Jennifer Graham
Dr. Armour
Pat Doran

WISEST Program - Summer '90

I was in the Chemistry Department, working in the Chemical Exchange Program. My supervisor was Pat Doran. For my first week, my partner and I put recycling labels and code stickers on a large batch of newly recycled chemicals. After we had labelled, Pat listed the chemicals on a form which was then sent out all over the campus. People then ordered chemicals, which they wanted, and we filled the orders and delivered them. The second week, I had to design a program for the lab computer so that we could have an easily accessible list of all the available recycled chemicals. I also helped Pat compose two "form letters" that we stored on the computer. One form letter was to request safety information, from various companies, on certain chemicals. The other letter was to request information/articles for a recycling letter that the Exchange Program is starting. All this computer work took me two weeks to complete. Also, some days we had to stop what we were doing to help Dr. Armour proof-read next year's Chemistry Lab Manual. My last two weeks I have spent doing lab experiments for Dr. Armour. She wanted me to do the labs and determine whether or not the experiments work. If they work, Dr. Armour may put them in next years lab Manual. My first experiment was the free-radical polymerization of Stirene (making polystyrene using free-radicals) Polystyrene is used in the manufacturing of plastics and synthetic rubber. I used two rather

By Karen Leonard
for Dr. Armour
Chemistry
August 10, 1990.

It has been a most interesting experience working for WISEST this summer. Expecting to be doing gopher jobs for the chemists in my lab, I ended up performing experiments of my own.

During the first week of work, I learned how to use just about all of the equipment in the lab. Different experiments taught me how to use the Gallenkamp to find melting points of certain substances, how to do a recrystallization, how to reflux, how to do a vacuum filtration, and how to do a distillation.

Throughout the next weeks of work I made different polymers. It was my job to find safer ways to carry out the experiments, the length of time they took, and how efficient they were. My lab partner and I also made pear essence where we learned to use the infrared spectrophotometer. I later made different semicarbazones and learned to use the ultra violet spectrophotometer.

My final lab was the preparation of copper phthalocyanine, a very stable blue pigment. I enjoyed this experiment the most as it was the first time I really worked with colours.

The last six weeks have been quite the crash course in organic chemistry. I have many memorable experiences to take away with me. I have seen what is involved in research and I can now make that much more of a knowledgeable decision about my future.

WISEST Summer Program 1990

Susan Shalanski
Chemistry (under Dr. M. A. Armour)

During the first weekend a half, I worked out of "organic chemistry experiments", which is the Chemistry 250 laboratory manual. I did the first 4 labs to become familiar with such processes as: melting point determinations, recrystallization, extraction and distillation. They would be needed for the other experiments I would do. Following the introductory experiments, I worked on my first project. A lab in the Chemistry 350 course, consisting of the reduction of a ketone to an alcohol was causing some trouble because there was a discrepancy as to which substance was crystallized and collected at the end (the starting ketone or resulting alcohol). To get accustomed to the process I did the lab using the ketone benzophenone. I used thin layer chromatography and infraredspectrophotometry to help with the identification. Thin layer chromatography is used to determine when a reaction has ended and the infraredspectrophotometer produces a spectrum unique to each substance thus aiding in identification. The results from the benzophenone experiment showed that the substance collected and recrystallized was indeed the end product (alcohol — benzhydrol). I repeated the experiment using the ketone that was causing the trouble - 4,4-dimethoxy-benzophenone. Using the same methods, I concluded that the crystals collected and recrystallized were actually the starting material and that the end

product was in the filtrate. I discovered this when the liquid evaporated off when left on the counter. The next experiments I worked on were to be potential labs for the next year's manuals. The first one I worked on was the making of pear essence (an ester) called isoamyl acetate from an alcohol. The odor produced was very strong and "pear-like". I then worked on the production of semicarbazones of cyclohexanone and furfural so that my partner could examine the kinetic and thermodynamic products. The last experiment I did was the production of gramine which is a naturally-occuring alkaloid, produced in barley. I am getting different results each time I repeat the experiment but don't think any of the products is the gramine I am looking for.

I have enjoyed working with WISEST and have definately learned alot. Although I do not plan to make a career in Chemistry I know I will most definately using the researching skills I gained in whatever I do.

Brook Tsegaye.

9/8/90

The collection of clothing and textiles consists of approximately 20,000 costumes. They are of different periods and cultures. The oldest textile found in University of Alberta is the Peruvian fragment which was at pre-colombian times, that is 300 A.D. The collection has spread throughout North America. The collection includes history of costumes, preventive-conservation, historic textiles and cultural textiles etc. About half of the collection consists of mens wear, womens and childrens wear. The earliest western dress kept in the University of Alberta is of 1760. The university of Alberta has the largest clothing and textiles departement in Canada.

All the artifacts are kept in accession number so anyone can refer to it very easily and it is registerd into the computer program for easier use. To protect this artifacts from some unwanted factors like humid, temp, insects and sunlight etc so coreing must be done to preserve it as well as possible. Restoring the mens wear, and childrens wear by making shelves and, hanging storages and moving the artifacts to a new place. We also create research files for patterns & photographs and photocopied artifacts so that the copies will

be handled and not the fragile artifacts.

Various cultural organization make use of the collection for research purposes for providing their groups the opportunity to tour through clothing and textile facilities

During the time I spent at the University this summer, I was helping researchers in the forestry department. As well as working in the general area, I spent a few days in the forestry genetics laboratory. I also had a tour of the Canadian Red Cross Blood Donor Clinic and spent two days working with researchers there.

One of the experiments I was helping with dealt with jack pine and their ability to adapt to possible climate changes. In this experiment twelve hundred plants are being grown and their root systems will be measured. The researchers are trying to find out if complex root systems are inherited within different tree families. I participated by cleaning seeds (in which empty seeds that had been eaten by insects were removed), labelling them after the weight was taken and by planting them. I then entered data from previous experiments into the computer using the Lotus 123 program. I also took seeds out of pine cones that will be used for another experiment.

In another experiment a species of jack pine from a southern habitat was planted in a northern region and a species from a northern habitat was planted in a southern region. The researchers want to know if northern jack pine can survive if the climate changes and our climate becomes warmer. I spent a day at one of the sites in Bruderheim seeing how many of the plants had come up, been eaten by predators, and had died. They had been planted last year and will be checked again later.

I made tables of already gathered information on the computer using Word Perfect 5.1. The tables contain information on northern people's diet, favorite foods, and whether or not they believe the food is healthy for them.

I also helped measure leaf areas using an area meter. In this experiment several groups of plants were grown with different amounts of carbon dioxide, ultraviolet light and water. In the future the earth is expected to have warmer temperatures, more carbon dioxide and higher levels of ultraviolet light. The experiment was also concerned with how aspen and grass in the same pot compete for space under these conditions. The results may tell whether the grasses are more likely to move into the treed areas or if the trees are likely to move into the grasslands.

Another experiment dealt with the decomposition of grass. The researchers are trying to determine the rate of decomposition in stagnant water, small amounts of rainfall and in water with an increased amount of air being put into the samples. I helped by adding water and randomizing the different samples.

In the last experiment seeds were planted in ashes from different areas. They wanted to determine the amount of time required for the seeds to germinate. I helped by taking out the germinated seeds and counting them.

In the forest genetics laboratory the researchers were extracting DNA from spruce needles. I helped them cut the needles off the spruce branches and then ground them using liquid nitrogen. They were then put into a solution and ground even finer. The samples were kept surrounded by ice so that the live tissue would not die. The solutions were then filtered through a cheese cloth and centrifused for fifteen minutes. The liquid portion was then poured off so that just the larger cell particles remained. Another solution was added and the sample was gently mixed. A second solution was added and after mixing, the samples were left standing in room temperature for ten minutes. They were centrifused for another fifteen minutes to separate the specific components. The top clear liquid was removed and put into a different test tube. This portion contained the DNA. An acid was then added and when the samples were gently mixed the DNA came together in jelly like strands. I participated in this part of the experiment which took almost the whole day. Later the DNA itself will be broken up using specific enzymes. These will then be run on jells. There is an electric current running through the jell. Different parts of the DNA will move at different speeds along this jell because of their size. A dye is added so that the DNA parts can be seen and photographed under ultraviolet light. The researchers are comparing white spruce and black spruce to see how similar their DNA is and if they are from the same species or not.

I talked with an Immunologist who works at the Canadian Red Cross Blood Donor Clinic about his work. He is doing experiments with macrophages. These are white blood cells that perform phagocytosis on viruses and other foreign particles in the blood. Presently he is trying to find

out how they grow and which stimuli will help the macrophages produce more TNF (tumor necrosis factor). The stimulus that he is currently using is called CFL-1. He then adds radioactive sulfur to the samples to see if more TNF is produced then was already inside the cell. This work is important because macrophages kill tumor cells. After explaining the experiment to me, he also showed me normal and abnormal macrophages under the microscope.

I spent another day with a technician who also works in the Canadian Red Cross Blood Donor Clinic. She works with bone marrow and separates specific cells from this solution. She also separates blood into its components so that other people can work with specific parts of the blood.

I have really enjoyed the time I spent at the University. The third and fourth year university students I worked with were very friendly and I learned quite a bit from them. The researchers and my supervisor were also very pleasant to work with, and went out of their way to show me a few different areas as well as the forestry department. I'm still not sure which area I would like to have a career in but I'm very thankful that I was chosen for the program and had this opportunity.

Katherine Brown

Report (Nursing)

Linh Nguyen Nursing

My first impression of the wisiest program was that it would be a great opportunity for me to gain more knowledge of the careers available, and to learn new skills. With the influences of my sister, who had attended this program last year, I decided to try out nursing for six weeks. I felt that the program, in whole, turned out really wonderfully. After talking to all the other wisiest students, it seen to me that everyone enjoyed the program, and they all have benefitted from it in some ways. Maybe that why my sister kept talking about this program ever since she started taking it. I glad that there is such a program like this, and the sponsors who provided the funding.

After six weeks of working in the nursing research area with my supervisor, the program was completely different from what I had in mind. My expectation of the program is that it would have some involvement and interaction with patients. I though I would have at less some contact with patients and with registered nurses who work in the University Hospital. Well yes, there were nurses who worked at the my supervisor's office, but they were mainly specialize in research. For most of the six weeks, my job was more of like secretary job than of a nurses' job. There was no specific project that I did. I did a variety of jobs, and some was not even related to nursing.

During the first and second weeks of my stay here, I did not worked with my supervisor, Dr. Morse. Instead I worked with Gwen Anderson, who was the coordinator at the office. Gwen taught me the differences between Nursing and Medicine. She said that the main differences is that a doctor tries to cure patients, while a nurse try to find ways of giving comfort to patients during their stay at the hospital. I wanted to do some interacting with patients and be in those type of environment, but I worked mainly in the office. In fact, I was took to the hospital only once, and that was to see a bed. I was disappointed that this was the only tour of the hospital I got. They should have set up more tour in the areas where other nurses are working at. Nurses does a lot of more things beside researching. That's particularly why I entered the Wisiest program. So I could see the job of nurses from a different perspective, and see if I liked their work. I was not given an opportunity to do this.

During the first and second weeks of the program, I was introduced to literal search. I was not given any personal research to do.. Dr. Morse and some of the other staffs would give me a list of articles, books, and journals they would want me to find. These stack, which they were called, was to be found at the libraries on the campus, and be brought back to the office. With this type of work, I did a lot of travelling, and whenever I borrowed out some stack which was related to their research, I would bring them back, and photocopy every single one. So for the majority of the first three weeks of the program, this was my job.

I did not mind doing the work above, but I got really tire of doing photocopying. A little was fine, but a lot... it was boring Sometime I would be photocopying for hours. Almost everyday, they would have something for me to photocopy for them. It was very boring work.

The other works I did was going to the printing service, photography, and staff room to get the materials they requested. A few other time, I had to even delivered enevelope to other building that was in the campus. Much of the works I have done here were unrelated to Nursing, like shred papers I thought it was a waste time doing this, because most of this did not benefited me, but maybe for Dr. Morse.

During the last two weeks, I continued to do the jobs I explained above, and was also introduced to do a different kind of work. There was a conference coming up in Frebruary, so what I had to do was to organise the abstracts, put the abstracts into file. The Applicants whose abstracts was accepted was to be notify with a letter. So it was my job to proper the letters and others pamphlets to be sent away. I had to also scan the abstracts, so Dr. Morse would have a record of it on the computer. Sometime it can take over 20 minutes to scan a single sheet of papers.

