technological development of humans and correlate it to a hypothetical evolutionery path of human beings.

Since Anthropology is more a social science than an exact science, several aspects usually present in a scientific research were absent from the work I was doing. Repetitive experimenting was one of them; analysis was conducted on stone artifacts that were already made and used, and no experiment was necessary to obtain them. However, the research I was involved in did allow me to come to more or less the same conclusions about scientific research that I suspect were shared by a great many other students. One of them was the necessity of keeping in mind the bigger picture and the great questions one hopes to help to answer in order not to get discouraged by some of the monotonous work that has to be done. Analysis has to be conducted on a huge number of samples before any

definite conclusions can be made about them. For example, over 10,000 stone artifacts have to be all individually washed, labelled, classified, measured, and the information recorded, which means repeating the same procedure over 10,000 times. I had a chance to help in analyzing several hundred of artifacts collected, but since there were thousands left to go before the last day of the WISEST program and the end of my working experience, I wasn't able to form any great conclusions.

The WISEST Summer Resarch Program is an excellent opportunity in my opinion for students to explore the various options that are available to them, in both the science related and the nursing/home economics related fields of study. In my experience, the many interesting facts about the campus and the University that were unknown to me before and the chance to meet many exciting and inspiring people made this program especially worth while, and I would like to thank Dr. Pamela Willoughby, Dr. Dorothy Tovell and Dr. Margaret-Ann Armour for this great experience.

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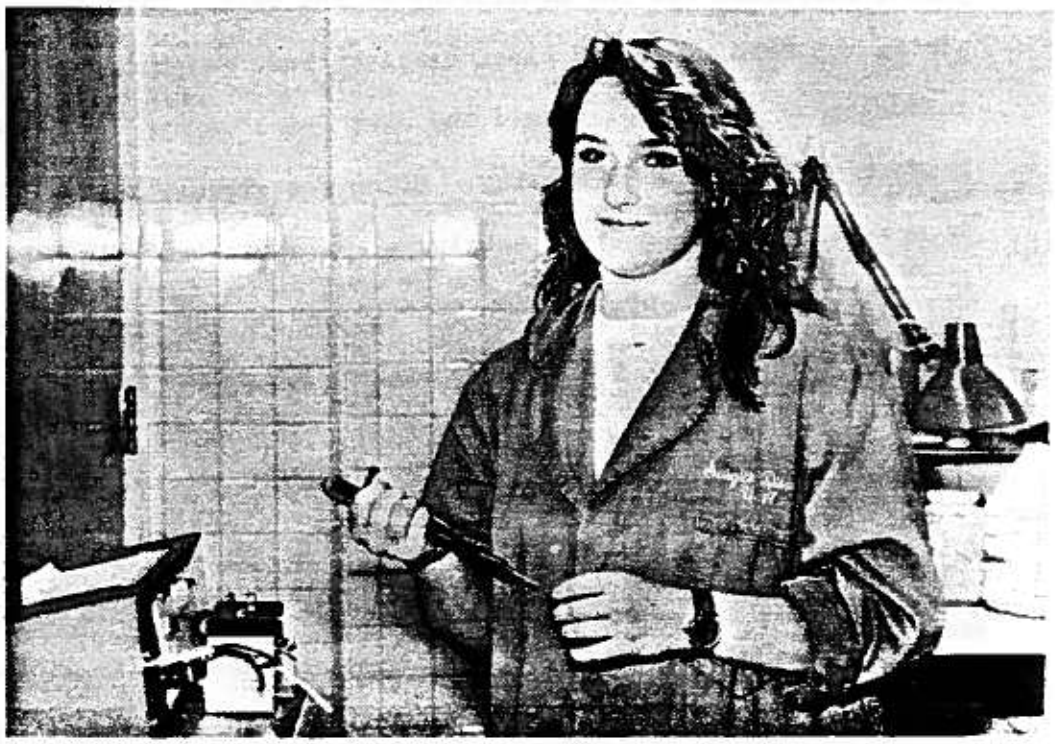
THE WISEST PROGRAM

DANIELLE MITCHELL



WISEST

Through the wisest program I was able to experience a totally different aspect of the science world. I worked in the department of endocrinology under the oupervision of Dr. Finegood, (whom we called Boss) in the lab, I was on a team of lab techs, summer students, and other researchers working together on several diabetic projects. Everyone assested on all the projects so I was able to apply myself to many different experiments and tasks that gave me a brief understanding of Endocrinology and what a life in science might hold for me.

Most of my experimental work dealt with diabetic rats that had recieved islet transplants. I did many experiments on the rats and then observed the changes in their bodily functions. One of the main jobs I performed was the monitoring of the rats. This consisted of taking the rats urine and blood samples, body weights, and weekly food consumption. I also exercised the rats which was running them on a large tread mill for 90 minutes. Using the glucose analyser was a must because all blood and urine samples are used to read glucose levels. All the results and observations contribute to how islet transplant patients will recover and what conditions will best assist in thier recovery.

I can see science in my future as a career do to the first hand experience and encouragement I recieved this summer. The wisest program has also allowed me to recieve a job oppertunity in the department of Endocrinology for the next aproaching summer. The wisest program was a valuable oppertunity that I was very lucky to recieve and I would encourage anyone to apply because it is an experience no one should miss out on.

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Being a part of the 1991 WISEST program at the University of Alberta has been a valuable learning experience for me. At the beginning of the program, as I'm sure many others can relate, I was apprehensive as I did not know what to expect. I was assigned to work under Dr. D. Cass in the Department of Botany. My job was to work in his lab and to help everyone else out with their research. I was able to get hands on experience in everything that was taking place in the lab. At first I was quite confused, but after a few days I soon learned the routine in the lab. The people I worked with were very nice and extremely helpful and the things I learned were things I could have never learned in high school. Working with university students was also an added bonus due to their advice about what it is like to attend the University of Alberta. Over the six weeks I learned the importance of keeping records of everything you do in an experiment, and I also learned that some of the things we do in the lab, even though they sound easy to do, take a lot of practice to do correctly. Working here for the past six weeks has given me a good look at what a career in science will be like, and will help me make a decision as to what to study when I come to university.

The eventual goal of the research taking place in the lab is to improve *Zea mays* or corn. By growing the corn *in vitro* in the lab and by studying its characteristics one day will enable us to manipulate genetic characteristics and create better corn. For example, corn which is faster growing, hardier to adverse conditions, and better nutritionally. In order to do this we have to isolate the sperm cells of the corn from the pollen grains of the corn tassels and isolate the embryo sac from a corn kernel on a cob of corn. I helped with both of these isolations. I also spent a lot of time preparing slides, making buffering solutions, washing and sterilizing dishes and looking after the corn plants. I also learned microscopy and I had the opportunity to look at the slides I had prepared. What I enjoyed most was the photomicrography where I took pictures of material under the microscope. I was able to develop the film and make prints from the negatives. It was interesting to see the results of what I had spent the past six weeks doing.

Leanne Boyko

Zea Mays and The WISEST Experience

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The past six weeks have been great. When I first started, I was very excited. This program was my chance to get my feet wet and participate in serious and meaningful research at the University of Alberta, a place I knew little about. I wanted to know what I was going to do and if the research I was taking part in would be important to me. I didn't have a clue what to expect. As far as I knew, I was alone; I wasn't going to meet anyone I knew, and I was going to be stuck in a tiny laboratory with a very nasty professor! However, things were not all that bad. I saw some girls I had met at the WISEST conference two months earlier (we laughed a lot), and I got to know my partner, Leanne. I also got to meet Dr. Cass who, despite his towering height (I'm only 155cm tall), was very understanding.

Then he told us about the corn.

I nodded my head politely, but I couldn't help thinking, 'Corn??? Great, I have to be a farmer for six weeks!'. However, there was a lot more than planting, watering, fertilizing, moving, and harvesting the corn -- there's studying it. The aim of the research is to achieve fertilization of the sperm and egg cells of the Zea mays in-vitro -- that is, in a petri dish with agar -- by altering the genetic structure of the sperm cell. This would allow genetic hybrid crosses with other types of corn or other plant species. It sounded impressive.

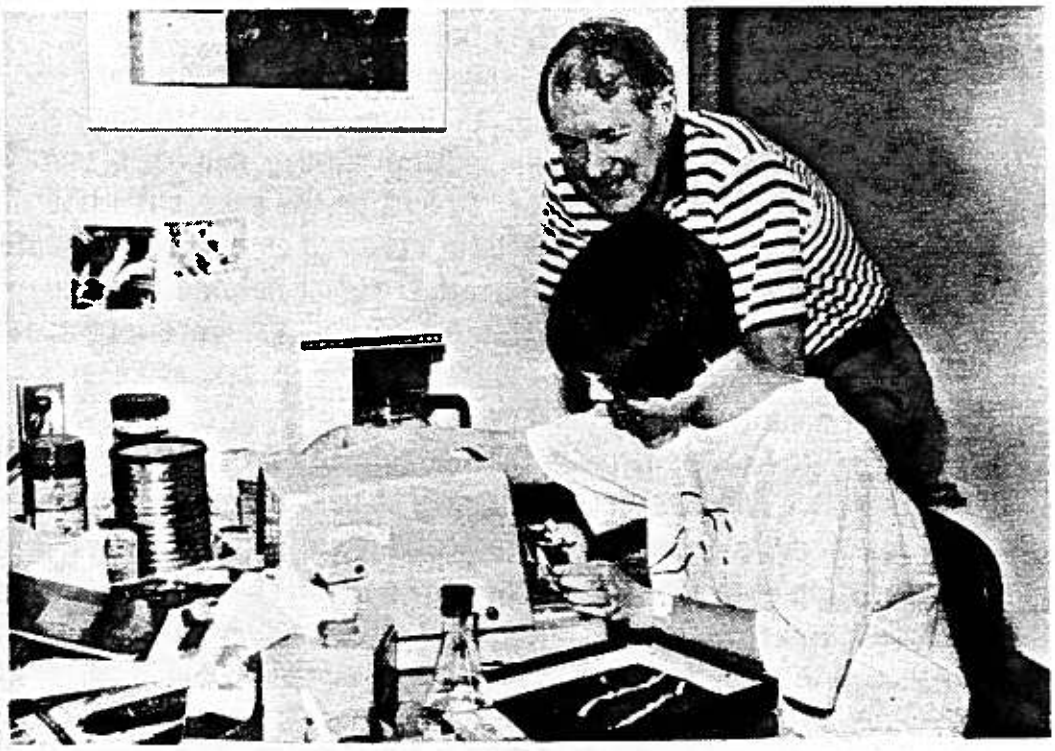
First, we had to find out what everything looked like. Leanne and I had to take the extremely small embryo sacs out of the corn kernels with the help of Mary Kay (a lab technician), a small dissecting blade, and a dissecting microscope. I was so frustrated that I wanted to quit on the spot, but I literally kept hacking away until there was nothing left but creamed corn. I felt defeated. Important information had been destroyed. I felt I wasn't helping anybody -- I was slowing everybody down. I recovered after the sacs which were intact were embedded in paraffin, sectioned into 15 µm pieces, put on slides, and stained so that I could see I hadn't done that much damage.

Soon afterwards, the seven of us in the lab calmed down and things were happening much faster. We had to start on the second part of the objective. We helped isolate the sperm cells of the corn by collecting pollen from the very tall corn stalks and separating it into a JUNK LAYER and a SPERM LAYER using liquids with various densities and a centrifuge. Now came the problem of keeping the sperm alive long enough to be able to fertilize the egg. After we made buffer and sugar solutions to give to the cells to keep them happy (or maintain their osmolarity), the cells continued to die faster than we wanted. The people in the lab are still trying to solve this problem.

Although most of the work is done in the lab and in the dishwashing room, a fair amount is done in the darkroom. We took pictures of the sections we did, using a camera attached to a huge microscope, and we also developped the negatives. In addition, we made black and white prints. This was fun!

But sometimes, things wouldn't turn out the way you wanted them to and you had to work extra hard to get it just right. This was discouraging, and at times exhausting. Even though I didn't participate in every activity, like coming in at one o'clock in the morning to count sperm cells, I found myself taking long naps after work and snoozing on the bus in the morning. I'm just now starting to get used to waking up early to take the bus. It wasn't convenient for me to get to work before eight in the morning because I am a night person, and I like to sleep in. But if you're a morning person, it's fine.

I had a wonderful time at Dr. Cass' lab, and I feel that was because of some very important aspects. Getting help, advice, constructive criticism, and support from your superior is a critical part of the program's success. Dr. Cass treated me as person, and respected me as much as I respected him. I also made friends with people in the lab. It was much easier to work with people I got along with. You have to be organized. That's the key (I wasn't organized, and I was about as lively as a tree stump for six weeks). The most important thing though was that I had fun, and the work was worth it!



Anne Kaewmongkol
August 9, 1991

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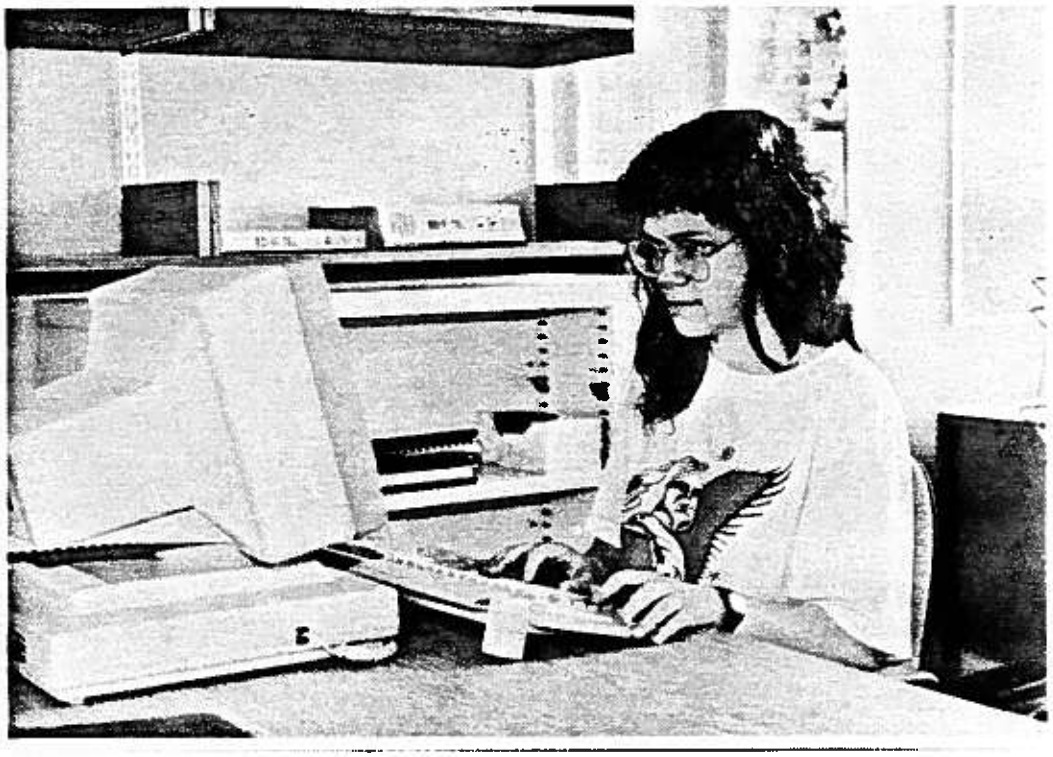


WISEST Final Report

by Karen Brownlee

University of Alberta Summer Research Program

August 9, 1991

During the WISEST summer research program, I worked in Computing Science at the General Services Building with Support Staff members Bruce Folliott and Carol Smith. Because the projects in the department needed a great deal of background information and expertise, I was introduced to various computer systems used by the department. This helped me to understand how projects were designed and solved using computers.