I felt that the nursing program did not provided the things I had expected from it. The works and experiences I had picked up and learned could have been learned elsewhere. I think the nursing area could have much been improve if they could provide more tour of the environment that nurse works in. Student like me entered this program to experience the job of nursing, so we can have the opportunity to expand our knowledge. A nurse does more things

than beside photocopying, literal search, and filing. Even though, this was not what had in mind, I have gained a few useful skills, like knowing how to use the Macintosh, graphic package, the libraries system, and above all I have made some new friends.

WISEST REPORT

(CIVIL ENGINEERING)

KOREN CROMWELL

YANNING LI

We have always been fascinated with the world of science. We too, have always wanted to explore our potential not only as scientists or engineers, but as women. At this crucial stage in our lives for decision making, WISEST is the perfect opportunity to broaden our horizon. Although at first Civil Engineering wasn't our "ideal" choice, we soon found that it is a very interesting and involved field. After six weeks of hands-on experience in Civil Engineering, we have a whole new perspective toward this field.

Our project supervisor Professor Teply designed and organized six weeks of interesting and fruitful projects, lessons and tours. We spent the first three weeks in Transportation Engineering, a field we can safely say we never knew existed. There, we worked with Prof. Teply, Dr.Sproule and a summer student Tanya. They were very kind and were willing to teach and help us as much as they could. We were given a introduction course to Transportation Engineering together with the SYU students. We learned how to do traffic counts using datamos and husky machines. In St. Albert, we tested efficiency of the first variable speed limit sign in North America. We also learned how to analyze the data we collected. In addition, we got very familiar with lotus 123, a computer program. Using this program, we analyzed airport statistics of Canada which could then later be used to design airports.

Our next stop was at Water Resources Engineering where we were introduced to the study of the forces of water. Martin and Arbin, two graduate students put off their own work and spent time teaching us all about their work. We found out this particular field was very important to the design of bridges, dams, fishways and other structures that have to stand against the forces of water. There we learned how to measure the velocity of fluids in river. Our projects involved doing velocity and temperature profiles of fluids. We learned a new computer program called EXCEL.

After a week of fun with water, we met with Karen Emde at Environmental Engineering. We were surprised to find that engineering involved microbiology and chemistry. We helped Karen (a microbiologist) and Christine (a chemist) doing experiments on the quality of pool waters. We learned how to do membrane filtration. We did different test on the water samples collected from Kinsmen Pool to examine the level of cleanness of the water. Karen brought us to a series of tours. We visited the Provincial Microbiology Lab, Rossdale Water Treatment Plant, a private lab called Prairie Biological and Toxicity Lab. Through the tours, we saw how the same science could be applied to different fields with different purposes.

Our last week is at GeoTech Engineering. Steve, a technician gave us a tour of the labs and explained each equipments' use. We learned a graphic program called AUTOCAD. Here, we helped to do some data entries.

These six weeks have been a most valuable experience for us. We found how interrelated Transportation, Water Resources, Environmental, GeoTech and other branches of Civil Engineering are. Whether our lab was on the highway, beside a river model, in front of microscopes or heavy machines filled with concrete, we enjoyed the things we learned, but more importantly enjoyed the friendships we built with the people here. We found out about what research life is like, but, more significantly, the purpose of the WISEST program is fulfilled. This experience has deepened our interest in science and engineering. We found that the faculty of Civil Engineering is a male dominated faculty, but people like Karen and other women students and staff are changing this imbalance. Balance of men and women in science and engineering would bring out the potential of both men and women. We have nothing but admiration for this program and are glad to have had part in it. Having benefited from this program, we are going to tell others about our experience. We believe that WISEST is a very effective program. We now consider Civil Engineering as a possible career choice. We hope some day we can contribute further to this program.

The WISEST Report

Holly Tsang

August 10, 1990

WISEST, Botany

To begin, I must say that my expectations of the WISEST program were surpassed by the actual experience. I was assigned to the Botany department under the supervision of Dr. E.A. Cossins. However, when Mary, the other WISEST student assigned to the Botany department, and I arrived at Dr. Cossins' office, we discovered that he was on vacation for another week and a half. Therefore, we were both, originally, under the supervision of Ian Atkinson. I was surprised to notice that our laboratory was not swarmed with plants; instead, the odd plant was sighted near the windows. Mary and I were then told that we would be working with enzymes and protein instead of working on the physical aspects of plants.

Mary and I began by taking inventory of the liquid chemicals, reorganizing the chemical catalogues, and taking inventory of the remaining chemicals. We were also taught basic skills such as how to use a micropipette, an autoclave, the glassware dishwasher, and how to change the pH of a solution. I also gradually picked up different laboratory skills and precautions that I know will be useful to me in the future. For example, I frequently had to rinse and dump radioactive containers or work with potentially harmful substances such as concentrated hydrochloric acid which both require that I wear a lab coat, gloves, and footwear that covered my feet completely. After my first week in the laboratory, I developed the habit of automatically taking precautions whenever I felt that the chemicals I was working with

could be hazardous.

Dr. Cousins returned to the laboratory during my second week in the WISEST program. Dr Cousins then assigned Mary to work with Yili, a transfer student from China, and myself to work with Van Stemmen.

Working under Van's supervision, I began making simple solutions such as ATP solution, wash buffer, extraction buffer, and less concentrated solutions of hydrochloric acid. I eventually began to make media, liquid and solid, that would be innoculated by Van. As the week passed, I was introduced to various sections of Van's research. I frequently helped finish an assay for Van. Then, one day, I completed my own assay.

The assay was only 8 tubes large because there was a minimal amount of enzyme available. To begin, I prepared the enzyme a day in advance I filtered a 6L container of liquid media that had been innoculated into a large erlenmeyer flask. I then removed the dried filtrate from the filter paper and tore it into small pieces. The pieces of filtrate were placed in an Osterizer with 100ml of extraction buffer. I blended the solid and liquid for 3 minutes at 1 minute intervals. I then added a layer of sea sand to the liquid and ground the mixture. Afterwards, the mixture was centrifuged, streptomycin sulfate was added, the mixture was centrifuged, and the remaining liquid was dialyzed in ammonium sulfate.

The next day, I prepared 8 test tubes which contained:

400µL Tris
100µL ATP
100µL $MgCl_2$
100µL KCl
100µL THFA
100µL formaldehyde
50µL Glutamate
enzyme

However, each pair of test tubes had specific, varying contents: tubes 1+2: complete 200µL enzyme
tubes 3+4: did not contain THFA but contained a substitute for THFA as well as 200µL enzyme
tubes 5+6: boiled 200µL enzyme
tubes 7+8: contained 100µL enzyme
100µL buffer

I boiled the 200µL enzyme for 10 minutes before pipetting it into the test tubes 5 and 6. After the test tubes were prepared, I set the incubator at 37°C and placed the tubes into the incubator. I let the test tubes incubate for 2 hours.

Following the incubation, I added DI 5% and a sea sand cap to 8 filter tubes. I ran 5mL of wash buffer through each of the filters before adding 3 mL of boiled methanol to the filters. Before the filters dried, I put the samples into their respective filters. I then added 30mL of wash buffer into each filter, 1mL at a time. Then, after the filters were dry, I added 6mL of 0.1N hydrochloric acid to each filter and stored the remaining liquid in the refridgerator that was the last step to my assay before I can analyzed the results.

I made HPLC buffers, L-Broth, and benomyl plates. When I made the benomyl plates, I learned how to quickly pour a boiling liquid into petri dishes in order to prevent contamination by bacteria as well as solidification of the agar contained in the liquid.

Frequently, I was asked to graph the results from the HPLC on the computer as well as type notes into the computer. Because I have not had any previous experience on computers, I found the experience to be interesting as well as informative.

I learned more than I could write about such as qualities that researchers require: patience, perseverence, and innovation. I am not definite yet whether I will want to remain in research in the future or whether I will want to enter the faculty of science. Because of several different influences this summer, I am now somewhat interested in engineering and am uncertain in which direction my future lies. However, the WISEST program has been an enjoyable experience that helped broaden my field of interest.

Xiao-Li Cheng

NAME: XIAO-LI CHENG
SCHOOL: HARRY AINLAY COMPOSITE HIGH SCHOOL
SUPERVISOR: DR. PATCHIT

Purpose

Inclusions are non-metallic particles that do not mix with the pure metal. They are one type of impurities. At the cast stage, inclusions in the copper bar are round. After the bar is rolled, the inclusions stretch out in the rolling direction. The purpose of this project is to determine the effect of temperature and time on elongated copper sulfide (CuS) inclusions.

Summary

Two copper sulfide bars have been used for this project. The first one is full of gas bubbles. After the bar is reduced 88%, the inclusions are still in globular shapes. There is suspicion that the gas bubbles are preventing the elongation of these inclusions. Thus, a deoxidized copper sulfide bar has been cast. This deoxidized bar is reduced to 84% of its original thickness. Several pieces of samples have been cut, and they are annealed at 600 ^{0}C for 5 minutes, 20 minutes, 1,2,5,10, and 25 hours, or annealed at 700 ^{0}C , 800 ^{0}C , and 900 ^{0}C for one hour. The following is a log base on the procedure of the deoxidized copper sulfide bar.

Xiao-Li Cheng

July 17

Procedure Of Casting A Deoxidized Copper Sulfide Bar:

- melt a pure copper bar in the crucible which is controlled by a frequency generator

* - throw in a wooden pencil and then take out the flowing lead

** - use a tong, dip a piece of copper sulfide stripe deep in the molten copper until the entire stripe melts

*** - throw in another wooden pencil

- pour the molten substance into a casting plate and let cool

Note: Throw in certain amount of charcoal constantly. The pieces of charcoal tend to flow on top of the molten copper. They function as a protective layer, because they are made up of carbon and will react with oxygen before copper.

* The wooden pencil is composed of hydrocarbon. In contact with molten metal, it breaks down into carbon and hydrogen. Those two elements react readily with oxygen, preferentially forming carbon dioxide and steam water before oxygen can react with sulfur and copper. Compared with sulfur dioxide and copper oxide, carbon dioxide and steam are lighter in weight and less soluble in molten copper which means there is a lesser chance of forming gas bubbles, therefore, they are likely to escape from the crucible and accomplish the purpose of deoxidization.

** Instead of mixing molten copper with sulfur powder directly , a piece of copper sulfide stripe is thrown in. The piece is made by hammering flat a copper pipe which contains sulfur powder inside . If the sulfur powder is thrown directly, the powder will flow on the surface. To mix sulfur and copper, the sulfur powder which is already in contact with oxygen in the air requires stirring. This process introduces more oxygen to the molten copper, forming sulfur dioxide gas, and this defeats the idea of deoxidization. If the copper sulfide stripe is used, the stripe will limit the available oxygen to react with sulfur since the sulfur powder is protected directly by the deoxidized copper. The gesture of melting the stripe deep down in the molten copper also limits the sulfur oxygen reaction since oxygen in the air contacts the surface of the molten copper more often than deep down, making the underneath area almost oxygen free.

*** The purpose for throwing this pencil is to try to break sulfur dioxide if there is any.

Xiao-Li Cheng

The Induction Furnace

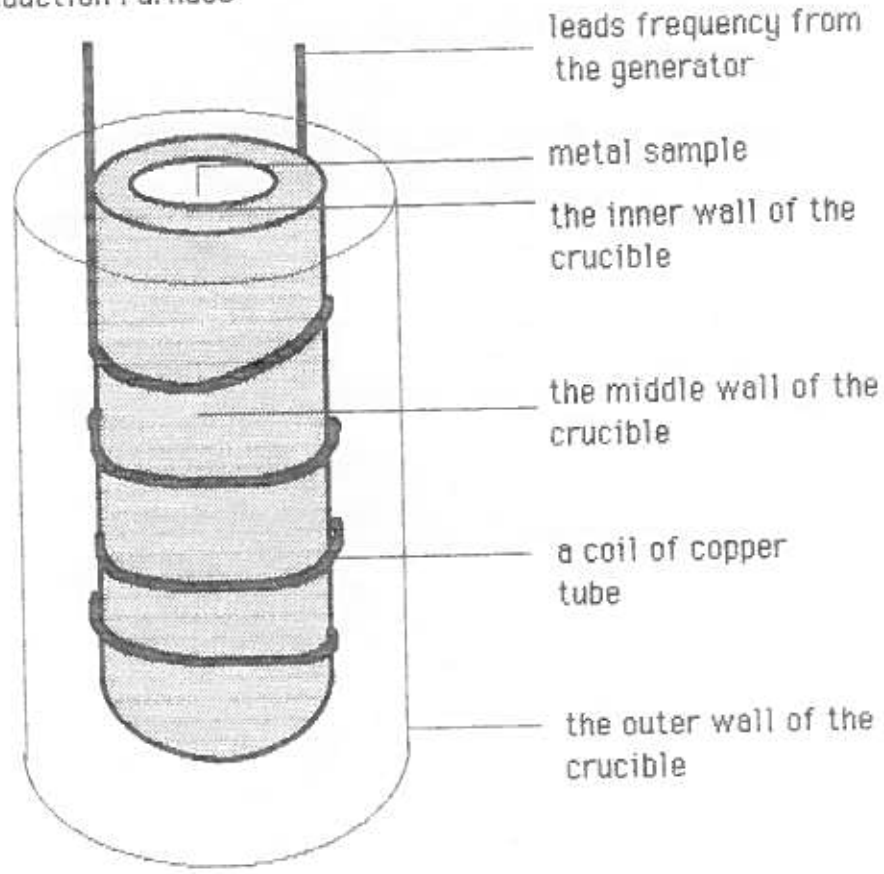


Fig. 1. This is a diagram of a complex crucible which is connected to a frequency generator.

An induction furnace is made up of a frequency generator and a complex crucible. This crucible is composed of three layers of walls: the inner wall, the middle wall which is wrapped with a coil of copper tube, and an outer wall which acts as an insulation. High frequency voltage from the generator produces electrical current that travels through a coil of water cooled copper tube. The high frequency also causes the fast movements of electrons in the tube. Through the ceramic middle wall, the electrons then induce electron movements in the metal sample, and cause its electrons to move in an incredible fast pace. These electron movements create heat by making and breaking the bonds between them. The heat builds up and eventually produces the melting process of the metal. High frequency is used for melting a piece of thin metal with a large surface area. Low frequency is used for penetrating into the inner part of a metal. This type of frequency is usually used for a block of thick metal.

Xiao-Li Cheng

The new deoxidized copper sulfide bar (see Fig. 2) with lesser and much smaller gas bubbles than the previous one, is reduced to 50% of its original thickness through a rolling mill at 10% reduction each trail. Its width increased 17% and its length increased 70%. The measurement of the new length is an estimation, since during rolling, several pieces broke off from the bar due to too much stress. The first piece broke off at 30% reduction, and three smaller pieces broke off at 40% reduction. Photos are taken under scanning electron microscope to examine the fractured surface.

	Original		Final	
	in	mm	in	mm
thickness	0.562	14.3	0.282	7.2
width	0.690	17.6	0.81	20.6
length	5.6	143	9.5	242

Table 1 shows the measurements before and after the 50% reduction of the deoxidized copper sulfide bar

Photos Taken Under SEM

Fig. 3, under the low magnification of 240X, shows the fracture surface of copper sulfide bar caused by high stress created during the rolling process. In the lower left hand corner, a gas pore can be seen. The blunt projections extending into the gas pore are known as dendrites. The remainder of the fracture surface appears to be made up of a numerous ringlike structures.

Fig. 4, under the high magnification of 3200, shows those ringlike structures to be the ductile failure areas of the metallic copper that surrounds oxide inclusions.

Xiao-Li Cheng

July 20

The inclusions after the 50% reduction are still in globular shapes. In order to elongate them, the copper sulfide bar needs further rolling. However, after the 50% reduction, the copper bar is now in fully hard condition. To soften the material, the bar is annealed at 950 °C for one hour. It is then rolled down to 75% of its original thickness. Its width increased 9%, and its length increased 70%. The unit elongation is 2.9%.

	Original		Final	
	in	mm	in	mm
thickness	0.282	7.2	0.139	3.5
width	0.81	20.1	0.88	22.4
length	7.4	188	12.6	321

Table 2 shows the measurements before and after the 75% reduction of the deoxidized copper sulfide bar after annealing at 950 °C for one hour

July 23

Three pieces of copper samples are cut from the copper sulfide bar that was reduced 75%. These pieces are all heat treated at 600 °C for 5 minutes, 10 minutes, and 20 minutes respectively. The purpose for annealing these samples is to see at which time trail the copper sample is the softest and yet without changing the elongation of the inclusions. Later on, the entire copper sulfide bar can be annealed at that temperature and for that amount of time, so when the bar is rolled again, the inclusions will stretch longer since they are already elongated.

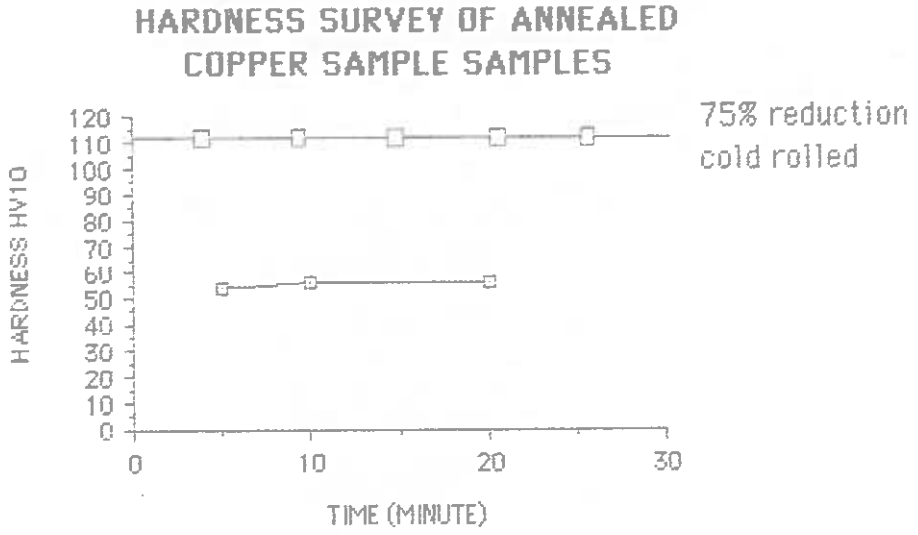
After annealing, the three pieces of copper samples are cut midway parallel to the rolling direction. As observed under the light microscope, the inclusions of the 5, 10 and 20 minute annealing pieces are similar. The long inclusions in the 10 minute piece are somewhat shorter than the ones in the 5 minute piece, but the size of their smaller ones is about the same. The long inclusions in the 10 and 20 minute pieces are similar, however, some of the smaller inclusions in the 20 minute piece have spheridized. As shown in the hardness test survey, all the samples have a similar hardness.

Xiao-Li Cheng

July 25

	Trail	Diag. 1	Diag. 2	Ave. of Diag.	Hardness HV10	Ave. of Hardness
copper as cast	1	0.63	0.63	0.63	46.7	42.5
	2	0.67	0.665	0.668	41.8	
	3	0.68	0.70	0.69	39.0	
75% reduction no annealing	1	0.40	0.425	0.413	108.7	112.0
	2	0.41	0.395	0.403	114.2	
	3	0.41	0.40	0.405	113.1	
75% reduction annealed for 5 min.	1	0.58	0.58	0.58	55.1	54.8
	2	0.58	0.59	0.585	54.2	
	3	0.585	0.575	0.58	55.1	
75% reduction annealed for 10 min.	1	0.57	0.565	0.568	57.5	56.1
	2	0.575	0.575	0.575	56.1	
	3	0.58	0.585	0.583	54.6	
75% reduction annealed for 20 min.	1	0.585	0.58	0.583	54.6	56.3
	2	0.58	0.57	0.575	56.1	
	3	0.57	0.56	0.565	58.1	

Table 3 is a hardness survey of deoxidized copper sulfide samples at 75% reduction, annealed at 600 °C for different amount of time



Graph 1 results from the values in Table 3

July 26

The copper samples that are reduced 75% are etched using a 5% ferric chloride solution for about 40 seconds. The grain structures of the 75% cold rolled piece are clearly stretched greatly compare to the as cast and the 50% cold rolled pieces. The etching shows that the grains quickly recrystalyzed after 5 minutes, and they begin to grow a little after 10 minutes. The grain structures of the 20 minute annealing piece are the same as the the 10 minute one.

July 27

Since at 600 °C, the 5 minute annealing piece has the longest inclusions and a similar hardness as the rest pieces, the entire deoxidized copper sulfide bar is heat treated at 600 °C for 5 minutes. The bar is cut into exact half. The thickness is reduced 84%, the width is increased 4%, and the length is increased 52%. The unit elongation is 4.4%.

	Original		Final	
	in	mm	in	mm
thickness	0.139	3.5	0.089	2.3
width	0.78	19.9	0.81	20.6
length	5.5	140.0	8.4	213.8

Table 4 shows the measurements before and after the 84% reduction of deoxidized copper sulfide bar after annealing at 600 °C for 5 minutes

Seven pieces of copper samples are cut from the 84% reduction copper sulfide bar. One piece acts as a controlled sample (see Fig. 5), while the other three are all annealed at 600 °C for 5 minutes, 20 minutes, 1 hour, 2 hours, 5 hours, 10 hours, and 25 hours.

July 30

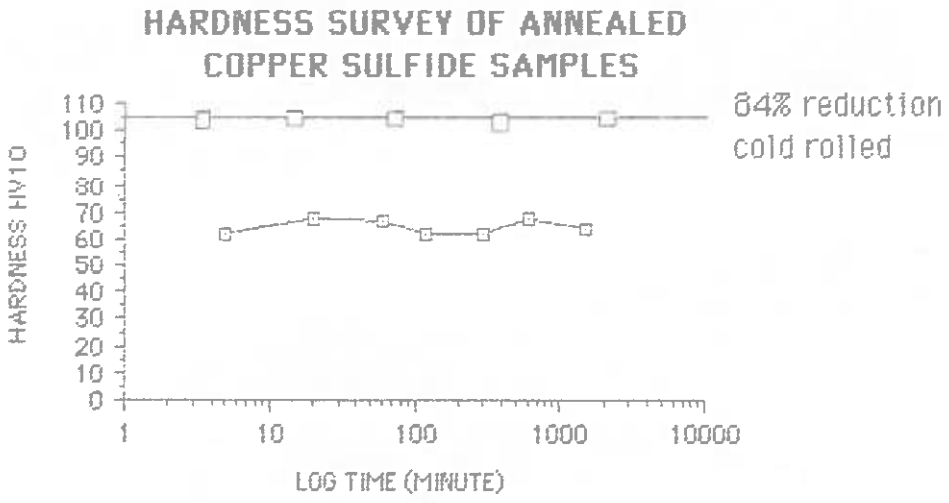
As observed under a light microscope, there is not much size difference of the inclusions between the no annealing, 5 and 20 minute annealing pieces, and 1, 2, 5 and 10 hour annealing pieces. However, the inclusions of the 25 hour annealing piece are definitely smaller in size (see Fig. 6). Also, the tips of most of these inclusions are round instead of pointed. This phenomena indicates the early stage of spheridization. As the heating time increases, the small inclusions in the samples increases.

July 31

A hardness test survey is done on the copper samples which are all annealed at 600 °C and reduced 84%. Once again, the being annealed pieces have a similar hardness reading.