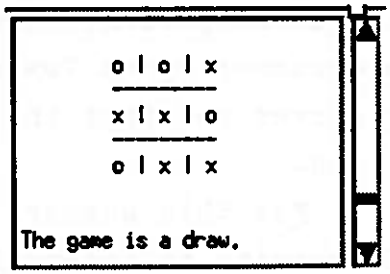
Bruce introduced me to the UNIX system, and to editors and utilities such as EMACS and AWK. I also learned how to do shell programming and to use UNIX pipes, which allow the output of one program to become the input of another. I spent my first two weeks reading manuals on these systems. Since Bruce is in charge of the department's electronic mail, I wrote a set of programs to analyze the department's daily mail; how much was internal and how much originated from and/or went to other places.

Carol introduced me to Artificial Intelligence through Prolog, an AI language. Prolog programs give the computer a set of facts and rules to enable it to "reason out" answers to questions. My main project with Carol was to port a tic-tac-toe program from another Prolog implementation into Quintus Prolog (refer to figure at end of report). She also introduced me to the X Window System and some of its utilities like idraw. Using the word processor FrameMaker, I was able to generate this report.

This summer, I discovered that computer programming involves encountering all types of problems and finding ways to solve them. For example, the manuals I read described a slightly different shell language than the one my computer used, so I often had to ask my supervisors why a program didn't work the way I thought it should. An understanding of different programming languages also helps when translating an idea into a working program.

The University had many systems I enjoyed learning about and working with. It was a fun experience, and I learned more about computer systems than I would have in a high school course.

An example of a tic-tac-toe session in Quintus Prolog.



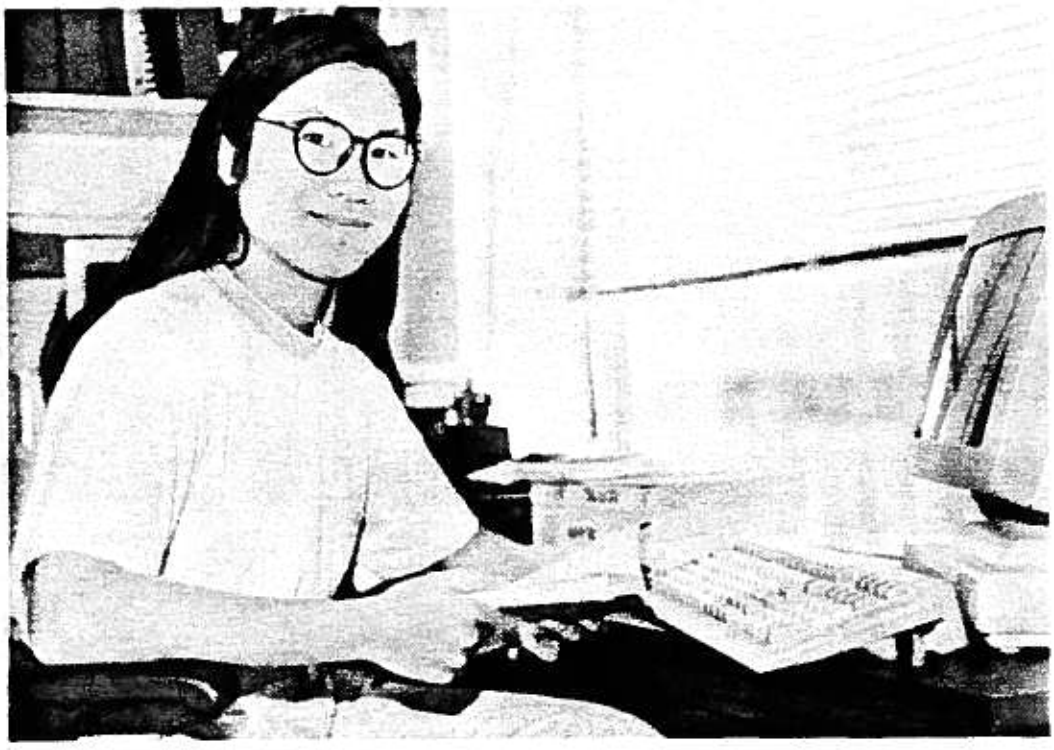
13 My name is Alice Kwan and I have worked in the Department of Computing Science for the WISEST summer research project. Under the supervision of Dr. Catherine Descheneau, I worked with Carolyn Morris, a staff member in Computing Science, to analyze the new laboratory exercises on MTS (Michigan Terminal System) for the first year student of Computing science. For six weeks, I have worked not only with the new laboratory exercises on MTS but also with various material concerning with computing science including the study of the UNIX mailing and operating system, Pascal programming with macintosh and the application of the Macintosh. Throughout the six weeks, I read many manuals teaching me how to operate the different kinds of computer and books about Pascal programming language. My summer research project is more of a learning experience than a research experience because I gained much practical skills through working with different kinds of computer which I would never have the chance to work with in classroom. My experience in Computing Science had indeed broadened my view in this field.

There are a lot of things that one can learn when working in computing science. In my work, I gained the experience of operating various kinds of computer. Working in the Department of Computing Science is very different from working in school. In a classroom, people work with individual computers such that when a problem comes up, one of the solutions is to turn off the computer and restart it. However, in the computer laboratory of University of Alberta, people work with a networked system. When there is a problem, turning off the computer and restarting it cannot be the solution. Therefore, a very clear understanding of every step that one is approaching is very important. This taught me how to be responsible with my work. Secondly, I learned how to be patient working with the computer. Most of the computer programmer spend 70% of their time on testing and debugging their programs and thus their patience is required to accomplish their tasks.

For this summer, I had experienced that the life at the University is independent and free. Studying in the University

is a step for growing up in which people are taught to be more responsible and independent. Eventually, one can develop a more mature thinking mind to handle various problems. In fact, life at the University prepares each individual for the working world. Furthermore, working in the Department of Computing Science has answered me many questions about the study in this field. Computing science is not just learning how to program with certain computing languages, but it demands the understanding of how computers work which requires sophisticated skills in Mathematics and English. There are also many research opportunities in computing science and so it is a very good field to be in.

Computing science may not sound as interesting as many other science courses, but I have really enjoyed the time I spent on working in this summer research project. I did gain much knowledge about computing science through this summer research project and it has changed my attitude and my perspective toward woman studying in the fields of science and technology. Moreover, it was a great experience working with the staff in the Department of computing Science. Above all, I would like to give thanks to the WISEST for giving me such a wonderful opportunity.



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CHER TSANG
Supervisor: Dr. Mark Dale
Department: Botany
August 8, 1991

What do *festuca rubra, medicago sativa, phleum pratense,* and *trifoluim repens* mean to you? They meant nothing to me until I took part in the WISEST program in the department of Botany with Dr. Mark Dale and Dr. Rob Powell as my supervisors. In the six week duration of the program, I learned to recognize and identify grasses and legumes, such as those mentioned previously. As part of a twenty-year secondary succession project, my fellow WISEST students (Olivia and Peggy Sue) and I spent a lot of time out at the Wagner Natural Area. At the site, we recorded the presence/absence of plants growing in the abandoned farmers's field. Although the project was interesting there were a few drawbacks. First of all, unless you are an outdoorsy person, you would not have enjoyed working in grass over one meter high, using outhouses, and sharing your lunch with wasps and other pests. Secondly, the work became quite tedious with data being collected from sixty quadrats or six thousand microplots. However, when we got bored of field work, we always had things to do: data entry, photocopying, running errands, helping in other projects, attending lectures, watering plants in the greenhouse, doing research in the library, and getting to know our supervisors and each other better.

All in all, my six weeks in the summer WISEST program were quite an experience. There were times when I couln't wait to get to work, but there were also times when I dreaded getting up in the morning. The WISEST program gave me an opportunity to try hands-on scientific research both in the lab and out in the field. It also helped me in deciding upon my future career. My favorite moments during my participaction in the WISEST summer research program include making new friends, getting to know the campus better, making trips to and from the field, and attending the Wednesday meetings. I'm sure that my memories of WISEST will not be forgotten easily.

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Journal of Women in Scholarship Engineering Science and Technology

Field Botany at its Best

Olivia Tsai

ABSTRACT

The WISEST program allowed me to be involved in two projects: a long term succession study and a study of drought stressed plants in insects. I have learned a great deal.

INTRODUCTION

Field Botany...oh what a feeling! The WISEST program has afforded me the opportunity to experience field botany and learn first hand about non-traditional careers. I was fortunate enough to contribute to two projects. The first project involved studying secondary succession on a boreal forest type area and the second involved studying the effects of drought-stressed canola plants on insects.

METHODS AND MATERIALS

Project 1: We manufactured quadrats using metre sticks. These materials were taken to a field west of Edmonton where they were used to aid in counting vegetation. Types of vegetation involved Bromus inermis and Medicago sativa.

Project 2: We manufactured bug cages made from petri dishes and bug netting. The plants were canola plants and the insects were myzus persicae and plutella xylostella. Drought was simulated by limiting water available to the plants.

RESULTS

Project 1: Because we are studying long term succession (twenty years) and because this is ony the first year of this study, conclusive interpretations of the data gathered this year can not be made.

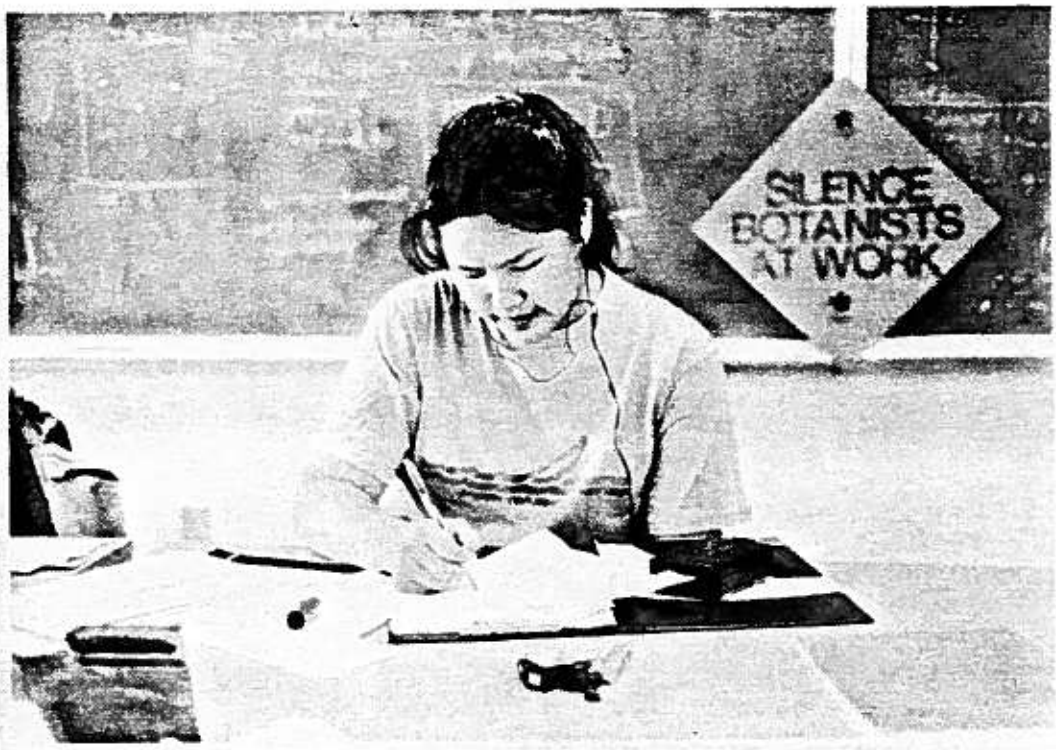
Project 2: Because the study of drought effects has not been concluded at this time, no results can be reported.

DISCUSSION

I have realized from the WISEST experience that scientific research is not frivolous and not always conducted in a typical laboratory. I have, for myself, learned perseverence, patience, tolerance and endurance.

ACKNOWLEDGEMENTS

I would like to thank Cher for her support during the more difficult periods and Peggy Sue for her understanding. I would also like to give thanks to Dr. Rob Powell for his help and "supplies", Dr. Mark Dale for giving me this opportunity and the University of Alberta for funding it.