	Trail	Diag. 1	Diag. 2	Ave. of Diag.	Hardness HV10	Ave. of Hardness
84% reduction no annealing	1	0.42	0.43	0.425	102.7	105.2
	2	0.41	0.43	0.42	105.1	
	3	0.415	0.415	0.415	107.7	
84% reduction annealed for 5 min.	1	0.545	0.555	0.55	61.3	61.6
	2	0.55	0.555	0.553	60.6	
	3	0.54	0.545	0.543	62.9	
84% reduction annealed for 20 min.	1	0.515	0.525	0.52	68.6	67.3
	2	0.515	0.525	0.52	68.6	
	3	0.54	0.53	0.535	64.8	
84% reduction annealed for 1 hr.	1	0.52	0.535	0.528	66.5	66.6
	2	0.525	0.535	0.53	66.0	
	3	0.52	0.53	0.525	67.3	
84% reduction annealed for 2 hr.	1	0.545	0.55	0.548	61.7	62.1
	2	0.545	0.55	0.548	61.7	
	3	0.54	0.545	0.543	62.9	
84% reduction annealed for 5 hr.	1	0.53	0.525	0.528	66.5	62.2
	2	0.545	0.55	0.548	661.7	
	3	0.56	0.565	0.563	58.5	
84% reduction annealed for 10 hr.	1	0.52	0.53	0.525	67.3	67..3
	2	0.52	0.54	0.53	66.0	
	3	0.515	0.525	0.52	68.6	
84% reduction annealed for 25 hr.	1	0.535	0.535	0.535	64.8	63.5
	2	0.545	0.55	0.548	61.7	
	3	0.53	0.545	0.538	64.1	

Table 5 is a hardness survey of deoxidized copper sulfide samples at 84% reduction, annealed at 600 °C for different amount of time



Graph 2 results from the values in Table 5

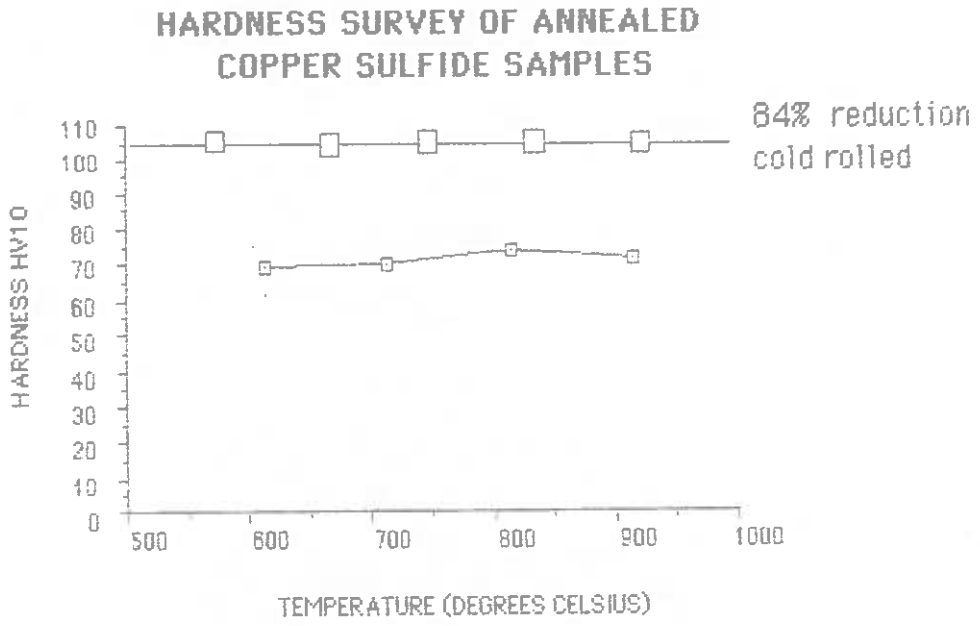
This graph uses log time in minutes because the values of the x-axis are too far apart, from 5 minutes to 1500 minutes. If a graph is drawn from a normal scale, the points in the first 600 minutes will be very close together, and the point at 1500 minute margin will be far apart from the rest of the points. The log method eliminates this problem.

August 7

Three pieces of copper samples at 84% reduction are annealed at 700 °C, 800 °C, and 900 °C for one hour. As observed under a light microscope, the inclusions in the 700 °C (see Fig. 7) annealing piece are about the same as the ones in the piece that is annealed at 600 °C for 25 hours. The inclusions in the 800 °C annealing piece are shorter than the ones in the 700 °C annealing piece. The inclusions in the 900 °C annealing piece are significantly deformed (see Fig. 8). Like the ones in the 50% reduction piece which is annealed at
950 °C for one hour, most of these inclusions are neither round nor elongated, but angular.

	Trail	Diag. 1	Diag. 2	Ave. of Diag.	Hardness HV10	Ave. of Hardness
84% reduction annealed at 600	1	0.52	0.535	0.528	66.5	66.6
	2	0.525	0.535	0.53	66.0	
	3	0.52	0.53	0.525	67.3	
84% reduction annealed at 700	1	0.525	0.52	0.523	67.8	67.2
	2	0.525	0.535	0.53	66.0	
	3	0.52	0.525	0.523	67.8	
84% reduction annealed at 800	1	0.505	0.51	0.507	72.1	71.1
	2	0.515	0.515	0.515	69.9	
	3	0.51	0.51	0.51	71.3	
84% reduction annealed at 900	1	0.52	0.51	0.515	69.9	68.9
	2	0.53	0.525	0.527	66.8	
	3	0.52	0.51	0.515	69.9	

Table 6 is a hardness survey of deoxidized copper sulfide samples at 84% reduction, annealed at different temperature for one hour



Graph 3 results from the values in Table 6

Theoretically, as the temperature increases, the hardness of the copper samples decreases. However, in this case, the hardness values of copper samples that are annealed at 600 °C, 700 °C, 800 °C, and 900 °C are very similar, ranging from 66.6 HV10 to 71.1 HV10. As seen in Graph 3, the hardness values at these different temperatures form an almost linear line. An interpretation from these experimental values is that the copper samples have already reached their minimum hardness at a temperature lower than 600 °C. Any temperature above that unknown critical temperature does not affect the hardness of the samples. However, an empirical fact contradicts this idea. The hardness of the 50% reduction piece which is annealed at 950 °C for one hour is 48.8 HV10. The annealing temperature is higher than 900 °C, but the hardness value is much lower. An explanation for this fact is that there is a second critical temperature somewhere between 900 °C and 950 °C.

Due to time limitation, further experiments cannot be done on this project. Several conclusions can be drawn:

1. At 600 °C, copper sulfide sample requires more than 25 hours for its elongated inclusions to respheridize.
2. The hardness values do not change much after annealed at 600 °C for 5 minutes.
3. The hardness values do not change much when annealed at 600 °C, 700 °C,800 °C, and 900 °C for one hour.
4. There are possibly two critical temperatures in the Graph 3: one before 600 °C, and one beween 900 °C and 950 °C.

WISEST SUMMER RESEARCH PROGRAM
WOMAN IN SCIENCE AND TECHNOLOGY
UNIVERSITY OF ALBERTA

Alice Chow
Department of Computing Science
Supervision of Miss. Beverly Bayda
August 8, 1990

WISEST SUMMER SESSON SUMMARY

My name is Alice Chow and I have been working in the department of computing science in the General Services Building for the past few weeks. This particular building is the center of the computing activities on the U of A campus. In the GSB, the staff are divided into 2 groups-- the operations group and the support staff group. Each group's involvement with computers vary. I have been working under the supervision of Miss. Beverly Bayda, one of the members of the support staff. Generally, the support staff group is where students would go if they ever had any problems. The operations group deals mainly with programming. Therefore, I have mainly been becoming familiarized with the day to day applications of the computers. The main emphasis of my work is on the Macintosh computer and to become more knowledgeable of its different functions.

The first week of the program I was given a document called "Hello Mac" to read. This document was to get me started with handling a Macintosh. Generally, it was a beginners guide to the various options and desk accessories on a Macintosh. After reading this, I basically understood the functions and the use of different features on the computer. As well, I was given manuals to look through to learn about the basic usage of computers, the history of computers, and some simple programming languages and procedures. My first project involved the Microsoft Word program using the Macintosh. I was to write a resume for myself and to become familiar with a basic word processing program in the process. This particular editing program was equipped with a multitude of options ranging from style of pen, different fonts to a dictionary check listing. I became aware that a word processing program would be very useful when writing reports or essays for school or a job environment. The next assignment involved the MacDraw II program which also used the Macintosh. I was to draw different flow charts to become familiar with a basic drawing package. As well, when following the step by step MacDraw II manual, I learned how to draft different parts of the inside design of a house. I was able to use the draw program to add and take away designs from the house as well. Finally, the latest project that I have been working on involves the Double Helix database program, the Microsoft Word, and the Superpaint programs still compatible on the Macintosh. I was to

convert a database manual from MacWrite to Microsoft Word, and edit screen pictures so that they could later be added to a Microsoft Word document. This project involved the use of a graduate student's research study. This project combined some of the previous skills that I had learned to create the finished product. In general, these few project's purpose was to get me to use and practice the application skills of computers.

Besides the application part of computers there is also the programming section which I was also partially exposed to. The basic program for this was the UNIX on the cavell system. I went through a "learn" program first to understand the simple concepts and procedures. The UNIX system itself provides a lot of different programs. One example is an international news network--any one in the entire world may write and read articles in it. My last project was using this program. This news network is only used in the UNIX system, but to run each of the programs the different users put in the news; we must first decode it and put it in readable form. To do this, I had to first save the files I wanted to read on the Unix system then download the files from the UNIX system into the Macintosh and finally use an unpacking program to decode the information. This unpacking program consists of many steps. The end product has to have been run through all these steps of which the most important is the "BinHex" program to be transcribed into a readable form. In addition to the news network, there is also another option on the UNIX called "Mail"; this program allows anyone to send messages around the world! The 2 other computing science WISEST students and I have been sending messages to each other daily. Also, the UNIX system has a variety of games to play when bored!! Overall,the UNIX system is a very versatile and user friendly system.

In conclusion, I believe that I have learned a lot about computers these past few weeks. Before I entered this program, my knowledge of computers and their capabilities was minimal, but now I can say that I feel more confident and comfortable with them. As well, after these few weeks I think that my typing has improved a lot! I would like to take this chance to thank all the co-ordinators of this program for providing such an opportunity for me to gain experience in the field of my choice. This time spent and my supervisor have both given me valuable ideas of what computing science is all about. Over all, this program has proved to be most beneficial, educational, and enjoyable!!!

WORK REPORT

Wendi Kusic

For the past number of weeks, I have been working under the supervision of Dr. Rostoker at the Earth Sciences Research Lab. Throughout this period I have dealt with the northern lights (aurora borealis).

To begin with, my supervising professor gave me various books, articles and magazines to read, in order to help me gain a better understanding of the northern lights.

After this, Dr Rostoker assigned the project I was to undertake.

I was to plot two variables versus each other in order to try and find a relationship between them which could be represented in an equation. (i.e. $y = mx + b$) The two variables were Kp and AE. Kp and AE are a system of numbers that enable people to monitor and measure disturbances within the earth's magnetic field. Researching these disturbances aids people in determining the possible presence of auroras. The graphs I plotted dealt with the months of January to December 1978 & also January to June 1979. Since there are 3 AE values per 1 Kp value I was to make three groupings of graphs. For one set of graphs I was to plot the max AE value vs. Kp, for the second set AE (avg.) vs Kp and for the last set AE (min) vs. Kp.

e.g. Kp value : 1o (note: 3 AE / 1 Kp)

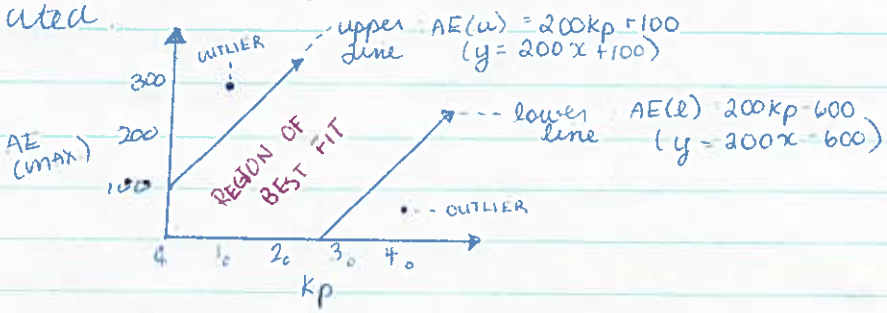
AE values : 25 50 100

↑ AE (min)

↑ AE (max)

AE (avg) → 58.3.

In the end, only equations for the AE (MAX) vs Kp graphs were able to be calculated.



Incidentally, all of my work was completed and saved on a computer.

When I had finished this task, I had to note all of the outliers, (points which did not behave as expected), and try to explain why these points did not fit where they were supposed to. In order to accomplish this, I had to use reference books and microfilm which had magnetographs, (these record and graph disturbances in the earth's magnetic field), stored on them. It is important to note that I was only able to do this for the AE (MAX.) versus Kp graphs. Following this, I calculated the percentage of times a certain reason accounted for outliers. (on following page) Afterwards, I arranged all of the above information into a report. Dr. Rostoker has plans to use my results in one of his papers.

Besides what I have already mentioned, I also constructed quite a few handplots and completed other tasks for Dr. Rostoker. (these handplots were compared to the computer's "work" in order to ensure no errors existed in the computer program)

Finally, for the remainder of time left, my supervisor has planned for me to con-

PERCENTAGES OF OUTLIERS

(% of times a certain explanation results for outliers)

OUTLIERS ABOVE UPPER LINE TOTAL 21 POINTS

1) Peak value occuring during 1 hour time interval is not reflected in final average AE no.

$\frac{21}{21}$ = 100%

OUTLIERS BELOW LOWER LINE TOTAL 17 POINTS

1) Station is underneath electroget / substorm

$\frac{14}{17}$ 82.4%

2) Station registers an unusually high AU value

$\frac{1}{17}$ 5.9%

3) Station registers a very high AL reading

$\frac{2}{17}$ 11.8%

struct more graphs on a computer. These will compose of the ratio $\left|\frac{\Delta U}{\Delta L}\right|$ versus ΔE. ΔU and ΔL are numbers, when added together, make up ΔE. (note $\left|\frac{\Delta U}{\Delta L}\right|$ means absolute value of $\frac{\Delta U}{\Delta L}$) *

Luckily, I have been able to expand my knowledge and have a "taste" of something unknown to me. On the whole, I have had a pleasurable and rewarding experience.

Thank-you, Wendi Kisic

* Since the time this report was written, Dr Rostoker has determined there will not be enough time left for me to complete this assignment. The computer program for this project is very complicated and ~~time~~ extremely time-consuming. The remainder of my time is spent preparing the final document of all my work.

On the following pages are 2 examples of the graphs which I have completed.

WISEST SUMMER RESEARCH PROGRAM
WOMEN IN SCIENCE AND TECHNOLOGY
UNIVERSITY OF ALBERTA

Trang T. Vy
Computing Science
Bruce Folliot
August 8/90

WISEST SUMMER SESSION SUMMARY

My name is Trang T. Vy, I have been working in the Department of Computing Science (General Services Building) for the past 6 weeks. My supervisor is Bruce Folliot. He's both a programmer and an analyst. He works with the mail and news . Therefore, I've been working with the mail for the entire 6 weeks period.

The first two weeks of my work was mainly reading from different texts and the manual pages to get used to the computer's language, learn to edit a file, and the basic usage of the different kinds of computers.

After I kind of understood what was happening , and somehow got used to the editors then Bruce gave me my first assignment. And that was to write a resume. This exercise was to help me write a resume in the future.

My second assignment was the mailing stuff. This was the main project I got. Basically, what it was, was to use the awk programming language to make a program and tried to run it. Next get the results and mail it to Bruce. For the first three days, i was using the same awk program, but after that I had to change the basic program into a more complicated one, and tried to get in different messages or information.

To do this Bruce gave me the awk programming book to read. After I had an idea to how it works. He told me to make a program that would run the following as the output out of the file called "logfile" .

- The total number of log entries (lines in that file)
- startdate, starttime
- enddate, endtime
- number of new messages (new mail being sent)
- the number of mail delivered (already received mail).

This program was to be sent to him every day. Next he told me to get all the deferred mail. These are the mail that didn't get to the receiver.

The next step he told me to do was to do a program that only get the recipients and the senders but strip away all the extra information. To make it look nicer, I had to program another one that would print out both the senders and the recipients on one line.

In order to get a full list of the different messages in that logfile, I had to go through the whole list of entries to get the satisfied results. Usually, the whole list for one day is around over two thousand entries. Sometimes over three thousand. But over the weekend is different. It usually contains less than one thousand entries per day. Once I got into the logfile I then search for different types of deferred messages, different types of mail failed, errored mail, etc. Next, what I did was to make up a program that would count up the total of mail for each one. Every day I added some different new messages in the output, and sent it to Bruce. It took me over a week to finish searching for everything.

The last one was to type in a program that would count the total number of mail being sent around such as local mail to local mail, local mail to non-local mail, local to mts(non-local), non-local to local, non-local to non-local, non-local to mts, mts to local, and mts to non-local. This program was the hardest program of them all.

Bruce also showed me how to read News stuff. It was really interesting. I really like it. This News program is for communications all around the world. You can get all kinds of information out of this program.

This WISEST program is an excellent way to get experience as a high school student. I really enjoy this program. I not only find out more about Computing Science but also in other fields as well. I really enjoy working with my supervisor. He had taught me a lot about Computing Science. I really thank you (Ms. Ardakani) for giving me this great opportunity to learn so much about this WISEST Program.

Lisa Anderson
July 31, 1990

Food Science

Before I began this program I didn't have any idea what the area of food science was about. Though my work and watching others I have learned that it involves analyzing food to obtain quality levels. In Alberta many foods are analyzed, the main ones being milk and honey. For most of my six weeks I worked with honey.

A beekeeper in Beaverlodge was trying a new system of hive management and wanted to know if this would effect the quality of the honey produced. Every two weeks he would send us around a dozen combs and I had to extract the honey from them. The combs were cut into chunks and hung in cheesecloth so the filtered honey would drip into a jar. After I removed the honey there were three tests which I performed:

① MOISTURE: In this test honey was spread on a refractometer and an index of refraction was obtained. Using this number the moisture percentage could be calculated. The first samples I tested were dandelion honey and it was very low in moisture. The reason for knowing the moisture level is it will have an effect on the storage period of the honey before it starts to ferment.

② DIASTASE: This is an enzyme added to honey by bees and is to be at a minimum level in honey which is marketed. To obtain this value I prepared and standardized solutions as well as used a spectrophotometer to measure the absorbance of my solutions. The data was graphed and I

came up with the number. It indicated the ripeness of the honey.

③PROLINE: Proline is an amino acid which also plays a part in the ripening. This test also included prepaing samples and using absorbance levels. In this reaction a solution was used which seemed to turn your hands purple - no matter how hard you tried to be careful.

As well as working on my own project I helped and observed the others in the Labs around me. The German exchange student I worked with did an ash test where the honey was heated until only ashes remained. Together we tested our honey samples for antibodies using an Elisa test. I also had a tour of the microbiology lab to see the incubators, centrifuges and microscopes.

On one Tuesday I was able to make quark. This is a cheese similar to cottage cheese. To make this I pasteurized milk and then added a culture. After leaving it to strain overnight I had quark.

I have had a great time working here this summer and I hope many other students will be able to have the same experiences next year.

August 10, 1990

Dear Members of the WISEST coordinating group.

I have enjoyed the past six weeks of the WISEST program very much. As one of the students assigned to the Department of Computing Science, I had the opportunity to explore many of the programs, systems, and applications that the staff use daily. For example, I had access to Microsoft Word, Microsft Excel, MacProject, Double Helix II, MacPaint, Course Builder, UNIX (through Cavell, Pembina, and Innesfree), and MTS. Each had different functions, and although I had experience with some, most were quite new to me.

The first week I spent mostly reading up on the manuals, and figuring out how to get on the machines. That week was the most boring, to tell you the truth, for it was not a lot of fun to read 2 inch thick books that had countless meaningless words and know at the same time that it's pouring rain out!

However the next week was better. My supervisor, Marion Paproski, began to give me projects to do that really will be used. Of course, I had to go through some samples first, but soon, I was familiar enough to work with real information.

The first projects I had were timelines. I was required to construct one for each of the staff members in my department in CAB, and in fact, because some of people were not able to give me all their specifications on time, I was not finished until today. I used MacProject to do them, and it was quite easy. It has many options, and allows you to also see the same timeline under different criteria. (However, I still think that the easiest way to do timelines are by hand.)

Two other major projects I had were spreadsheets. One was concerning Enrollment Projections for the next school year. At first I was terribly confused, trying to read the data off incomprehensible computer readouts and making sense of what I was typing into the maze on the screen. But I did manage to get it done, and printed it off on a laserwriter (but you wouldn't believe the trouble we had trying to achieve that!). The other was to organize four terms worth of different levels of computing courses by different informations, such as lab coordinators, times, etc.

Then I received a project with Double Helix, which is a database. Supposedly after looking through the entire file, I was to try to add some more options to the menus, and manipulate information on graduate students to more up-to-date ones, but it turned out more complicated than Marion had expected, and I would've had to take an entire course to learn to do it! So instead, I went through all the custom made menus and copied them out in such a fashion so that similar data will appear together, and the staff will later use it to determine what may be eliminated and what else is to be added.

The second last big project was Course Builder. It was a brand new program to the Department, and Marion gave it to me to preview. After I tried it out, I wrote her a report expressing my opinion on it, as well as outlining how I felt it may benefit the Department, etc. I might add on here too that I really like this application. It's powerful, and fun to use.

Just yesterday, I got one more project. This one was to make a spreadsheet according to outlines Marion gave me on four terms's worth of computer courses. First, I had to go through an entire cabinet of files, pick out the required ones, then put them into one spreadsheet. It was not hard, and was intersting to see the different classes and what their assignments are.

I also wrote resumes, letters, "diary", poetry, and drew pictures as minor projects along the way. Those often served as application practices when I had nothing to do.

But the weeks were not without a hitch. Far from it! Often, I'd enter something wrong, and the computers will suddenly freeze on me, or blare jargon, or simply take away the cursor and not give it back. I especially hate that annoying little bell that sounds every time I make a mistake on the MacIntosh. Sometimes, they refuse the disks, or says I'm out of volume,or tell me that they can't copy the entire file, etc. after I had waited forever, and then just quit! One of the "scarier" problems I had was with MacProject. For some reason, the computer kept telling me that I had 2 disks in the drives when I had only put in one. And on one occasion, when I tried to retrieve the timelines, the computer that I had been doing them on told me they simply did not exist! And it was true, at least on that computer. The folder said EMPTY. But when I went to the MacIntosh next door, they all magically reappeared! I still have no idea whatwas going on, and neither does anyone else.

Two weeks ago, I got onto MTS after spending the entire afternoon wrestling with the system. The computer simply would not accept the commands that links into it. There was nothing wrong, as far as we could see, and five staffs banged away at the keyboards until for no apparent reason, it suddenly said I was in! And yet we didn't do anything different from when I tried it a few <u>hours</u> ago!

There were also other (quite exasperating) problems sometimes, such as the entire computer network suddenly overloading and going down (such as right now, Cavell has crashed) or printers that would only print certain lines, and then filling in empty space with nonexistent information.

However, there were a lot of fun things too. On UNIX, which is one of the major networks in the university, there is a program called News. It is international, and once you're in, you can read any of the millions of articles that range from every topic you can possibly think of, or write one yourself. You can also communicate with anyone anywhere on the world on the same system. Eg. you can write to someone in Australia, or Antarctica. Also there is the Mailing System, through which you can send messages to any other person on any system anywhere in the University, and the Talk program. This is like a telephone line, except instead of talking into a phone, both parties simply type, and the screen is divided in half so you may see what you are typing and what the other person is saying at the same time. Alice, Trang, and I often spent time just talking or mailing to each other. It's the only thing that I could do without a mistake after the initial first tries! The only "bad" thing about them is that the computer will interrupt you no matter what you're doing at the moment to tell you someone wants to talk to you, or you have mail, etc.

But all in all, I think the only real job I did not enjoy was the Learn program of UNIX. I did not go even half way, and I don't think I ever will. But to make up for that, there were always computer games, graphics, and computer music compositions to fool around with. And if that still didn't work, I'll let you in on a little secret: the staff often have the most interesting conversations as they work, such as zuchinns and rhubarbs. Plus, we also had a birthday party, and planned on the demolition of one of the vacationing staff's office.

I feel that I have gained quite a lot in the field of computer usages (and confusion) in these past weeks, and experienced many things that I otherwise will never be able to had I not takened part in this summer program. I know it will help me in the future, and it was a worthwhile way to spend some of my summer this year. I think that if I had the chance, I would definitely take this program over again. I thank you so much for giving me this opportunity, and do continue with this program for the years to come.

Sincerely,

Amy Wong

Amy Wong
Computing Science Department.

PS. I loved the Wednesday sessions!

The Department of Entomology

Ann Hartanson
WISEST 1990

During the six weeks ✓ spent in the Entomology department ✓ was given a first hand look at the precision of laboratory work and the inner workings of science as a prospective field for women. Under the supervision of Dr. Gooding ✓ worked with Tse-tse flies; the transmitters of Sleeping Sickness in North Central Africa ✓. In addition ✓ spent a great deal of time working with Tracy Kutash, a graduate student, on a project with Pharaoh ants. Thus my six weeks with WISEST was divided into two sections.