16 Department of Botany

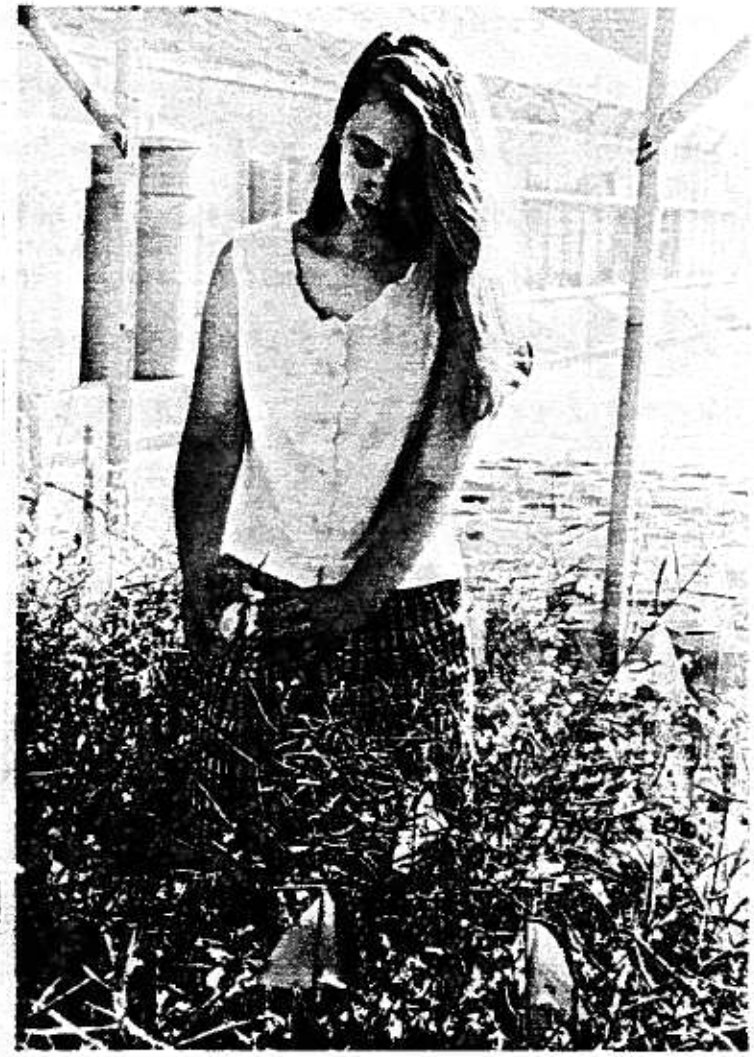
On July 8th I was caught off guard after walking into the lab in the Department of Botany where my soon-to-be comrades, Cher and Olivia, were deeply immersed in slightly modified petri dishes. These were, in fact, after some soddering and glueing, to become insect cages, and I was certain that I must have been in the entomology building by mistake. But then I was informed of the projects Dr. Dale and Dr. Powell had undertaken in which we were to be of assistance. The insect cages were being created to be attached to the canola plants in the greenhouse where the effects of drought conditions and pests on canola were being studied. Dr. Dale was planning to spend two weeks collecting data on the height of the various grasses in seventy-five hundred 10 cm by 10 cm micro-plots in the Wagner Natural Area. In fact, much to everyone's dismay, the field project took much longer than expected. This was the first year of a twenty-year project studying the secondary succession of a boreal forest.

I did not have any expectations of what the Wisest Summer Research Program would be like, and so I was surprised at what I discovered - amazing facts, like - scientists actually have to be creative, and must invent things for themselves which are not always successful. Hardware stores are a frequent brainstorming location because machines have actually not yet been invented to assist in all aspects of science. Data are not easy to come by, and it helps to have three eager Wisest students as free labour on those hot and sticky field days. And, scientists actually find a use for the huge volumes in the library as they search through hundreds of articles only to find that no one has yet studied the topic that they find so

appealing.

The opportunity to spend a summer working at the U of A proved to be very revealing about the lives of intellects, not to mention those of plants and insects, and made me more aware of the trials of scientific study. I especially appreciated being able to have input into the research projects and liked the diverse nature of the job. Although I will not particularly miss the intricate work involved, I definitely will never forget it.

Peggy Sue Ewanyshyn



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I think that WISEST is a fantastic program for teens because it opens our eyes to new ideas and plans for our future careers. For example, I had never even considered Home Economics as a career for me to look into, however it is now one possible choice in my future. I made this decision after working for WISEST this summer in the Clothing and Textiles Collection in the Faculty of Home Economics. I have really enjoyed working here and find it to be an interesting field.

In truth, I had very little idea of what I was getting myself into by spending the summer working with clothing and textiles, and was pleasantly surprised by what I discovered. Clothing and textiles is interesting! I had no idea how much could be learned through clothing. For example, it is a diferent way of looking at history. One does not think of clothing as an important part of history but that is because it is not realized how much clothing can represent society. For example, today's culture seems to regard clothing as something disposable, while in the past clothing was very important. In the late 1800's people would change an average of three times a day, while today one outfit is fine. As well as the history there is also the cultural differences that can be shown through clothing. For example, Peruvian grave dolls can give a little insight to the methods of burial that the ancient Peruvians used. Finally, there is a chemistry side of clothing and textiles. It is a puzzle to figure out how an ancient piece of cloth is to be cleaned and maintained without damage to the cloth. There were many sides of clothing and textiles that I never knew existed and was pleased to discover them.

The other reason that I had enjoyed working here was the variety of work that I was assigned. Each assignment that I was given helped the collection to become more organized, I was given a different job every two or three days. These assignments varied from cleaning tables to hanging a small exhibit in one of the rooms. There were three assignments that I was given that stick out in my mind. The first assignment was a research project in which I had compared four books. Each book was a manual on men's fashion and each one was from a different decade, my assignment with these books was to compare them and create a chart which displayed these differences. The second job was to hang some Guatemalan textiles in one of the rooms as decoration and exhibit. It was the opportunity to practice some of the skills that I had learned in clothing conservation. Finally the longest assignment that I had was to do an inventory and then reorganize the periodicals of the collection, it took me about two weeks to complete. The variety of the work as well as the work itself were the reason that I enjoyed working here.

Working this summer in the Clothing and Textiles colection has been a valuable experience for me and I would recommend it to anybody.

Timothy Spronk

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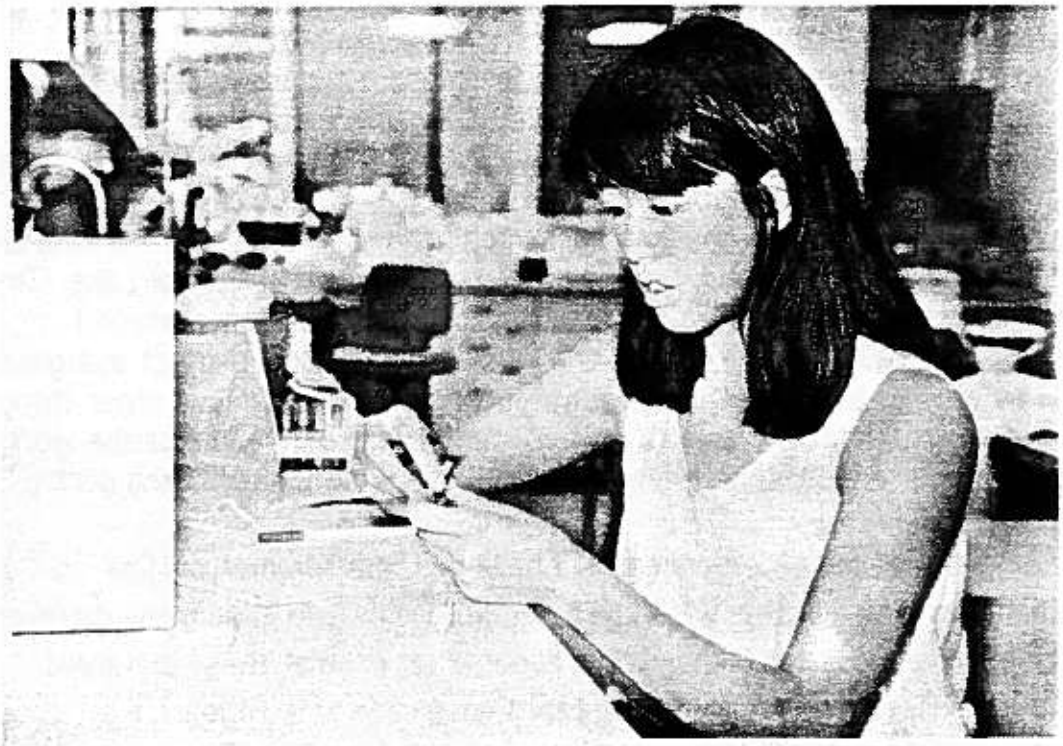
This summer, through the WISEST summer student research program, I was able to experience researching in the Department of Entomology. At first I did not know if the Department of Entomology was quite where I wanted to be, as I had and aversion to insects. I am very glad that I gave it a try though because I thoroughly enjoyed the experience and have even overcame most of my aversion to insects. I worked mainly with waterstriders, beetles and occasionaly flies. I found the work as well as the atmosphere at work to be very positive. One of the things I most enjoyed about working in the lab was the opportunity I was given to meet and work with many different types of people in different positions. I worked under Dr. John Spence but I also had the opportunity to work with Dr. Jari Niemela, a post-doctorate, Nora Berg, a lab technician, Nidia Moreno and Hector Carcamo, graduate students,Cameron Currie and Scott Digweed, undergraduate summer research students and Cheryl Bilesky another WISEST summer student. Everyone was happy to answer any questions I had and show me how to do things.

I had many tasks and was able to learn about the many aspects of research work in entomology. I was able to experience both lab and field work. Every Tuesday we went out to the field site at George Lake and did a bug count. This involved capturing all the Gerris buenoi and Limnoporus dissortis, waterstriders, on Experiment Pond and then counting, marking and releasing them. We also did various other things while at George Lake. This often included capturing specimens for predation experiments which I worked on. Throughout the rest of the week I worked on a project assigned to me as well as helping others with their projects and various other things. Some of the things I was able to do was help Nidia with some of the work she was doing on wasps, help feed and clean the waterstriders and sort samples.

I feel that the experience that I have had this summer will be invaluable to me. Working with and being around people in so many different positions gave me a little knowledge about what each of these different levels in education involved. I also feel I have been able to learn a bit about insects as well as what research work is like.

Julie Goo



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This summer I was given the opportunity to work in the Department of Entomology under the supervision of Dr. John Spence. I even feel I have a greater appreciation for the insect world now; never in my dreams did I ever imagine I would be learning the specific names of these bugs and insects!

When my supervisor took a brief leave of absence, I was able to do independent work in which I learned the scientific method. This required some direct observation, although sometimes the experimental approach was used. Data recording was used also. I honestly discovered the importance of using controls in an experiment to assist with the drawing of conclusions. A hypothesis was too soon to be developed yet, as I arrived in the middle of these projects.

While working in Entomology, I was doing several projects at once. A typical day would involve feeding and cleaning water strider cultures, sorting through field samples, filing records, weighing parasitic wasps and setting up predation experiments. Other jobs such as washing containers, refilling water tubs and observing wasps were also done.

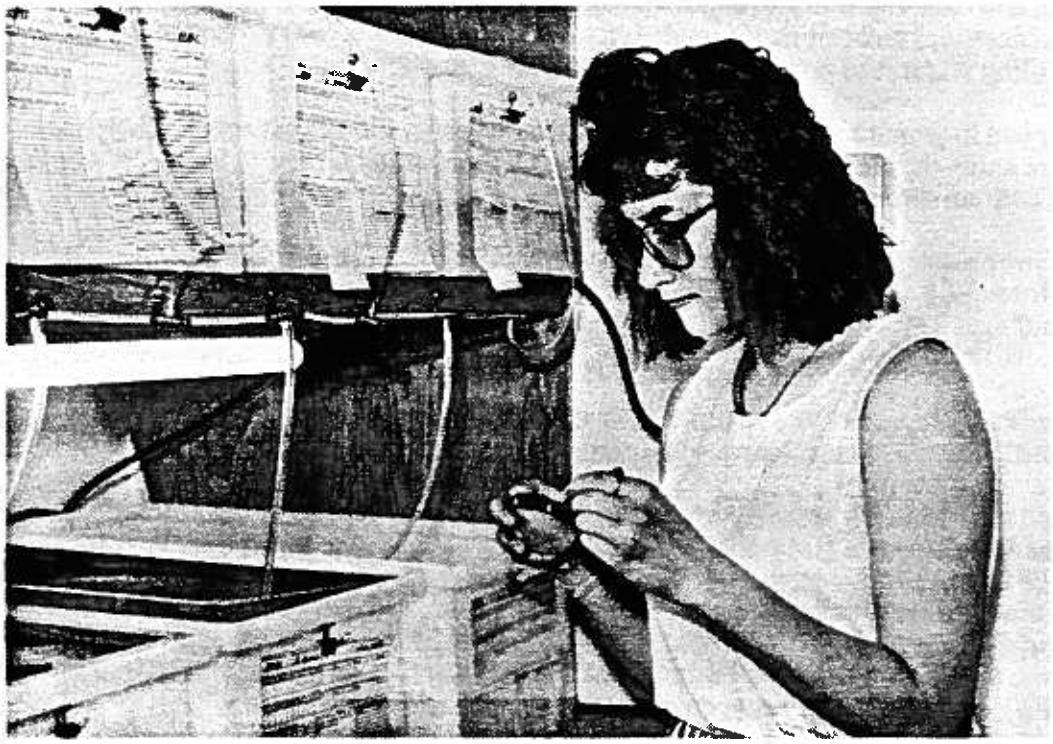
One project in which I was involved with was a kin recognition experiment. I helped a graduate student study the eating patterns of a certain species of water strider to learn if it would cannibalize its own offspring.

My favorite aspect of this job was a weekly trip to George Lake near Barrhead to collect water striders from the pond. I thoroughly appreciated this opportunity to work both in the field and lab surroundings. One trip even involved the activity of observing the mating behavior of these insects!

My last research project was to test different freshwater predators versus the water striders. Many were tested, and the conclusion was that some are not the greatest of eaters!

I learned a lot from my research experiences - work may be repetitive but recordings must be accurate when dealing with research. Also, patience goes along with this job, as tedious projects must be done. <u>But</u> the most rewarding gift one can receive is when your hard work pays off and you get the results! I found it extremely enjoyable to work in a pleasant atmosphere with friendly co-workers. I personally believe that I have benefitted from this summer program and I would encourage anyone interested to get involved. Unlike my first prediction of this job in Entomology, it <u>has</u> proved to be a busy, enjoyable and memorable summer.

Cheryl Bilesky



20 FINAL REPORT

Looking back on my first day at work, University campus was a huge, confusing place for a high school student, like me, to wander through. After six weeks, campus seems a lot smaller and, more importantly, much less intimidating. One of the beneficial aspects of the WISEST program is the opportunity to get familiarized with the buildings and facilities so that they are not as overwhelming when it comes time to jump into the first year there. Hands-on experience gained through the program is fundamental in terms of making decisions for the future. Working full-time in a given laboratory may be just the thing to convince one of aiming for an occupation in that particular field. On the other hand, it may result in the realization that pursuing one such career would prove to be regrettable. Predetermined notions, good or bad, about what a career in a certain field of science would be like are better shattered now than later if they are way off base. When I became aware that I had been assigned to a botany lab, I imagined that I would have to measure, examine, or take care of grass or some other plant. When I was brought to my lab, I was surprised to see only chemicals. I didn't mind at all though because chemistry happens to be my preferred science anyways.