Working with me under Dr. Gooding was Heather Nychka, a WISEST student from last year who was employed again this year by Dr. Gooding for the month of July. Together we performed a large number of mating duration experiments with Tse-tse flies. We would mate a number of pairs from each line of flies and time their mating duration. The timing would continue at 20 min. intervals for the better part of the day with the data

recorded in charts such as the one that follows.

eg. Mating Duration Exp.

using line CENT-4 ♂ (July 9) × CENT-4 ♀ (July 24)

pairs checked at:

tray ③ #2 - #5

pair #	set up at	separated at
2		
3		
4		
5		

After the pairs had finished mating the males and females were separated. The males were most often put back in their cages for further use at another time and the females were isolated to see if they would become pregnant. ✓ was given the chance to dissect a number of females to see if the males had been able to transfer sperm successfully into the female.

However, in addition to the work in the laboratory with Dr. Wooding, ✓ spent a great deal of time outside of the lab. with Tracy on a Pharaoh ant project in the Biological Sciences building. Pharaoh

ants, as explained by their name, originated in Egypt and various locations in Northern Africa. It is suspected that the ants in the Biological Sciences building were brought in with one of the laboratory testing animals by accident a number of years ago, and since then, their numbers have increased.

Thus, for the past six weeks Tracy and I have been monitoring the ants throughout each wing in the building. We do this with the use of commercial sticky traps baited with a 1:1 ratio of peanut butter and honey. We lay the traps in approximately every second room (depending on the room size) and leave them for a period of 72 h. Upon collection of the traps we count the number of ants present and determine the magnitude of the ant population in that area as compared to other areas of the building. The results that we have obtained thus far show a definate infestation with concentrations in Zoology, Cumulus and the Center Wing.

I have been very pleased with my experiences at WISEST in

the Department of Entomology because ✓ have been given alot of hands on experience that will benefit me in my preparation for university. ✓ have been given a taste of university life from a students perspective and have acknowledged the growing opportunities for women in the Sciences today. The ratio of women to men in Entomology is extremely low and therefore, there is great opportunity for success in the fast approaching future. Though ✓ do not think ✓ will persue Entomology as a career ✓ have enjoyed the opportunity ✓ was given and will advise others my age to enter the program in the upcoming year.

PROJECT REPORT

CLOTHING and TEXTILES

Randy Emery

August 9, 1990

The area of Clothing and Textiles that I worked in is concerned with the conservation and storage of clothing, textiles, and some tools that are used in clothing production. The first few days were spent learning about the storage, storage conditions, the handling of the artifacts, the accessioning system, and the task the graduates are undergoing. The Clothing and Textiles collection consists of over 20 000 artifacts. Some date back to around 400 AD, while most are more recent. The artifacts originate from all over the world; North America, Indonesia, Guatemala, Yugoslavia, Africa, China, and Japan.

The storage consists of a compactor unit that saves much needed space but allows for easy access to the collection, and also many cupboards and closets. Artifacts are also keep in acid-free boxes for temporary storage. The storage conditions are something very hard to decide on since the collection contains so many different materials. Temperature, humidity, and light are conditions that a collector has to concern himself/herself with. Other things, such as insect infestations and mold growth, are also concerns. Each new artifact that enters the collection first has to go before a committee and be accepted before it is apart of the collection. Artifacts that are not accepted are donated to other organizations. The accepted artifacts are accessioned, or numbered, with the year of the donation, the donation number, and the number of the artifact in that donation. So 86.56.2 would mean that it was donated in 1986, it was the 56th donation of that year, and the 2nd artifact in that donation. Information sheets are also filled out about each artifact and then it is found a place to be stored.

The job of the graduate students in the collection is to enter

about 8 900 information sheets onto the computer filing system. This sounds fairly easy, but they have encountered many problems. the information sheets are not always right, sometimes two artifacts will have the same accession number, and the hardest thing is to enter all the information into the computer in a similar language, so that the language is universal. It is a very hard task.

The project that Brook and I worked on was to create new storage for a men's wear storage area. First, one area had to be cleaned out and rearranged neatly. Then dust covers had to be sewn up for he closets in the room. After all this was done artifacts were moved into the closets. Each artifact that was moved had to written down along with its old location and its new location , so that later the inventory list could be changed. Then we moved to another room where the men's wear would be stored. Here measurements had to be made for new shelving. The shelving is going to be used for shoes and hats. By looking at a donation booklet for certain years, which gives a description and accession number, men's wear was located and moved to this new room. This was a lot of work because it was often hard to find the artifact. The boards were bought and they had to be painted with a latex paint to protect the artifacts from the chemicals contained in the wood. The boards will then be put into the closets and the new men's wear section will be ready for use.

Some filing was also done, along with rolling some textiles, and making bags for a few manequins. There was also some rearranging done in the compactor unit, that took some time and a lot of planning. All the artifacts have to be handled with gloves on and have to be handled with care.

THE WISEST SUMMER PROGRAM 1990

Through WISEST, under the supervision of Dr. F.L.Weichman in the Department of Physics, I have become better acquainted with the University campus, the requirements and expectations in the courses at the University, and most importantly, what employment in research entails. During the six weeks of the program I have been involved in a number of different experimental projects, broadening my knowledge in several areas in the Physics Department as well as other areas in the Faculty of Science. As well, I have the opportunity to continue working for Dr. Weichman for the duration of the summer to finish my investigations concerning the main instrument I have been working with.

The very first day I was shown a photomultiplier to start research on bio-luminescence; the emmision of photons from finger tips. Professor Weichman explained how the system was set up, and how it changes photo impulses into electrical impulses. The photomultiplier tube functions as follows: A series of dynodes are connected in a zig zag pattern down the tube. A voltage of about 1,500 volts falls across the series of dynodes. When a photo-electron is dislodged from the first dynode it is accellerated towards the second dynode which in turn excites the emission of a number of secondary electrons. These are accellerated toward a third dynode, until the end of the series is reached. The tube has twelve dynodes and an amplification of 10^7. The pulse of electrons striking the last dynode is transfered from an electric current pulse into a voltage pulse which is then amplified and recieved by the counter. The substance or matter being tested is inserted through a four layer, light proof cloth sleeve, and placed directly under the opening in the tube.

After two weeks of testing peoples hands for signs of luminescence without any success, I then began working with luminescent material similar to the material "glow in the dark" objects are covered with. Although the main objective for the work on the photomultiplier was to set up and test the equipment for one of professor Weichman's third year labs, I began to study how photon rate decayed in the material over time. The curve from our calculations did not come out as we expected, and thus we were delayed a week trying to understand why the decay rate acted as it did.

After coming to a conclusion that two different steps occured because of the type of material, a temperature change was then induced on the material, and the rate of decay was charted for four different temperatures and then compared. The results showed a direct relation between the rate of decay and the temperature, as was expected.

During this time I also graphed the calculations from Copper oxide samples which were being tested for the amont of light that was absorbed at different wavelengths in the spectrum. These tests did not aid Dr. Weichman in that the Copper oxide was very low quality for what was required therefore this work has been set aside while a vacuum system is set up for another third year lab.

During this summer I have learned a lot about how research work is carried out, and what it is like to be a female student or professor in the university. Almost all of the female students I have talked with have said that they have never encountered discrimination in the University. This is an encouraging sign, and with the support of WISEST I have now over come my fear of attending the University, which was one of the goals I had hoped to accomplish this summer.

The WISEST program has also given me that headstart towards my career goal of becoming a physician. I would like to thank Dr. M.A. Armour and Furugh Ardakani personally for the work and effort that they have obviously put forth. The WISEST summer program is an excellent opportunity for any female interested in science, and hopefully funding will increases to expand the program further so that all the applicants might be accepted.

Christine Cheng

Edmonton

August 10, 1990

c/o Department of Chemistry
University of Alberta
Edmonton, Alberta
T6G 2G2

Dear Miss Ardakani,

I am very pleased to be given the invaluable opportunity to work for the faculty of agricultural engineering in this year's Summer Wisest Program. Undeniably, the work experience as well as the friendships that I recede from the summer are fruitful and cherishable. Without a doubt, I am sure other Wisest students must have also enjoyed their work just like I do.

During the six weeks period I have been working on the "Wheat Bin Construction Project" with a graduate student, a technician and two other high school students. All of us get along very well and the treasure that I have dug out is much. I believe that some of my characters have developed more mature in this span of time and the change that I am going through will probably be influential to the rest of my life. Once again, thank you for offering the opportunity to learn, work and experience new tasks. The enclosed paper is a brief report of the "Wheat Bin Construction Project" and I hope you would enjoy reading it.

Sincerely yours,
Christine Cheng.

Wheat Bin Construction Project

The objective of this study is to test a new harvesting system, one which employs early harvesting of crops at high moisture contents. Our task involves building ten vertical wheat bins, installed with sensors which will allow for continual readings of the grain condition (ie. moisture and temperature).

The two aims of this project are:

To test for spoilage in the bins.
To determine if the "Green Heads" mature within the bins.

The assistance of Sandy Yakiechuk will be required for the design and instrumentation of the wheat bins. The building of the bins will be done in the Wood Lab on campus, and then they will be transported to the Harvesting Lab at Ellerslie.

If early harvesting at high moisture contents is feasible without excessive amounts of spoilage, and if the "Green Heads" will continue to mature while contained in the wheat bins, the ultimate goal is to produce a method of wheat harvesting (which may also be used for the other cereal crops of Canada) which eliminates the necessity of combining. In such a process, the grain would be picked up off the fields, while still at a high moisture content, and would be transported to the bins where it would be stored and dried, and later on, threshed. By employing such a process, it is hoped that harvesting will be made more economical, as the act of combining is very expensive, especially for a small farmer who does not have a large amount of grain to combine, or a large pool of capital.

The first two bins shall be filled with samples of wheat heads which were harvested (ie. removed from the field) while at a moisture content of 40%. This is an extremely high moisture content, and is much higher than would be desirable under normal conditions. This was done to show the varying degrees of spoilage related to the varying degrees of moisture content of the grain at the time when it was collected (ie. from a very high moisture content of 40% to a low moisture content of 20%).

A conventional swather was modified such that the heads could be collected rather that being laid down on the field in a swath to dry. A metal pan was attached just below the belts to serve as a collection pan. As the pan filled it was removed from the machine and the heads were kept until there was a sufficient amount to fill the bins. Previous to the collecting of the wheat heads, the grain in the fields was tested for it's average moisture content.

Within the wheat bins, a number of dew point and temperature sensors have been placed at one foot, three foot, five foot, and seven foot depths. Their purpose is to measure the conditions of the grain in those areas to give an indication of the conditions, and to indicate any variation of the conditions within any bin. The bins were then filled with the "Green Kernals" of grain.

Once the bins had been filled, the tops were replaced, and

sealed off. The wiring connections were then made to the data logger which was programmed to make a number of temperature recordings, from each grain bin, once every two hours, using thermistor sensors.

The dew point metre was attached once weekly to each of the ten grain bins to determine the Relative Humidity of the air within the containers.

The grain was to remain within the bins until Mid-November, at which time, the side was to be removed with the intention that the grain would be studied for it's degree of spoilage due to the varying moisture content of the grain at the time that it was harvested and also to determine whether or not the grain had matured sufficiently within the grain bins.

August 10, 1990

To Furugh Ardakani,

From the start, my experiences with the WISEST summer research program have been both educational and absorbing. I was placed in organo-metallic chemistry where I spent my summer synthesizing various crystalline arene-chromiumtricarbonyls. This process involved: performing reflux reactions under an atmosphere of nitrogen, recrystallizing the resulting solution, running several tests on the crystals to determine if the targeted structure was achieved, and performing a final test to determine the extent of the material's conductivity. This whole process was in the interest of relating structure to conductivity.

I learned more than just the hands on use of the lab equipment while working this summer. In fact, I received a crash course of university chemistry. I was schooled in everything from the naming of compounds, to interpreting data on compound structure, to the Quantum Mechanical theory regarding the probability patterns of the position of electrons. Until this summer, I did not realize how ridiculously simplistic was the chemistry I learned in highschool.

The WISEST program has been a very valuable experience to me. While it has not helped me come to any definite decisions regarding a prospective career, being around those in the field of science has strengthened my interest in entering that area of study. I only wish I could come back and try out some other areas of research.

Sincerely,

Cathy Chambers

Cathy Chambers

August 10 1990

Ms. Furugh Ardakani
Program Co-ordinator
W.I.S.E.S.T.
C/o Department of Chemistry
University of Alberta
T6G 2G2

Dear Ms. Ardakani,

Thank you very much for the opportunity to have been selected as one of the students that participated in the W.I.S.E.S.T. program. I have had a wonderful time and I hope that the students in the years to come learn and experience as much as I have in the past six weeks.

Attached is my report of all I have done and accomplished with in the past month and a half.

Yours sincerely,

Sarah Stinson

Sarah Stinson

FORESTRY PROJECT

Submitted by
Sarah Stinson

Through out the past 6 weeks being a part of the W.I.S.E.S.T. program has not only helped me gain new knowledge in the field of forestry but has introduced to me new people and friends. I have had many new experiences and have gained invaluable information from the six different field trips I was on and the work I also preformed in the labs and the greenhouse.

The first field trip we were on was to Carrot Creek in Edson Alberta which is about a two hour drive east of Edmonton. It was once a forest full of aspen but in the early 1970's was cleared with bulldozers by the forest service. They then air seeded white spruce. Two weeks prior to my visit to the site, the Department of Forestry selected several white spruce trees with in the forest that were being exposed to 95%, 45% or 15% shade. Half of the trees in each group were then subjected to mechanical removal of all surrounding vegetation. The other half were left as controls. By using a machine called a pressure bomb we were able to measure the amount of water each tree contained, thus determining how stressed the tree was. It was generally observed that trees whichwere exposed to full sunlight (cleared ones) were more water stressed than the control (shaded) trees.

The second sight we visited twice and this pine area is located in Hinton. The pines were planted by the pulping company "Weldwood". The trees were strategically placed in rows where each tree in the row had the same "mother" and "father" tree, yet each row had a different set of "parents". The trees are all growing in the same setting and so receive the same amount of light, rain and other elements. To illustrate and examine the differences between the

trees and the families we measured the rate at which the trees photosynthesize. The procedure was done with what is called, for short, an I.R.G.A. but stands for infra red gas analyzer. This instrument read the the temperature in the cuvette, where we placed the needles we wished to read the photosynthesis rate on, the humidity in the cuvette, the relative CO2 and the CO2 in the outside air. With these facts we were able to determine the information we wanted.

The third site that was visited was Wagner Bog. Like Hinton I was at this site twice, only instead of going with my supervisor a Grad student and myself went for it was his research that we were working on. Two weeks prior to our visit he had frozen certain stems off chosen branches of the tamarack trees he was working with. While we were there we measured photosynthesis, the quantum yield and the florescence of each stem. The experiment was designed to examine recovery of the trees from summer evening frost events.

Our last field trip was the most distant and we travelled all the way to Prince Albert in Saskatchewan. This site was on land owned by the Weyerhouse Compagny. The project being conducted was a repeat of the study at Carrot Creek. Again, two weeks prior to our visit certain trees had been cleared of shubery around them, thus submitting them to direct sunlight very suddenly. Pressure bomb readings were then taken to measure the amount of stress these trees were suffering from and their photosynthesis rate was also measured at this time.

When I was not on these field trips I was helping various Grad students with their research, weighing the tops of tamarack shoots to determine the difference between trees grown in highlands and those grown in lowlands, or washing roots in the greenhouse to be further analysed.

I have found these experiences and the environment in which I have worked within the past six weeks enjoyable and pleasant and I have also learned an incredible amount. I am also very grateful to Dr. Macdonald for she was a pleasure to work for. I believe that the W.I.S.E.S.T. program is very unique and it was a great pleasure to have been accepted. I believe that the knowledge that I have gained this summer will benefit me for many years to come.

August 8, 1990

Dear WISEST Organizers,

Through your summer student program here at the University of Alberta, I have spent the past six weeks working in the Department of Agricultural Engineering on a very interesting project for Alberta Agriculture. The objective of the study is to test a new harvesting system which employs early harvesting of cereal crops at relatively high moisture contents. Working under Dr. Wayne Anderson and with Sandy Yakimchuk's assistance, two other WISEST students (Christine Cheng and Leanne Travers), myself, and grad student Tracy Daly were involved in building ten vertical wheat bins (approx. 2.5 x 2.5 x 8 ft), installed with sensors to allow for the continual reading of grain moisture and temperature. The wheat bins were constructed in a wood lab on campus and then transported to the harvesting lab at Ellerslie.

At the present time, common farming techniques require that grain be swathed, generally in late August to early September, and then laid in the field to dry and ripen before harvesting time. During this short but critical waiting period, however, exposure to high amounts of moisture may decrease the value of the crop fairly substantially. Therefore, if early harvesting at high moisture contents is feasible with minimal amounts of spoilage, and if the green wheat heads will indeed continue to mature once placed in the bins, then a new method of wheat harvesting, which eliminates the necessity of combining, will result. This method may then also be applied to other cereal crops in Canada. In such a process, the grain would be picked off the fields while still relatively high in miosture content, and would be transported to the bins for storage, drying, and later threshing. It is hoped that by employing such a process, harvesting will be made more economical, primarily for the small farmer who lacks a large amount of grain to combine and/or a large reserve of capital. Such is the ultimate goal of our research project.

Within each of the wheat bins were placed a number of dew point and temperature sensors, one of each at one foot, three feet, five feet, and seven feet depths, in order to measure and indicate the condition of the grain in those areas as well as to point out any variation of condition within any bin. The bins will then later be filled with green kernels of grain at varying degrees of maturity; two

bins shall be filled with samples of wheat heads with a moisture content of 40 per cent, two at 35 per cent, two at 30 per cent, two at 25 per cent, and two at 20 per cent. This will show the varying degrees of spoilage as related to the varying degrees of moisture content of the grain when collected off the field.

Once the bins are filled and the tops replaced and sealed, the wiring connections will be made with the data logger, which will be programmed to take temperature recordings from each grain bin, once every two hours, using thermistor sensors. As well, the dew point meter shall be attached once weekly to each of the ten bins to determine the relative humidity within the containers.

The grain is to remain in the bins until mid-November, at which time one side will be removed and the wheat heads may undergo further observation. At that time, the grain will be studied for the degree of spoilage, as it corresponds with its moisture content at the time of harvesting. It will also be determined whether or not the grain had matured sufficiently within the wheat bins.

In addition to this, our foremost task over the past six weeks, Tracy, Christine, Leanne, and I were busy periodically counting and measuring plants for a fibre optics project, working with young, dead roosters for a study of animal science, and working on library research for information which we then recorded in the department's computers. We have also been fortunate enough to see and experience many unique aspects of the University by visiting various locations on campus and the two University farms, as well as through formal tours of the Alberta Microelectronic Centre and the Univesity's own self-sufficient underground tunnel system, both arranged by Sandy Yakimchuk.

I have thoroughly enjoyed my involvement in the WISEST summer program here at the University of Alberta over the past six weeks. My vast experiences will not soon be forgotten, and my many new friendships will be treasured always. Thank you very much for working so hard to provide grade eleven students with the opportunity to be involved in such an uncommon but invaluable program; I will surely recommend it to students at St. Francis Xavier High School in Edmonton come next spring.

Sincerely Yours,

S. A. Burghardt

Sandra A. Burghardt

The WISEST Summer Research Program

Leanne Travers

The Wisest program as a whole is a very valuable and informative program, and I am certain that all of it's participants, past and present have been justly advanced and aided by their participation in the program. In my own case, I have found the research that I did to be very interesting, and the people that I worked with to be both fun and informative. I have greatly enjoyed this project and feel that I have learned a great deal, even though Agricultural Engineering was not one of my choices for the fields that I wished to research in.

For the past weeks I have been working with a number of very fun and enthusiastic people. The project we have been working on has been involved in the harvesting of grain. Often when wheat, or other cereals, are ready to be harvested, they are swathed and left in the field to dry before they are combined. However, often the crops that have been swathed are exposed to rain and do not dry out quickly. Such rain exposure damages the grain and causes it to decrease in weight and grade and therefore the value of the crop decreases. This exposure also means that a farmer must wait longer to combine his crop, meaning that it is more likely that the elements will further damage the grain.

Obviously, such a scenario is not desired. One alternative is to allow the wheat to dry completely before harvesting it, and leaving it standing while doing so. In Alberta, this is not very feasible however, due to our early frosts and winters and our short growing seasons. Before the crop would become dry, winter would have arrived. Furthermore, a standing crop is much more easily damaged by high winds, hail storms, and tornadoes. This is also an undesirable scenario.

The scenario which is probably the best choice for the future is that of harvesting the grain when it has a high moisture content and then drying the grain while it is in storage. Our project was related to finding the best moisture content at which to harvest grain to use in such a process.

In order to determine the optimum moisture level, grain bins (made on a smaller scale than regular bins) were constructed and a number of sensors were placed within them which could measure the temperature and dew point in the bins which would then help to determine the humidity of the grain in the bin. Once the bins were completed, they were transported to the University Farm in Clerslie. The bins will then be filled with grain harvested when it reaches specific different humidities. The grain will then be left to dry in the bin. After a suitable period of time has passed, the grain bins will be reopened and the grain will be tested to determine which bin of grain, harvested at a specific humidity, had the least amount of spoilage, and which bin of grain matured to the greatest extent in the bin. There are, of course, a number of ingrained problems with this experiment. These, I will not discuss.

Unfortunately I will not be working when the bins are tested for spoilage, but other than that, my experience with the Wiscat program has been a positive one. I am pleased with the project we worked on, and the progress the group I worked with made. This program has given me a great deal of insight into university work, and I feel that this summer's participation in the program will be very beneficial to me in the future.

My assignment, working in the department of immunology under Dr. Linda Pilarski, has proven to be a very valuable and enjoyable experience. I have had the opportunity to work with blood samples donated to us from chronic lymphocytic leukemia (CLL) patients.

Before we are able to study the surface molecules of the B-cells, the blood must first be purified. We used the ficoll overlay technique to separate the red blood cells and other leukocytes from the lymphocytes. A very careful pipet procedure is used to extract the lymphocytes from the other blood cell layers. After the separation has been completed, the cells are washed and a slide is prpared and placed under the microscope. The lymphocytes ~~are~~ within a certain field are counted and simple calculations are performed to figure out the amount of lymphocytes present in the sample.

Using a two color immunofluorescence technique, antigens on the cell can be identified. I am primarily concerned with the leukocyte common antigen (LCA), CD45. We are curious to find out if the LCA in CLL patients is homogenous or heterogenous for molecular weight. If it is homogenous we would like to know whether the population of B-cells

has a high molecular weight (p220) or a low molecular weight (p180).

As cells differentiate into plasma cells it is found that their molecular weight changes from p220 to p180. Plasma cells play an essential role in our immune system, manufacturing antibodies. The purpose of my study is to determine whether the population of B-cells in CLL patients is virgin (p220) or experienced (p180) or whether or not they express both.

Tricia Anderson

WISEST

Summer Experience

Work Report

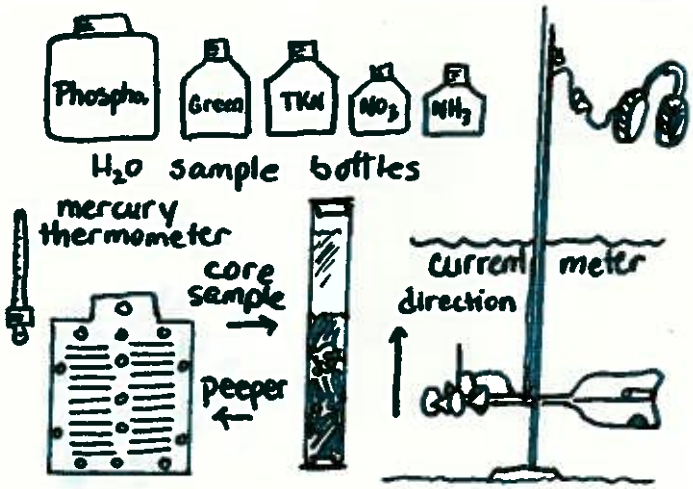
by Lisa Matsuba
Supervisor: Dr. E.E Prepas
Field: Zoology

for Furugh Ardakani
WISEST program co-ordinator

This summer, I had the opportunity to work at a research station. The Meanook Biological Research Station provides adequate work space in appropriate surroundings for many students. The students, both graduate and undergraduate, come from various Universities across Canada. Among the many projects pursued there is the Pembina River Project headed by Kathleen Gibson and the Deming Experiment performed by Kevin Hinbeault. I had the chance to take part in these two projects.

The Pembina River Project is aimed at studying what goes on in a river. How does it change? Do the nutrients in the sediment differ in type or amount than those in the open water? These were some of the questions this project tried to answer.