Dr. Cossins' botany lab involved the purification of pea enzymes. Working with one of the graduate students in the lab, I ran through the various steps of the purification process. Starting with dehydrated peas, we soaked them in tap water overnight. The next morning, we tackled the tedious task of taking the coats off of each individual pea. That was the only time where actual plant life entered the picture. We usually ground up about five hundred grams of the peas, with a buffer, in a blender. The mixture was squeezed through cheesecloth to obtain an extract. The extract was to be spun in the centrifuge four times, with the addition of a certain chemical before each time, with the exception of the initial spin, to get rid of most of the junk which accompanied the enzyme complex of synthetase, dehydrogenase, and cyclohydrolase in the original extract. The pellet formed during the forth spin in the centrifuge was dissolved in buffer and applied to a sephacryl column. It separated our sample according to size. We tested the fractions collected from the column for synthetase. We had a recipe and accompanying procedure for synthetase, dehydrogenase, and protein assays. The results were read by an ultraviolet spectrophotometer. It gave us O.D. readings for each fraction tested so that we could identify where our enzyme came off. We combined the fractions exhibiting enzyme activity and ran them through a DEAE cellulose column. This column separated the sample by charge. We had to pump four different buffers on after the sample and make sure the column did not dry out. We again tested for the peak at which the enzyme came off and combined those fractions to pump onto the final column, matrix green. It separated the synthetase and dehydrogenase by shape. A good portion of the

time was spent in the cold room, set at four degrees celsius, since that's the temperature at which our enzyme remains stable. The purification process was repeated over and over again so that it could be improved.

Janet Wong

August 9, 1991

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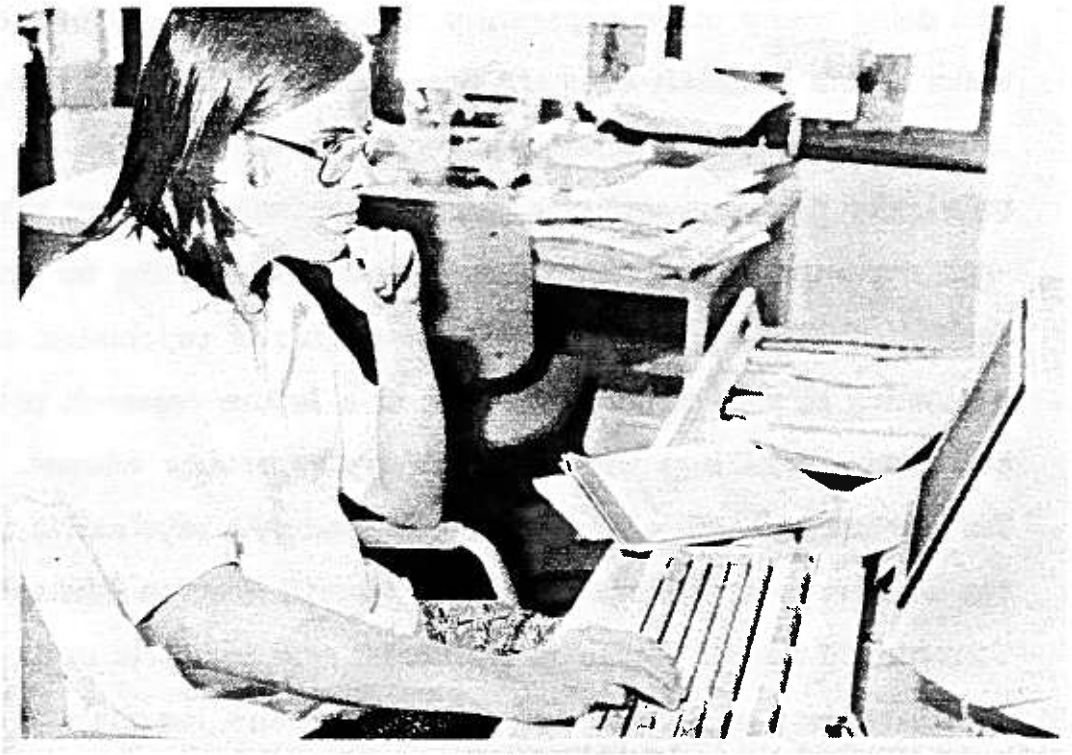
When I applied for the position in the WISEST Summer Research Program, I had little idea as to what the job would involve other than that I would be assisting a professor or a graduate student in his or her work. The experience, however, turned out to be much more. Activities such as writing annotated bibliographies, doing library work, organizing articles with a computer program, and doing many other apparently minor but actually important tasks that a research assistant does took up a large portion of the time. I also was able to experience in a small way the life of a university professor and of a nurse. I attended several meetings with my supervisor including a readmissions meeting for the Faculty of Nursing, a meeting on standards of psychiatric nursing, a meeting to plan the initial stages of a future research project, and several meetings with students my supervisor advises. Furthermore, I was able to tour the inpatient psychiatric unit at the University of Alberta Hospitals, Alberta Hospital Edmonton, the Community Health Centre in Hobbema, and pediatric units at both the University of Alberta and Royal Alexandra Hospitals.

During the six weeks of the program I have learned new skills, gathered more knowledge, gained an impression of the university other than that of a student, and seen things that I would probably never have been exposed to without the program and the job. Most importantly, the program has allowed me to meet people and learn to interact with them. Whether the person was a university professor or a patient in a hospital, my interaction with him or her has given me insight into myself and to the human condition. I am most grateful to the program

because it has given me a broader experience of the world and a better understanding of people.

Karl Darcus



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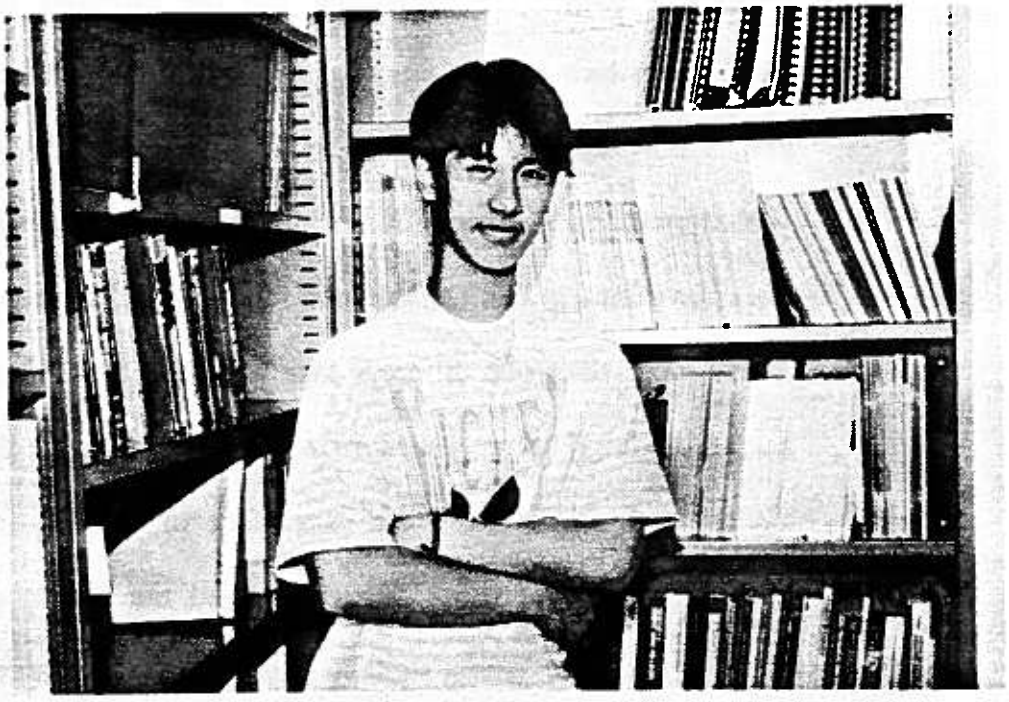

Kenny Lin

My summer in the Wisest program was a funfilled and entertaining time. I really enjoyed the experince of working with the professers (I was lucky to work with two) and their assistant researchers. Overall the program was very beneficial. I learned how the university works, what it takes to do research, what options are open to me once I enter university, and the ins and outs of how a faculty works. Iv'e also made a couple of new friends. During the six weeks I have learned how to perform a baby massage, use the extensive library system, and how to use software programs, such as Word 5.1 and ethnograph. Most importantly I learned how to communicate with many different people and how to make a work environment comfortable and fun. I would have wished to see more than one different faculty. Also it would have been more fun if there were more interaction among the Wisest students. I really liked the experience of working in the university atmosphere, and I also enjoyed the presentations made by the other Wisest students. I enjoyed my summer very much and the Wisest experience has been very good. I learned many things to help me in the years to come and I would like to thank "Wisest" for accepting me, and I hope everyone has a great summer holiday.

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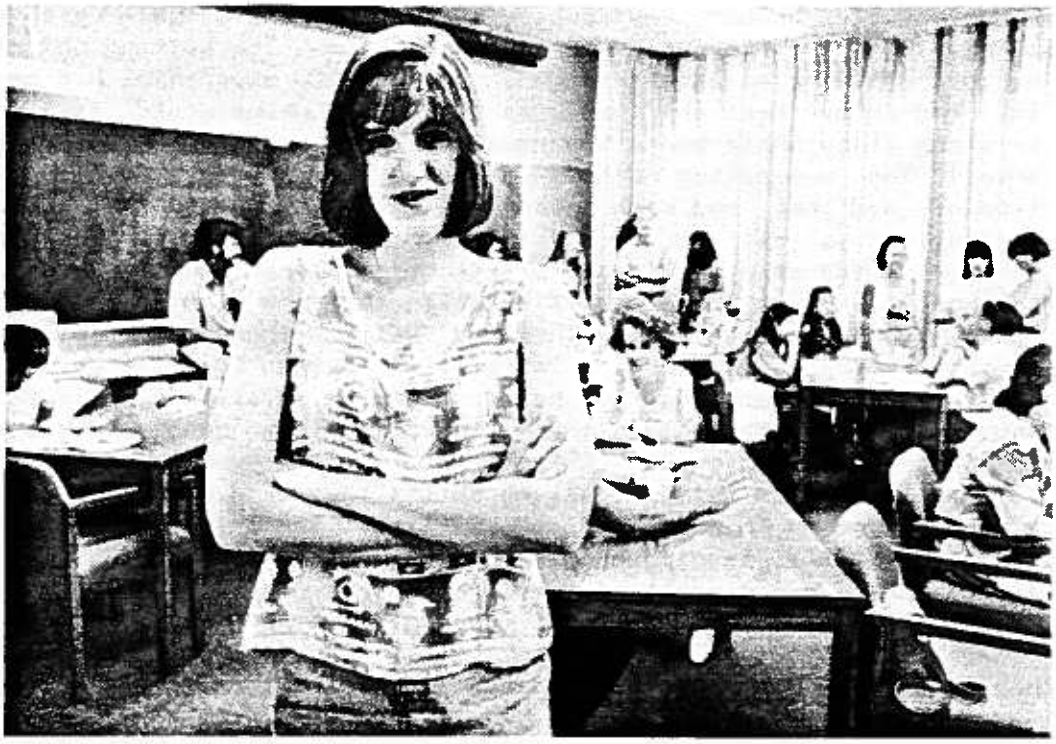
As part of the WISEST Summer Research Program, I spent the summer of 1991 at the Meanook Biological Research Station involved in studying the effects of liming on plants. The experiment was performed in barrels on three rooted plants: Myrio. exal., P. pectinatus, and P. richardsonii planted in triplicate, and one non-rooted plant: Lemna. There were thirty barrels from 1990 which were maintained to monitor long term effects. There were also thirty barrels from earlier this year, and seven new barrels which I helped to set up. We measured the lengths of the plants periodically in order to determine the effect of liming on plant growth. As well, we regularly did chemical analyses on water samples collected from the barrels. At one point, we pulled multi-celled containers called peepers from the 1990 barrels and removed the water from the cells for an analysis of the nutrients in the barrels. We went to lakes several times to collect plants for our own research and for others, allowing me to learn about other plants. I learnt how to filter samples for analysis, how to read phosphorus, and how to use a computer program to determine the concentration of phosphorus from the readings. Near the end of my first shift, a shift being ten days long, Dr. Prepas and Christine Scaber, my supervisors, decided to set up three new barrels with a different concentration of lime. The setting up of these new barrels gave me an understanding of how the experiment had begun. At the end of my next shift it was decided that we would tear down the existing sixty-three barrels because the lime was having no discernable effect. The unexpected results we had attained were attributed to the type of mud that had been used to plant the plants in. So, we were instructed to set up a preliminary experiment with four barrels containing the same species of plants but different mud. For the rest of that shift and my third shift we collected the plants from the 1991 barrels, weighed them, dried them and weighed them again. The tear down of the 1991 barrels took up a lot of time, but on the last day, I learnt how to read conductivity by helping someone involved with a different project. All the techniques that I learnt will no doubt prove useful in the future.

This job not only taught me the skills that were mentioned above, but also what research in the field is like. The setting up of the new barrels and the tear down gave me an understanding of how long and intense these experiments actually are. The unexpected results that we obtained taught me that living creatures are hard to predict and that research into them is therefore extremely interesting and stimulating. I really enjoyed working in an atmosphere where the emphasis was not on exact results but rather on a general trend. Another enjoyable aspect was that everyone was friendly and would volunteer to help. Since I had to stay at the station for ten days at a time, this friendliness helped me to feel at ease and to adapt to living without my family. Every Tuesday evening there was a small lecture where I had the opportunity of hearing from The Friends of the Athabasca, several residents of the station, and a professor from the university. These talks gave me an idea of what research in other areas of zoology was like. At the station, I got a chance to talk to people who had similar interests but had gone further to obtain them, which helped me see the possibilities for further education. Especially helpful was an ex-WISEST student who showed me that the skills and techniques I was learning were useful. One of the negative aspects was that I did not have the background knowledge so in several cases I did not understand why I was doing what I was

doing. However, this lack of knowledge has given me the motivation to continue in the sciences. In this respect, I feel that I have profited from the WISEST program the most - because it has shown me what I still have to learn. I now feel confident that I will continue studying the sciences in the future. The skills and techniques I have learned, the insight I have received into the field of zoology, and the independence, confidence and motivation I have gained have all contributed to my immense enjoyment of this program. I would like to thank Dr. Prepas, Christine, the other residents of Meanook, and the WISEST program for providing me with such an excellent experience.

Andrea Descheneau



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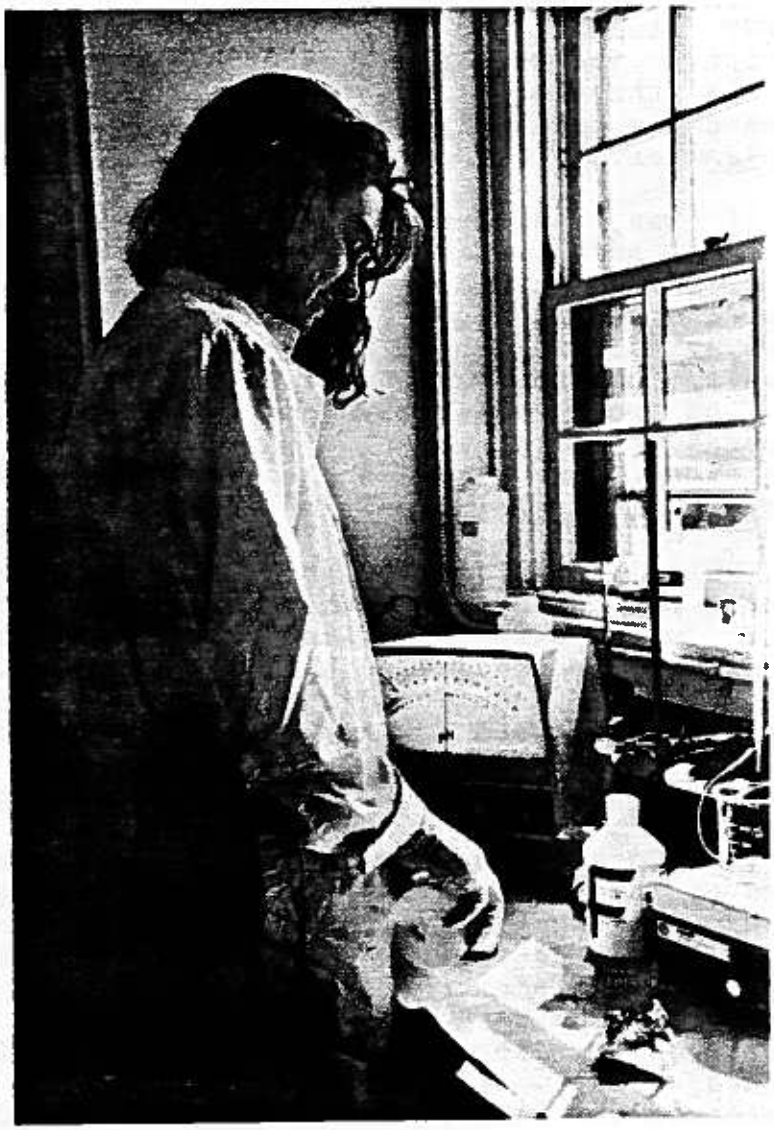

A PERSONAL VIEW OF MEANOOK
by Marilyn Robertson

This summer I had the good luck to be chosen as one of two WISEST students to work at the Meanook Biological Research Station. The Station is situated just 16 km south of Athabasca and is the location of many University of Alberta studies. Research is currently being done on fresh-water fish, plants, and zooplankton.

I was involved in water chemistry research at two lakes. One lake, Amisk, was being aerated to see how an increased amount of dissolved oxygen in the water would affect fish populations, temperature, and algal growth. Every week, samples of water were taken at various depths and then tested for phosphorus, nitrate, ammonia, chlorophyll and dissolved oxygen content. Conductivity and pH were measured, as well as light penetration and temperature of the water. Narrow Lake was used as a control for this experiment. It is a clear lake with little algal growth and correspondingly low levels of fish.

While doing field work at Amisk Lake and Narrow Lake I learned how to operate a thermoster, a flourometer, and a drogue. These were used to measure, respectively, temperature, chlorophyll content, and existing currents. In the lab, I was taught how to test for dissolved oxygen and phosphorus levels in water samples, and how to run the pH and conductivity machines. Some of the more fun tasks I performed were washing vans, picking weeds, catching baby toads, and diving for clams.

Working at Meanook was a great experience for me. Because I lived up there ten days out of fourteen, I got to know the people I was working with very well. There were university students from all over Canada (British Columbia, Ontario, and Quebec), as well as two students from Africa. My job gave me some insight into what courses I would like to take in university, and reinforced my decision to enter the field of science. I encourage everyone who can to visit the station, as it is considered the best of its kind in Western Canada.

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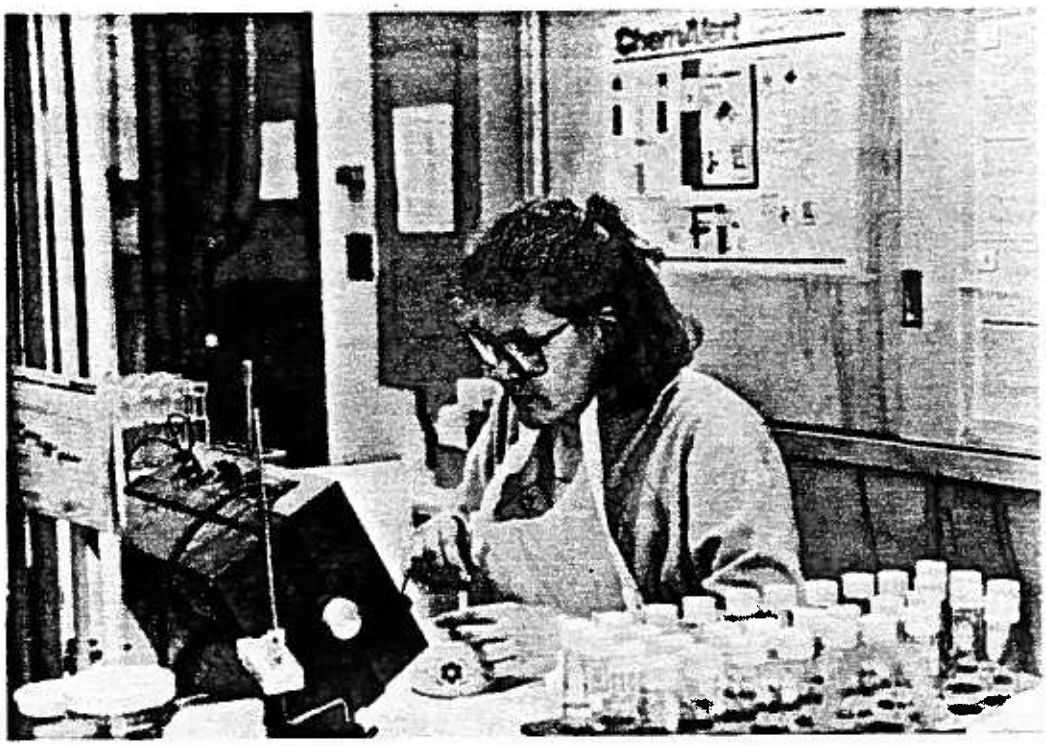

Kimberly Solga

Alyson Hrynyk

LAB REPORT-LIMNOLOGY

by: Kimberly Solga and Alyson Hrynyk

PROBLEM

To learn about and experience one unique aspect of the world of science and technology through the WISEST program.

PREDICTION

Entering the lab without knowledge of limnology, we hoped to discover exactly what limnology is, and maintain all our body parts in the process.

EXPERIMENTAL DESIGN

To complete various chemical tests (including pH, silica, phosphorus, and atomic absorbtion) on water samples collected periodically from lakes around Alberta.

PROCEDURE

8:00 a.m- Arrive at work, and proceed to don attractive white lab aprons, glasses, and orange rubber gloves, in preparation to remove glassware from the acid bath.

8:15 a.m- Rinse each item seven times with double distilled water. Place in the oven to dry.

9:00 a.m. Kim checks the field sheets for the samples requiring pH testing, collects them from the fridge, and proceeds to test them after calibrating the instrument. She also determines alkalinity by titrating H_2SO_4 into the sample until it reaches a certain pH. Alyson dilutes samples in preparation for atomic absorbtion testing (for elements Ca, Mg, Na, and K)

12:00 p.m- Lunch

1:00 p.m- Kim continues reading pHs. Alyson reads for phosphorus on the spectrometer, using tubes prepared that morning.

4:00 p.m- Clean-up and quitting time.

CONCLUSIONS

We both believe that we have learned more about water, chemistry, and the working world than we would ever learn in school. Although we enjoyed the six weeks that we spent in the lab, we would not desire to pursue similar work as a future career. In fact, the program has strengthened our desires to study architecture. We recognise the need to pick a career you truly are interested in. If we were to pursue careers in science, we would pursue our educations until we could design our own experiments.

SUGGESTIONS FOR FUTURE PROGRAMS

1)More detail in the applications as to the fields.

2)More emphasis on group activities and involvement during the weekly meetings.

3)Advanced warning of the requirement to make up holiday hours.

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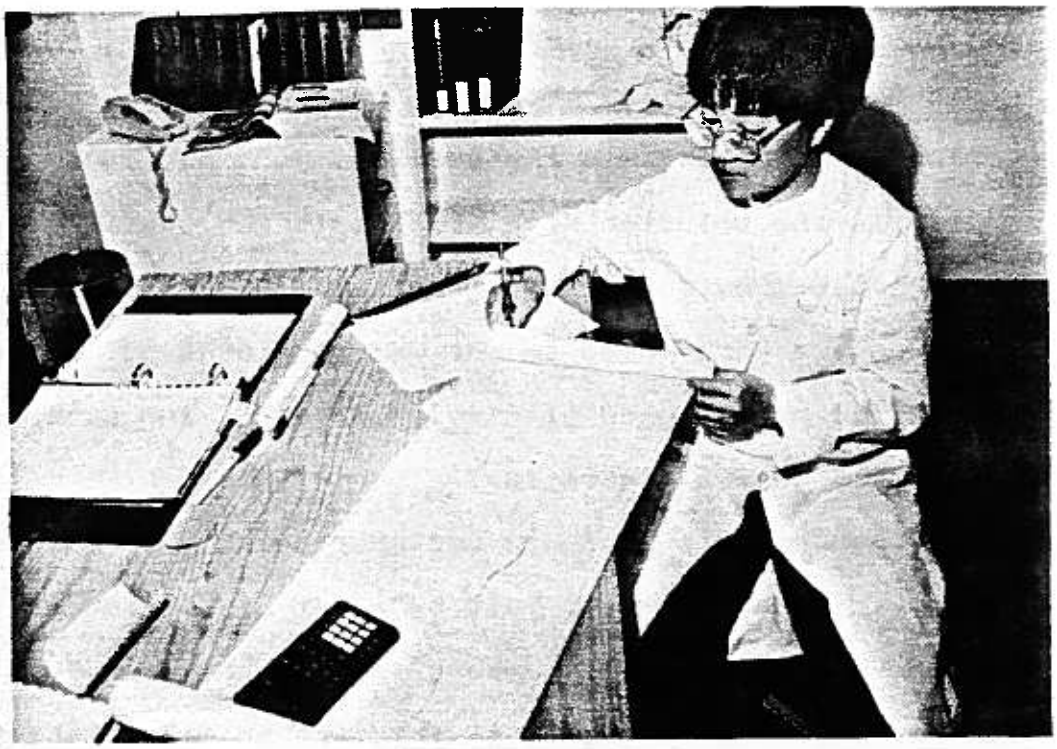
WISEST Summer Employment Program--1991

Department of Mechanical Engineering



Submitted by: Grace Chan

This summer I had the opportunity of exploring the department of Mechanical Engineering, working under the supervision of graduate students Gaby Sonego and Narendra Viswanath. I helped with several varied projects such as Narendra's polymer-metal sliding and Gaby's corrosion-fatigue and wear experiments. Around the floor, a few pieces of equipment suffered from my use, but a lot of gained experience with reading manuals helped. The one thing expected by me that was true of this experience was an interesting and fun six weeks.

The main experiment was a corrosion-fatigue experiment being done to examine the results of vibration and a corrosive environment on stress-relieved sucker rods used in oil pump horses. An almost daily morning ritual with set up with the equipment to disassemble the cell, remove the cracked sucker rod which usually failed overnight, clean the cell and jug, put in a new rod, and replenish the solution with fresh salt and distilled water from the chemistry building. After several samples were made, a set of bandsaws were used to cut small pieces of the crack appropriate for mounting in plastic, polishing, and photographing with a Polaroid camera microscope.

Other activities I did included using a surface roughness device to measure tracks left by a set of sliding polymer tests, finding the averages of numbers from an ohmmeter from a load cell to figure out coefficients of friction to make charts of the results, using a mechanical surface hardness tester, an ultrasonic surface hardness tester, printing tables and charts using Word Perfect, X-ray film preparation and development, X-ray

diffraction, using a densitometer to produce plotted graphs of the results of the X-ray photos, polishing of plastic and metal samples, and reading reports of previous years' results of corrosion-fatigue under different conditions.

Interesting projects in and outside of the building that I had a chance to visit included pelvis and knee studies, an electron microscope in the Biological Sciences building, the robotics lab, some welding, a computer lathe, and some photon detectors designed and used by the university's nuclear research team around the world in some experiments to search for subatomic force particles with nicknames like "beauty" and "truth".

Looking back, I realize I had an great opportunity to look into a wide branch on engineering and a network of knowledge spreading by close relations to the rest of science. This was due in large part to the openness of the team at this centre composed of technicians, students, machinists, professors, and staff. Though an engineering student wouldn't be doing as much practical work in the first four years, it wouldn't be hard to find an interest to continue fromtheir studies or research here.

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THE WISEST EXPERIENCE

When Dr. Dorothy Tovell (WISEST coordinator) called in July to inform me that I had been selected to be one of the relatively few who would spend about one and a half months of their summer learning about the research experience at the University of Alberta, I didn't realize that I was about to begin an exiting six weeks with benefits that would probably continue to be noticed for a long time to come. I ended up in the Division of Cardiology within the Department of Medicine. My supervisor was Dr. Alexandra Lucas and the research topic I was about to learn quite a bit about was Atherosclerosis.

The animal model we used to help in our study of this cardiovascular disease was the rooster. This specific model was ideal for three reasons. Firstly, the rooster's fairly large size allows for easy operation and examination. Secondly, it's both accessible and affordable. Finally, the rooster is useful because Atherosclerosis can be induced in it in three separate ways: virus, high cholesterol diet, and physical injury to the endothelium (the inner lining of the arterial wall) through an operation. The lab in which I worked is experimenting with all three methods.

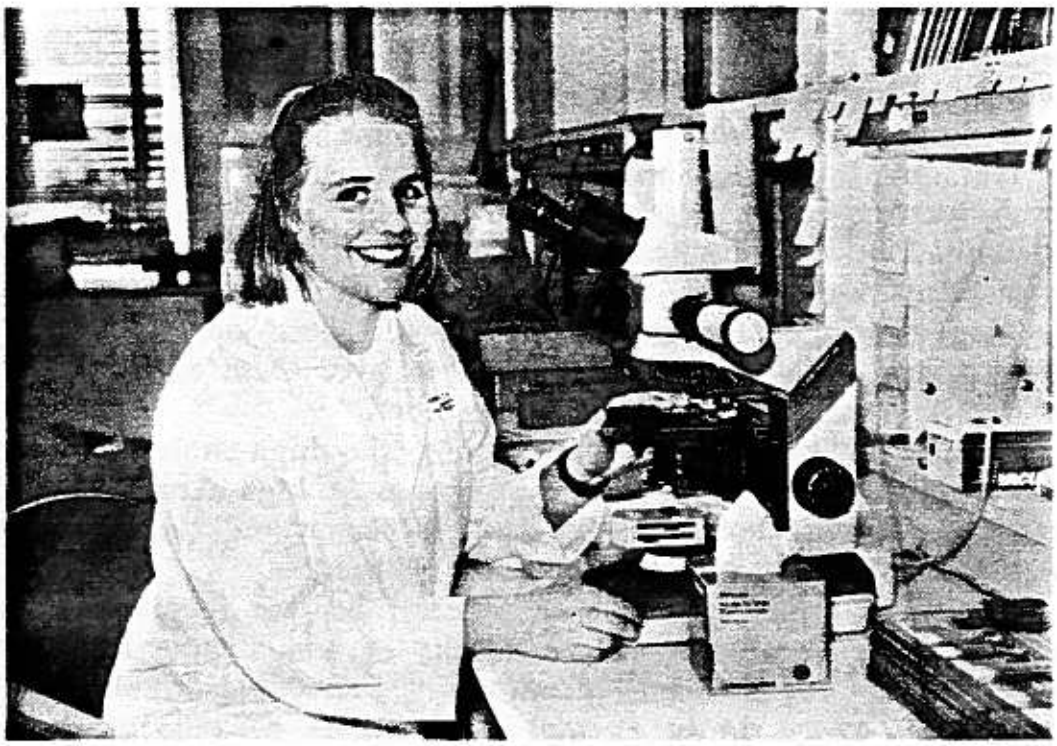
For the greater part of my time spent working at the University, I assisted undergraduate student, Anees Chagpar, and two doctors, Dr. Perk and Dr. Wen, with an assortment of investigations. The range of specific tasks to which I was assigned was fairly wide. One task which had to be performed daily was feeding aspirin to the roosters which had been operated on. There were about 16 of these roosters and to give them each half a tablet of aspirin usually took about half an hour.

Another regular job was to mix the high-cholesterol feed for those roosters which were to be kept on a high-cholesterol diet. I had to dissolve cholesterol crystals in peanut oil, then this solution was mixed into the dry chicken feed by hand.

Some of the projects with which I became involved included a protein assay (or lowry), the results of which were later analyzed along with those from previously performed cholesterol and triglyceride assays in an attempt to determine the role of these three substances in the formation of Atherosclerotic plaques. I've also done some work with monoclonal antibodies in an attempt to determine the role of platelets in Atherogenesis and plaque progression.

I found my entire experience of working at the University to be not only a situation of academic learning, but rather an experience that seemed to cover all the bases. I received a crash course in " U. of A. Geography " which will be helpful when I attend next year. I made new acquaintance and met a lot of really interesting people. I learnt about dealing with people both in and outside of the lab in which I was working. Most importantly, however, I learnt to ask questions and for help when I needed it.

Sharyn Straatsma



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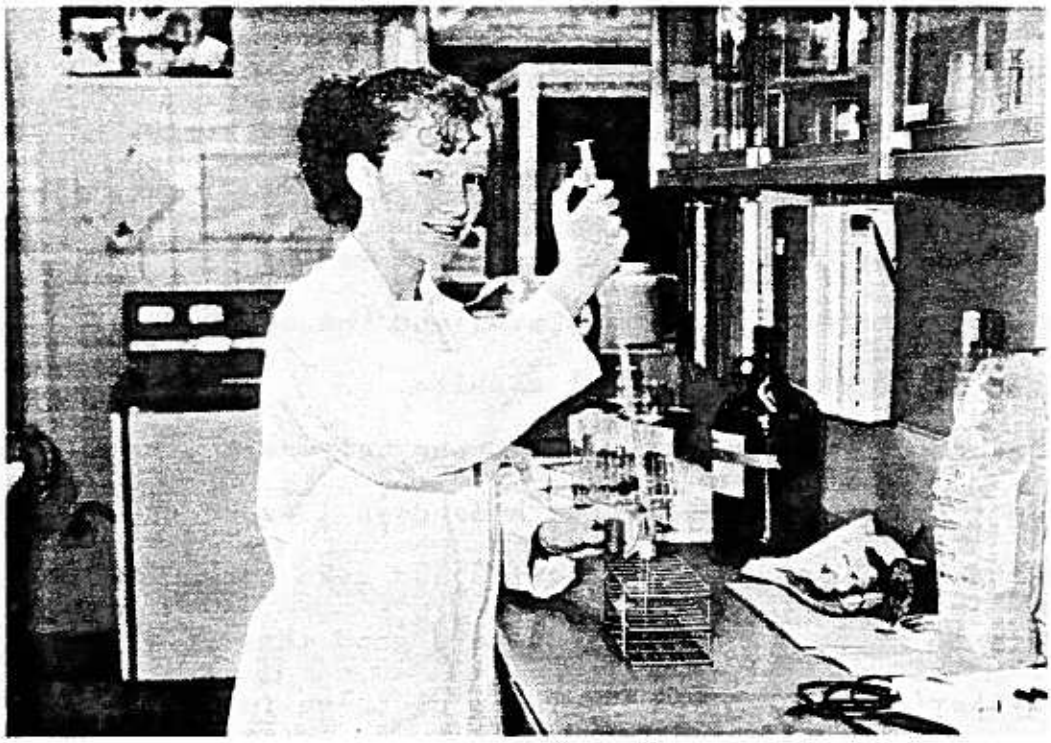
WISEST FINAL REPORT

by Tanis Toope

My research project was in the area of genetics, with Dr. Linda Reha-Krantz. For six weeks, I did a series of experiments to determine whether or not a reduction of dGTP in E.coli would increase its mutation rate. I learned how to grow bacteria, bacteriophage, and phage infected bacteria cultures. I also learned how to dilute accurately, how to titer, and how to "toothpick" bacteria. There was a lot of lab equipment that I had to use, such as the spectrophotometer, the autoclave, and the centrifuge, which helped me to obtain my final results.

I really enjoyed my work at the university, because my project had a lot of variety- some days I would experiment, and others I would record results and make notes. Working with grad students really gave me a good idea of the kind of work they do, which could be helpful to me in the future. Even though many of the students weren't there, I feel I got an excellent look at what the work of a university student is like. One of my favourite parts of the project was the three O'clock Wednesday meetings. I enjoyed the tour of the campus, and am really glad that I know my way around, at least more than before. I also was really interested in the tour of a medical lab. Before seeing this lab, I had never realized just how important research at the U of A is, or how much work is involved.

Overall, I had a great time. I think that the WISEST project I was involved in was an enjoyable and valuable experience, besides being a lot of fun and a great way to spend the summer.



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WISEST Summer Research Program

Department of Medical Microbiology and Infectious Diseases

By Teresa Pham

This summer, I was proud to have been choosen to work as part of a research project at the University of Alberta, under the supervision of Dr. J. A. Robertson. Through the WISEST Summer Research Program, I was given this opportunity to become familiar with laboratory research and what this field of science has to offer.

The research that I undertook involved working with a microorganism called Ureaplasma Urealyticum, which causes infections of the mucous membranes in some people. When necessary, the infections can be treated with antibiotics. However, the method for testing the clinical isolates for sensitivity to one usually effective antibiotic is not well standardized. An international study has been set up to address this problem. My contribution to the research was to lyophilize the cultures of the organism for distribution to laboratories around the world for further testing.

In the begining, I worked alongside with Dr. Robertson to carry out the control steps to lyophilize and preserve the cells. I learned how to grow the organisms by inoculating the cells into prepared media for incubation. When the organisms have multiplied, they were harvested using the centrifuge.

Next I dispensed them into tubes for lyophilization. This procedure is commonly known as freeze-drying. I was taught to use sterile techniques with each step to avoid contamination. After some practice, I was able to work independently on the project and found it to be very interesting. As part of the work, I also had the experience of using the many different kinds of equipment available in the laboratory.

From my experience, I gained a better understanding of what research is all about. Along with the many hours devoted to hard work, honesty, reliability, perseverance and patience are qualities essential for success. In the end, however, the results will prove to be worthwhile.

Outside the laboratory, I had the occasions to tour around campus and visit with people in different fields of study. After talking with a few students, I learned what it is like to be studying at the U of A and the life on campus. I found the students and staff to be very friendly and always welcome any questions I might have.

I feel that I have benifitted a great deal during the short six weeks. Working in the laboratory helped me to discover some of my strenghs and weaknesses. My experience provided answers to questions that will assist me in the years ahead to decide upon a career. What I now know will allow me to make future choices with more confidence. WISEST has given me the positive encouragement and a rewarding experience which now lead me to view science as a career possibility in my future.

I would like to thank Dr. Robertson and the people in her laboratory for their effort to help make this summer so enjoyable for me.

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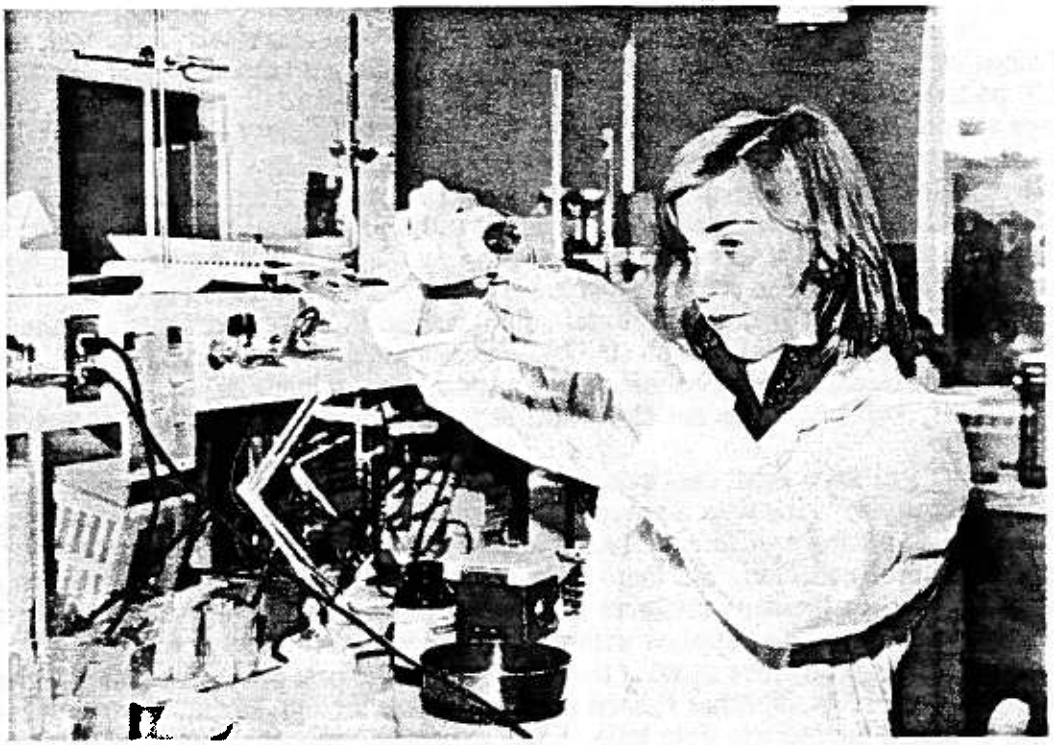
An Introduction to Soil Chemistry



Kjariene Kasa

Department of Soil Science
University of Alberta

August 9, 1991

The project I was working on was aimed at studying the adsorption/desorption of chemicals in the soil. Specifically, I studied which factors allow PCP (pentachlorophenol) to stick onto the soil. Why is this important? PCP is a widely used biocide and therefore is potentially very harmful to the environment. This chemical may enter the ground by way of a spill, reaching our groundwater and eventually the water we drink. If we can determine what allows PCP to adsorb, we are effectively able to clean the ground. We know that soil is made up of clay, sand, silt and organic matter. While clay is the mineral component responsible for adsorption, organic matter greatly influences the adsorption of chemicals. Therefore it's important to study the organic matter content of the soil sample in its amount and type. In the experiment I worked on, we used clays from two sites, each site having a different organic matter type and content. Shale organic matter is very old, with minimal amounts of organic matter on the clays, while the organic matter from a surface soil (Ah) horizon is relatively young and abundant.

In order to determine the adsorption/desorption of chemicals in the soil, a series of steps were completed. The process included 1) to prepare the clays and 2) adsorb PCP on the clays. For the preparation, clay separations were done (this means that the clays were separated from the soil sample by gravity sedimentation techniques). The characterization of the clays were completed by using an X-ray diffraction analyzer. This machine shows the d-spacing or distances between the atomic layers of a clay. A certain distance is characteristic of a certain type of clay. Later, the organic matter content of the clays had to be analyzed by burning the sample in a combustion furnace. Secondly, the adsorption studies involved taking a known amount of clay-organo sample and mixing it with a PCP water solution. The PCP was extracted and then analyzed by a gas chromatograph (G.C.). The amount adsorbed was calculated by taking the difference. I was only involved with the preliminary stages of this experiment, so results were not obtainable at the completion of my work period.

I've learned a great deal aside from the technical aspects of my work. I've had the opportunity to work with a group of dedicated people. Each day held its share of failings: each posing a different circumstance that had to be overcome and learned from. No one likes to fail. Yet these setbacks are the greatest indicator of our learning processes. Amidst the daily mistakes in the laboratory were discoveries revealed: new methods were shared and applied with others, in order to further each colleagues' research. Scientists believe in what they know from the past yet thrive on what they will know tomorrow. Thomas Edison personified this dictum. He failed many times trying to create the electric light bulb. Some expressed wonder at his perseverance and great efforts, all apparently in vain. Yet Edison looked at his work from a different perspective. "Never thought of it as a failure. It was only a thousand ways not to make a light bulb."

I would like to thank Dr.M.J. Dudas and Dr.A. Kharrat for acting as my supervisors, Connie Kohut and Clara Qualizza for allowing me to be a part of their work and all in the Soil Science department for their support.

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Environmental studies, especially in relationship to plants, has been one of my main future career interests. For the WISEST program, I was given a position in the Soil Science Department under the supervision of Dr. Anne Naeth. Soon after starting work, I learned how environmentally involved the study of soil really is.

Working in the Soil Science Department has exposed me to many different experiences within long-term, full scale research projects, including working both in the field and in the Soil Physical Analysis Lab.

The lab work consisted of washing weigh boats and bottles; weighing oven-dried soil samples; making quantitative and qualitative observations of water from the Stavely runoff project. After evaporation of the Stavely water from the weigh boats, the mass of the residue left inside, is taken and may be used to determine the rate of erosion. Observation of this residue helps to ascertain its origin. I also washed roots. As time went by, I was given lab work, that will have an impact on the research being done.

Studies are being done at various sites around the province, but I worked mainly at the Highvale and Whitewood coal mines near Wabamun. Activities in the field included clipping and sorting vegetation, which was then dried and weighed, as well as observing roots in pits dug on site One of the soil tilth project. Both of these data are used to help determine the productivity of reclaimed land at the Highvale coal mine.

Usually seven people, including me, went to the sites near Wabamun. We worked mostly outside, but if any vegetation samples had to be sorted, they would be completed inside. Because we worked long hours in the field, we had a four-day instead of five-day work week.

Everyone was accommodated at a house near Wabamun, that has been rented by the University. Living with some of the staff of the Soil Science Department, provided me with the opportunity to hear their personal viewpoints, regarding their training and work, which has helped me to bring my career plans into much sharper focus.

I have greatly enjoyed my summer experience.

Denise Erickson
Supervisor: Dr. Anne Naeth
Soil Science Department

32 **MEDICAL SCIENCES: ANATOMY AND CELL BIOLOGY**

Fibronectin Distribution During Chick Embryogenesis

by Karen Wong

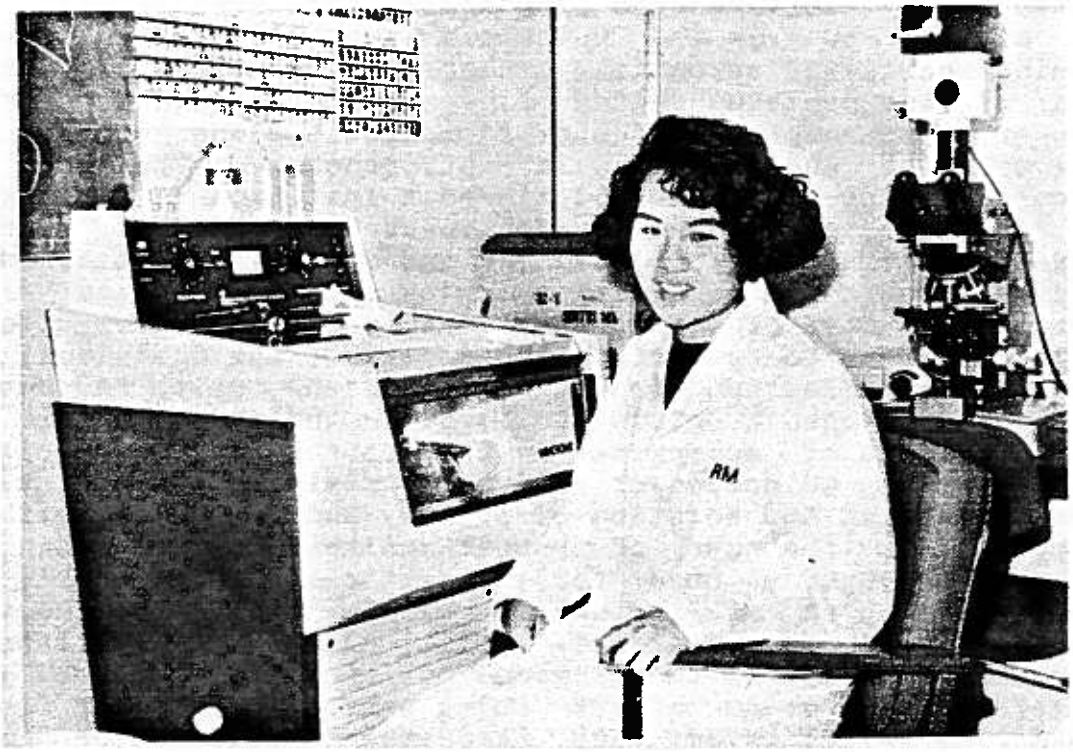
Under the supervision of Dr. Keith Bagnall, work was primarily conducted in the area of embryology. Research involved studies of fibronectin distribution in chick embryos between the developmental stages of three days and ten days. On a general basis, the objective of this research project, as part of a continuing series, is to determine how the vertebral column develops. From an applicative aspect, research could lead to achievement of the stated objective as well as relate to human vertebral formation, perhaps detecting causes for vertebrae diseases such as scoliosis (curvature of the spine).

The selection of chick embryos, varying from three days to ten days of incubation, were used because of their developmental progression, which shows somitogenesis and initiation of vertebrae formation. In the vertebrate embryo, somites are segmentally arranged blocks of mesoderm (middle germ layer) situated on either side of the notochord and neural tube (precursor of central nervous system). As embryogenesis progresses, the somites will disperse and migrate towards the notochord and neural tube, eventually forming cartilage resembling anlage. In vertebral formation, the role of the protein called fibronectin is not clearly known. However, it is speculated that fibronectin plays a major role in cell adhesion and migration in embryogenesis. Therefore, further discussion associates fibronectin as a initiator of somitogenesis.

In this independent study, procedure involved four primary stages: extraction, blocking and cutting, staining, and documentation. In extraction, chick embryos ranging from three days to ten days of development were removed from eggs and fixed for twenty-four hours. After this period, the individual embryos were then immersed and frozen in isopentane, which had been cooled by liquid nitrogen. Cutting followed as individual blocks were cut into sections of approximately ten micrometres and collected on slides. Upon selection of slides for staining, preparations were made concerning the addition of primary and secondary antibodies of fibronectin. The use of rabbit-antihuman fibronectin as the primary antibody allowed for its attachment, presumably, to all exposed molecules of fibronectin within the embryo section. A secondary antibody, goat anti-rabbit, allowed for attachment of a fluorescent indicator to all areas containing the primary antibody. Therefore, all areas of the chick embryo possessing fibronectin would be highlighted with fluorescent colouration and allow detection. After staining, slides were then viewed and photographs were subsequently taken of pertinent sections documenting fibronectin distribution in the vertebral area of the chick embryo.

Upon completion of this experiment in a duration of five weeks, results documented significant differences in spatio-temporal patterns of fibronectin distribution during chick embryogenesis. Fluorescent colouration showed brilliance and varied in location in the vertebral area as chick embryos developed, indicating site and presence of fibronectin.

On a personal view, I thoroughly enjoyed my experience and appreciated the opportunity to work in a lab and in the area of Medical Sciences. This experience has greatly expanded my awareness of science and scientific research. It was a great learning experience working with my supervisor, Dr. Keith Bagnall, for he showed me the true meaning of scientific research by encouraging independent work. At the beginning, he showed me how to conduct the experiment and was there if I required help, but as the summer progressed, his guidance eased off more and more, until it was virtually my own experiment. At this point, it was my own responsibility to conduct the experiment and resolve any impending problems. From this I was able to relate scientific research to the analogy of a maze, where every turn or path you take is purely an independent decision and it is this decision which will lead you to a dead end or take you closer to the prize. But most of all, through this opportunity, I was able to experience both the frustrations and successes of research, and that in essence, is the true meaning of science.



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DEPARMENT OF ANATOMY AND CELL BIOLOGY

STUDY OF SOMITES

BY: NICOLE AURIAT

My project was in the Department of Anatomy and Cell Biology under the supervision of Dr. Bagnall. It involved working with chick embryos and the cells believed to form the vertebrae of the spine. Groups of these cells, called somites, are on either side of the notochord. During formation the cells migrate towards the notochord, surounding it and forming vertebrae. During this migration the cells use fibronectin, a protein, for movement. My project involved taking the somites from a two day old chick embryo and make cultures of them by placing them in culture medium and then incubating them. Once placed in the culture medium the cells of the somites move and spread across the culture dish as they would in the embryo. I studied the different stages of growth and would, at various stages, replace the normal culture medium with medium containing antifibronectin. This antibody neutrulizes the fibronectin and I recorded the effect this had on the growth of the somites. The purpose of conducting experiments concerning the formation of the spine is to help find cures for spinal diseases such as Scoliosis(curvature of the spine). There is a considerable lack of knowledge concerning the formation of the spine and it is believed by many scientists that in this formation are the answers to many of the spinal problems that occur in later life. Only time and research will bring scientists enough information to solve these problems.

As my project was an independent one most of the decisions were mine alone to make and this responsiblity allowed me to experience what doing scientific research was like. A bad decision could mean the failure of many days work while a good one could mean results and success. I realized the patience and endurance a scientist must have and the frustration and hard work that is involved with research. I went into this project ignorant of what science was about and came out of it, thanks to Dr. Bagnall, a little more knowledgable. The respect I gained for the scientific community, alone, made my six weeks this summer worthwhile. I would like to extend my appreciation to the founders and directors of the WISEST summer program, Dr. Bagnall, and Ning, his lab. technician, for an enjoyable and enlightening summer.

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Agricultural Engineering

By: Lisa Boorse

Supervised By: Dr. Jerry Leonard

Being accepted to take part in WISEST has been a really great experience for me. It gave me lots of opportunities to learn about the University of Alberta, both socially and academically. One of the highlights was meeting and working with lots of interesting people and listening to their experiences and advice. The people at the U of A allowed me to get a feel of the friendly atmosphere here. There was tremendous freedom to ask questions about anything, which I enjoyed. After exploring many different faculties and areas on campus, I feel less intimidated by the size of the U of A and that I could survive here. Through this program, I have more of an idea of what career areas I am interested in. I feel that there could be something in science for me. On account of the broad nature of Agricultural Engineering, I was introduced to most areas of engineering, which has helped me to understand a lot more of what engineers do. Possible career opportunities for me in engineering, especially Computer Engineering, have been brought to my attention from this experience. The lack of females entering Agricultural Engineering was noticeable and unfortunate. Although I enjoyed my stay at Agricultural Engineering, it was a little sad and frustrating as this important department received news of a definite shut down.

The main project I was involved in was the research project dealing with new computerized pig feeder systems. These feeders monitor the feed each animal receives. The project was to set up standards to measure future systems by. Each pig has a special ear tag or collar which signals each one as it enters the feeder. With video recorders and painted symbols on the backs of the pigs, checks were made on the computer's ability to correctly identify them. Tests with known masses were conducted in the pig feeders periodically to check for the

accuracy in measuring feed consumed and to compute the time period after which recalibration is required. I helped in the computerized data manipulation, interpretation, organization and graphing. Also related to the hopper styled pig feeders is the mini project of experiments which I researched and carried through to collect data on how moisture content is related to bridging in the feeders. Bridging causes problems with feeders as they do not let feed through but are set so that the computer still believes that the animals are fed. Farmers are unable to see inside. This can possibly cause damage to the expensive animals. Grain storage bins are similar in structure and also have problems with bridging. However, it is even more complex in emptying these bins because of their huge size. I compared moisture content of the milled grain feed with bulk density, internal and external friction, and particle sizes, and reported on the data collected. Within the department, I learned about many other things, especially about computers and electronics which are complex, yet fascinating. WISEST has been a valuable and rewarding experience that I am proud to have been through.

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IMMUNOLOGY - BY FAUZIA MOHAMED

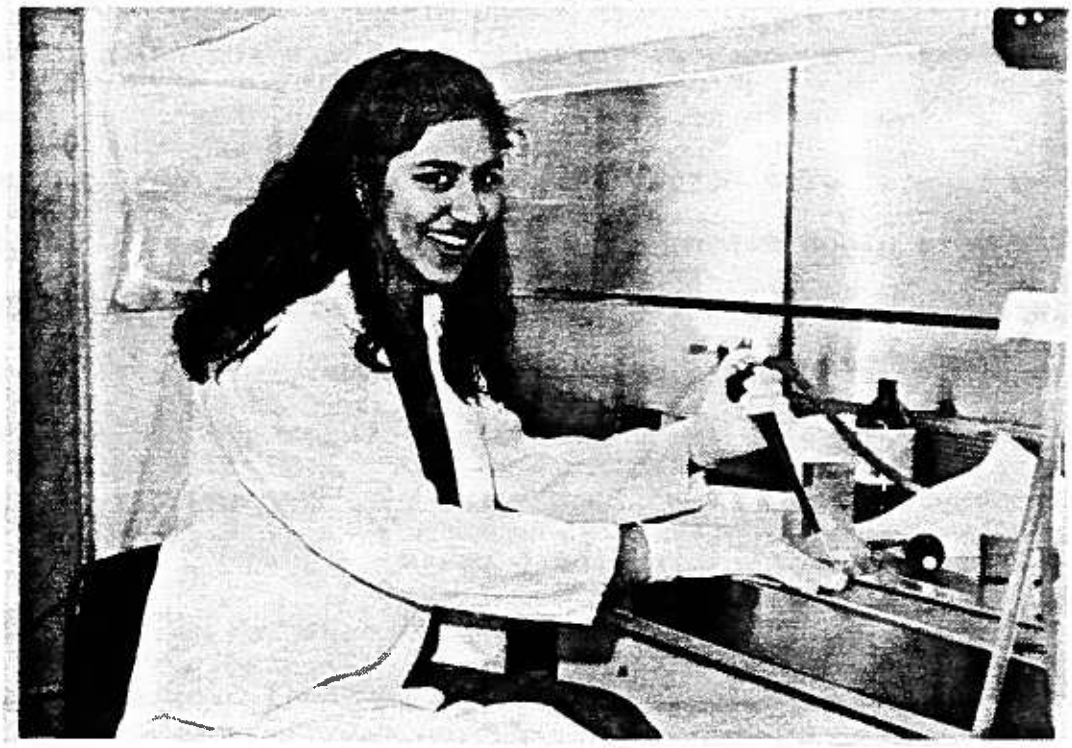
This summer I had the pleasure of working for WISEST in Dr. Linda Pilarski's Immunology lab. The experience of this short term job was incredibly gratifying and beneficial in my attaining hands-on experience in scientific research. The opportunities given to me by many of my fellow colleagues, to perform the duties of the lab to my capabilities, left me with numerous new skills of which I am sure to benefit from. The interactions within the labs were quite rewarding and I found that the variety of personalities in the lab offered me a greater understanding of what it takes to cooperate with each other in the lab and make the time spent efficient and productive. As for my specific responsibilities, I am pleased to account the vast areas which I was involved in in the lab.

Immunology refers to the study of the immune system - our lab specifically dealing with the human immune system. This system deals with trying to fight any foreign objects which might enter the body such as viruses, flu bugs and harmful bacterias. For a few years now, the Pilarski lab has been working on experiments with Multiple Myeloma (MM) Cancerous patients. Of the whole blood taken from these donors, the red blood cells are discarded and the white blood cells are separated into their subsets by a process of centrifugation. The peripheral blood mononuclear cells (PBMC) are then used to accumulate the lymphocytes and the monocytes. Of the lymphocytes, I specifically worked with the B cells.

The project of which I was a part of this summer was to study these B cells by two color immunofluorescence (IF) using antibodies directed to a broad range of B cell markers. Through

this process we are trying to detect what stage each B cell is at in its process of fighting the disease. By knowing the stage of the B cell, eventually, we will be able to determine the extent of clinical treatment necessary to improve the condition of the patient. From previous studies, it has been shown that the large subset of monoclonal B lymphocytes from myeloma patients are at a late stage in B cell differentiation, continuously progressing towards the plasma cell-stage. Therefore, as we are still in the process of experimentation in order to determine the defined stages of B cells, my studies were eminent in describing the processes needed to further carry out any additional experiments.

Thus it is through the WISEST program that I have been given the opportunity to experience research in science, and I found that this time spent was indeed very consequential to my growing knowledge of the world around me and I am grateful to the program for it's success as well as mine.



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Nicole McMillan
Canadian Network for Space Research
University of Alberta

WISEST
August 9, 1991

The time spent at the Canadian Network for Space Research was enjoyable yet also informative and challenging. As I had never had any instruction in geophysics, Dr. Gordon Rostoker spent the first few days giving me some background knowledge. After studying theories such as magnetic flow around the earth, we came to the real problem: auroras. I learned that because of the structure of the earth's atmosphere, auroras will form in an oval around the pole. I then used a computer to display images of the oval taken from the Swedish satellite, Viking. My job was to search through the pictures and create a data base of definite cases where auroral activity found closer to the pole was separated from activity located closer to the equator. Dr. Rostoker is to use this to determine if the two areas are independent of one another. After nearly six weeks of examining the images, I have found that in the majority of cases, poleward activity experiences more frequent and sudden changes in light intensity, while equatorward auroras remained steady. This is to say that they do appear to be separate occurrences. This same data base however, has also proven useful to other staff members in the lab. They will be using the images for projects such as the creation of a model of particle flow in the atmosphere, and the monitoring of auroral forms, positions, and patterns that may develop.

The WISEST program not only gave me the chance to see a different side of the spectacular northern lights, but I also have a new view of the field of physics. I realize now how diverse a subject it is, with an area of specialization for almost any interest. And even though the basic laws of physics are known, there are still a multitude of mysteries about how they apply themselves in the world around us. A few weeks into the program I was able to see real scientific progress being made when a conference was held in the lab. There was a lot of disagreement over which theories were correct, but the constructive criticism that followed allowed the speaker, and all others present, to reexamine his topic with a more objective viewpoint. This type of atmosphere carries itself not just in the conference room but also throughout the whole lab. Coworkers, who have differing ideas, could still work together in order to find what was closest to the truth. In general, I found all the staff to be very helpful and cooperative. I was not made to feel, at any point, as though I were inferior to any of the other students or employees. Any questions that I may have had were answered as well as they could be, with consideration to my level of education.

Over the summer, I was left with the responsibility of completing the research, with no direct supervisor. This gave me independence to work at my own pace, but also self-motivation and discipline to ensure that it got done. All in all, the experience was a good one. I now have a further understanding of the atmosphere around me, and also of the scientific processes and work that go into everyday research. Going beyond that, I have also found people with common interests and who have given me insight into university life.

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Christine Zinner
Department of Microbiology
Supervised by Dr. G.W. Stemke

As an employee of the WISEST Summer Research Program, I have come to a greater understanding of the life of not only a researcher, but also an employee in the working world. The final goal of the entire research project, of which I had a part, under the supervision of Dr. Stemke, is to be able to detect *Mycoplasma hyopneumoniae*, which is pathogenic in pigs, in the presence of its very close, non-pathogenic relative, *Mycoplasma flocculare*. These two organisms, which have theoretically evolved from bacteria, have only small portions of each of their DNA molecules differing in base sequences. The task is then to determine which differences account for pathogenicity verses non-pathogenicity in the same host. By following the PCR (polymerase chain reaction) protocol, we were able to greatly multiply only certain differing DNA segments. Primers (several oligonucleotides) began the replication in a particular location. New bases were added with the aid of Tag polymerase enzyme. With the help of a special machine, this process gave us a large number of identical DNA segments to work with. Under electrophoresis, these samples were run through an agarose gel and then stained with ethidium bromide. This allowed us to see the DNA bands under an ultraviolet light. Analysis of the gel results then provided us with or without new information, which then can help solve our question.

A few of the things which I enjoyed most about this summer position were the anticipation involved in the participation of a research project, and the tremendous learning experience which was involved. Most of the equipment and procedures that were used I have not previously encountered in my highschool classes. For example, I had to learn how to use and operate eppendorfs, centrifuges, an autoclave, photography equipment and vacuum dryers, to name a few. Apart from the specific project experiments, I initially had to read a collection of articles and sections of books to establish a foundation on which I could base my work. I also discovered that laboratory work is not isolated from daily routine housework. Using the knowlege I had learned at home, I mopped floors, washed dishes and defrosted freezers. An observation which greatly astonished me was the quantity of material which we mostly worked with. 0.5μL is a VERY small comparison to the usual 100-250 ml experiments we carried out in Chemistry 20 classes. As well, everything had to always remain sterile. When working with such minute volumes, the slightest contamination could be disastrous. I learned that gloves and notes were some of the most important things in a Lab. Careful records were kept of all the procedures and data. However, I was exposed to a lot more than just experimentation. Many times, I functioned as a secretary, such as sending FAX messages and entering references into the computer. I also spent many hours

searching for written documents in particular journals at the Library. When the Lab technician left, I filled many of his duties as well. With this exposure to the different areas of work, my appreciation for scientific research, and my knowledge of other responsibilities, has been greatly increased. The emphasis on working hard, exercising patience, and striving for accuracy and precision was stressed over and over again, and thus prepared me for my future adventures into further areas of life. I was also impressed by the friendliness of those all around me, and the orderliness of the entire Department. These six weeks flew by before I could blink an eye. I owe all my gratitude to those who made this tremendous experience possible, and a special thank you to Dr. Stemke, who helpfully provided many explanations and illustrations, and who aided in the transformation of this summer into one of the most enjoyable I have ever had!!

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Project: Food Science
Supervisor: Dr Spornes
July 2 - August 9, 1991

The past six weeks working at the University Of Alberta through the WISEST program has been one of the most incredible experiences! I feel that I was lucky to be chosen and I learned more about my department, the university and the different fields of study in the Scences.

I was selected to work in the department of Food Science. Food Science is the study of the components of food and the factors that affect food. My assignment was to be a research assistant for the testing and evaluating of honey.

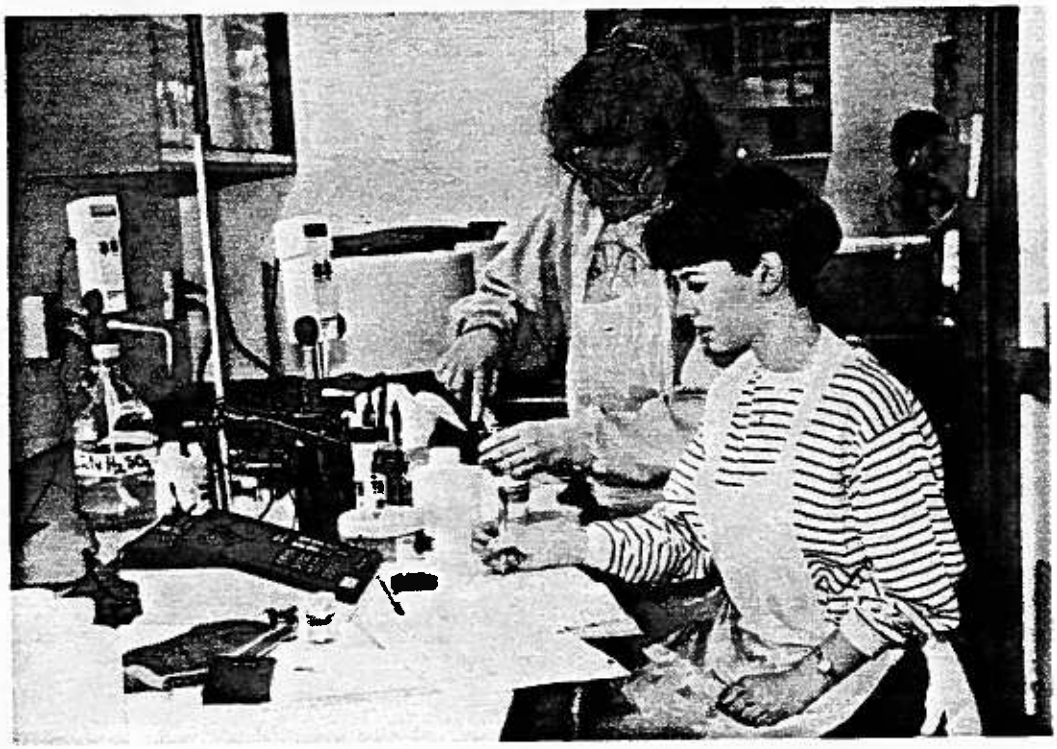
Honey was sent to the lab from various sources. I was taught how to correctly measure out substances, make a stock solution and then test the solution in various machines. I got the chance to operate equipment that I normally would not have access to in a high school lab. More importantly, I learned how to read the results of the experiments and interpret them. The things I learned in theory in the Sciences at school, I was able to put into practice. It was a terrific method of learning!

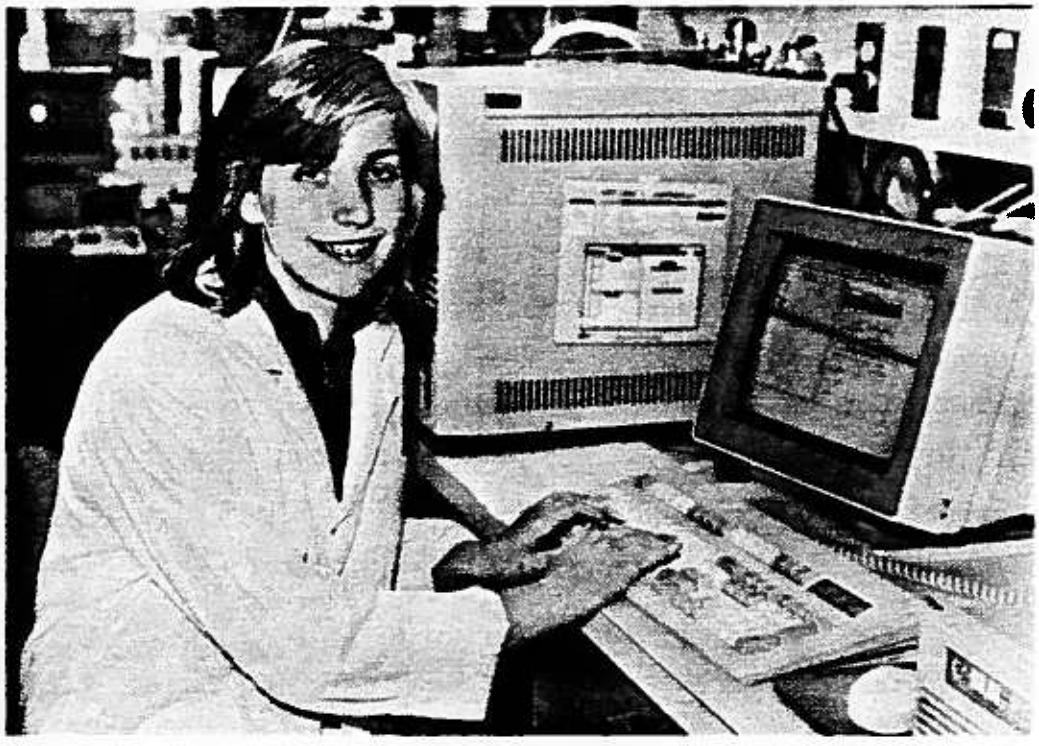
The University of Alberta is an incredible place! Each department is like a small community within the larger community. I felt that I was part of it. I was able to use different facilities and interact with the regular users, to get a better idea of university life.

To have the chance to even work at the University while still in high school is invaluable. I found that this early introduction through WISEST has given me an advantage of knowing the types of programs that are offered to women in science. The opportunity of seeing women in non-traditional fields during the WISEST meetings, really reinforced my interest in the Sciences. I think that to be at the University of Alberta in a science faculty, will be *the* place to be in 1992 when I graduate from high school.

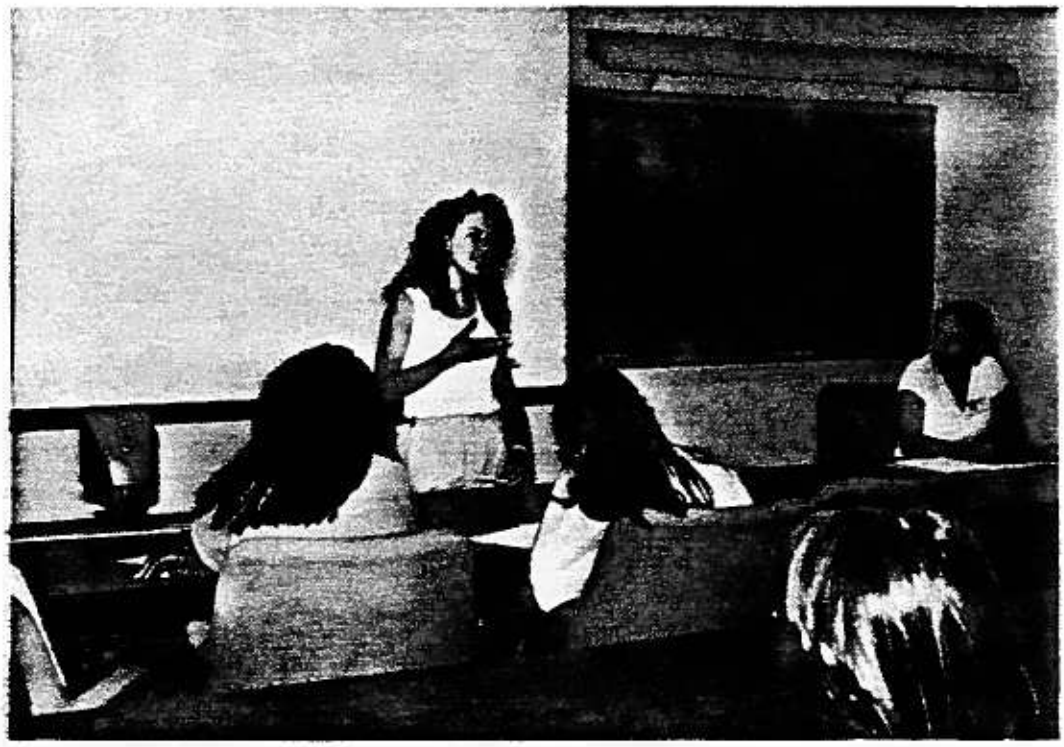
- Tanya Haluk

...in the lab





....student presentations



....at the final luncheon

Janice White, Alberta Women's Secretariat, speaking at the final luncheon