Two times a week, water samples are taken from 4 prechosen sites along the Pembina River. Temperature, current meter, and core samples are taken and recorded. Sometimes, peepers (plastic slabs with filter-covered chambers) are planted or removed. During these excursions, I usually acted as a helping hand - there to make things easier. I would help carry equipment and samples to and from the sites. I collected water samples, took the temperature of both air and water, assembled the current meter and recorded the numbers. When we were pulling or planting peepers, I ferried back and forth between the divers and the 'peeper-people' and held the security rope attached

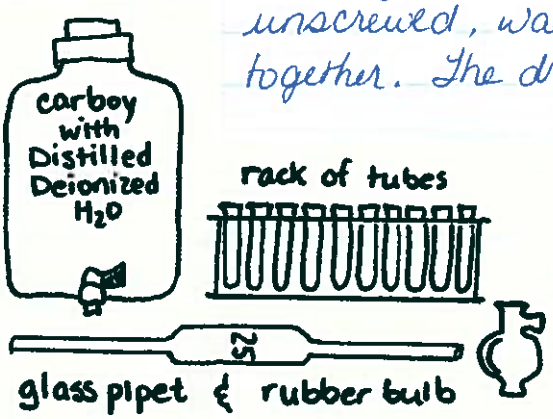


to the divers.

The work would take all day occasionally extending into the evening. Some of the samples had to be analysed with 24 hours. This meant filtering, acidifying or going through other preparations for analysis on the same night. The field days were definetly the most busy days.

The days following a field day held lots of lab work. The things left undone the night before had to be finished. Since there were many other analysis to be done, there was a lot of preparation to do.

For me there was both 'important-monotonous' and 'important-exciting' jobs to do in the lab. Glassware and other instruments had to be rinsed 7 times out of an acid bath or 5 times out of a soap bath - with distilled deionized water. The pipers had to be unscrewed, washed and screwed back together. The drying ovens had to be emptied and their contents covered and put away. When analysis was done, racks of tubes had to be rinsed 5 times each.



On occasion, when too much was to be done in too little time, I got to lend a hand in 'important-exciting' tasks. In order for amounts of dissolved oxygen to be measured, chemicals must be added to the sample water in a series of steps. I was able to help by adding acid and rotating (stirring) the syringe thus bring the precipitate into solution. I also added specific amounts of d.d. H_2O to phosphorus (P)

tubes for P analysis and HCl acid to iron (Fe) tubes for Fe analysis. On occasion, I used the spectrophotometre (a machine that passes a laser through a cell (a small glass container) and measures the colour intensity) and recorded nitrogen and soluble reactive phosphorus readings. A few times I made premixes and reagents and through this I became acquainted with the electronic scale, the fumehood, certain acids and pipetting.

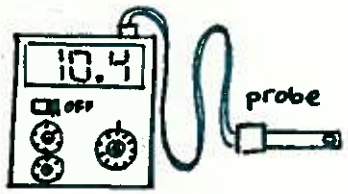
Although there were some days when it seemed like rinsing glassware was all I did, those days were few. I was lucky to have experienced so many different tasks and believe that Kathleen and other members of the Pembina Project should be the ones to thank.

The Liming Experiment, headed by Kevin Himbeault, tries to determine the effects of lime on macrophytes (large bottom-dwelling plants). The area around the station is farmland. Many farms have dugouts providing drinking water for livestock. This drinking water may contain P, a substance algae in the water feed on. High amounts of P leads to large growths of algae. Too much algae lowers the water quality (bad smell, odor, clarity, etc) while excessive amounts can produce deadly toxins. By adding a slurry lime solution of either $CaOH$ or $CaCl_2$, the P is precipitated out, sinking to the bottom. Without the P, the algae starve and the water is cleared. But what happens to the bottom plants? How are they affected?

The experiment consists of 30 barrels of eutrophic lake water. Each barrel now contains a bottom layer of sediment, 10 milifoil plants and a specific concentration and type of lime. Yet this

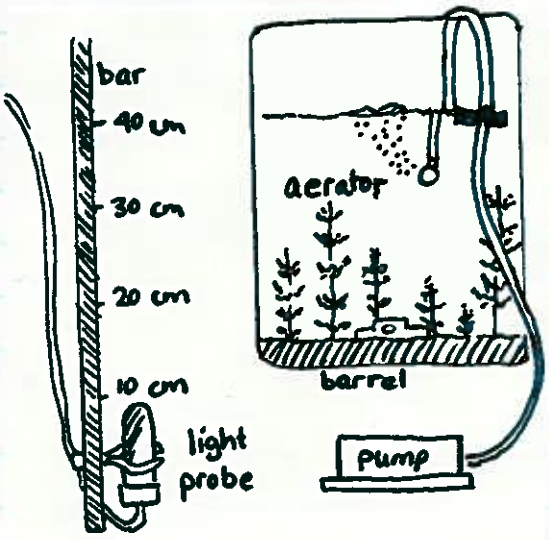
set-up hadn't always been this way.

When I arrived, the barrels were set-up. They contained the lake water, the sediment and the lime. The pH levels however, were erratic, ranging in some barrels at 5 (very acidic), while others at 11 (very basic). For a few days, my task was to monitor the pH levels by taking pH readings at least twice a day. This familiarized me with the portable pH meter. As the pH's stabilized in later weeks, I helped Kevin and his professor Patricia, collect and sort milifoil (the plants to be used in the experiment. This took 2-3 trips to Long Lake. When we got back, all 300 carefully chosen plants had to be dri , weighed..and tagged. Then they were given to Kevin who had the back-aching job of planting and later on measuring them. Unfortunately, I was to short-of-arm and could do nothing but record lengths for the remainder of my stay.

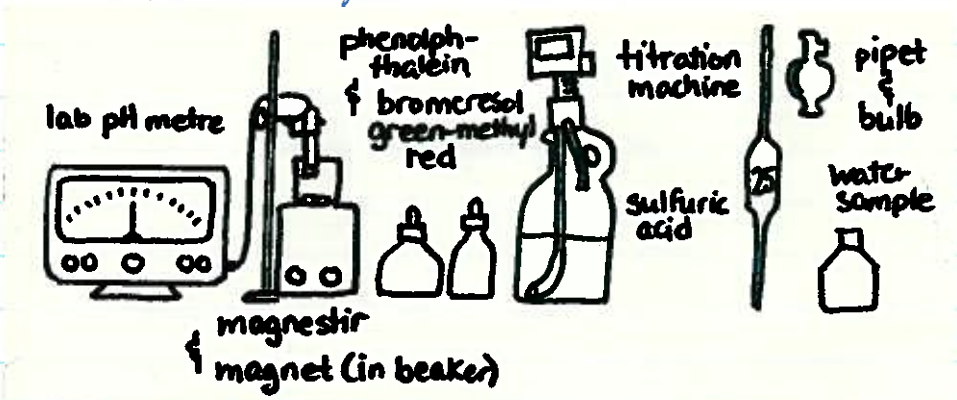


pH/temp. meter

I found this project, unlike the Pembina, to be progressive rather than repetitious. New things were being done each week. Before long, peepers were planted, water samples were taken. as well as light metre.



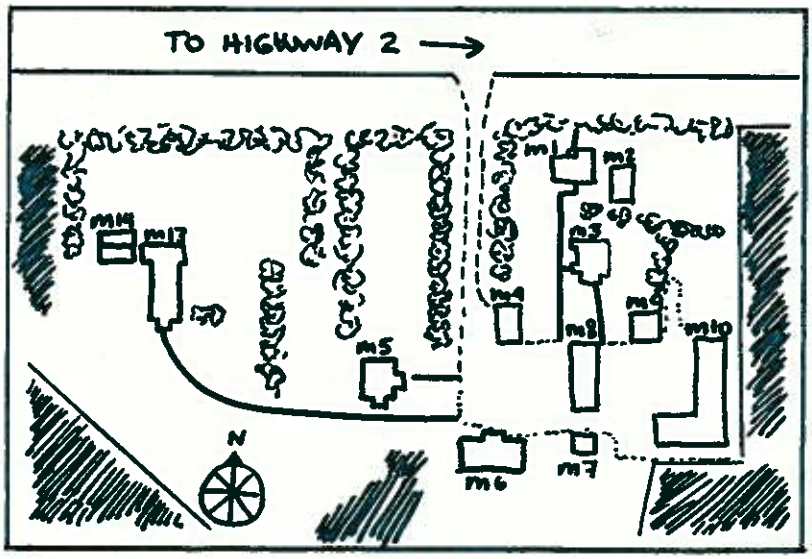
The water sampling from the 30 barrels created a mind boggling amount of lab work. The P and Fe tubes required reached a total of 12 racks each (40 tubes per rack). Luckily I only had to read a few racks and only once had to wash the whole set. I also got to perform alkalinity tests on the water barrels. Through this test, I achieved a lot of pipetting practice. I also learned how to use the lab pH metre, the magnestir and the titration machine.



It might seem like 'Cinderella-work' with all the washing tubes and rinsing acid baths (I really did do a lot of those) but there was lots of time after hours. That's what I especially liked about being at the station. Once work was finished, you still got to stay with the same people. MBRS turned out not only to be a work experience but a social experience as well.

Generally, work ended at 5pm giving us an hour before supper was served. We ate together in the dining hall and usually talked about the quirky moments of our day. After supper, we often went to Narrow Lake to swim. There was CBC to watch (the only channel our midget TV could accept), people to go biking with or golfing with, or your own bedroom to retire to. Many times, people had to go back to the lab to continue working and I often took advantage of this to learn more about them or their work. There were also duties to be done.

There was kitchen help sign-up twice a month and bathroom, work office, lab and lounge clean-up at least once. With all this, my leisure time was quickly filled up



m1, m2 - Resident Manager's house & Garage
m3, m5 - Senior scientists residences
m4 - Workshop
m6 - Station centre: kitchen, dining hall, bunkhouse & laboratories
m7, m11, m12 - Storage facilities
m9 - Aquarium + SCUBA centre
m10 - Main lab + office building
m13, m14 - Dormitories

I have met and made many new friends at MBRS. Because of the unique and 'independant' lifestyle there, I have acquired new lifeskills. Although I do not think this specific science (limnology) will be my future career, I have no doubt gained a new perspective of science. I have learnt that it takes a lot of patience and meticulousness. There is a lot of repetitiveness and caution (ie. no contaminations) used in the lab work. It can sometimes be very frustrating when your results don't come out as you expect or if your experiment is hindered by minute details.

I am very grateful to all the people who contributed to give me this experience. I sincerely hope others might get this opportunity next summer. My hands-on experience at the Meanook Biological Research Station will never be forgotten!

Maria Papathanasiou ⇒ Chemistry

- Distillation (ethanol)
- making solutions: weighing out material
  : some I would have to mix with magnet burner with heat, ice, or just room temp.
  : others I'd just mix by shaking it in the vial
- after making the solution, I'd put them in ~~=~~ tubes with either some ethanol or THF and put them on a gas vacuum machine while freezing them with Liqued Nitrogen
- I'd do this 3 ~~times~~ times then I'd seal the tops of the tubes by melting the tops off with a flame
- I'd make 2 or 3 tubes of each solution
  I would go into a 61°C oil bath
  I would stay at room temp
  and ~~I~~ if I had 3 tubes, the ~~a~~ last one would go into a 25°C light water bath.
  : I'd leave them for 24 hrs.
- then I'd put them in Liqued Nitrogen for about 5 min.
- ~~and~~ and then let them melt
- with a glass cutter, I'd open the top of the tubes and ~~p~~pour them into vials and quench them (that's
  : taking about 1mL of Ethanol or THF with one drop of water and shake it together
  - taking a pipet, I'd put 3 drops of the mixture into all of the solutions and shake them
  - then I'd put some drying agent (e.g. Magnesium Sulfate) in each vial and shake them

- after the drying agent settled to the bottom, I'd take a μl serrenge and take about 0.8μl of a solution and put it in the GC machine (Gas Chromatograph) which analizes the solution and gives the peaks of the products in the solution
- after I'd inject the solution in the G.C., I'd have about 40 min ~~weigh~~ waiting time
- in that time, I'd either sit arout, talk, weigh some more chemicals, or most likely do dishes, even if I didn't even use them, I'd do Yangs (person Dr. Tanner gave me to) dishes, he hasn't done a dish since I got here!
- then after the G.C. was done, I'd calcalate the figures to find the Area Ratio.

Also when I did dishes I used acetone, but sometimes, when I washed tubes, I used salfuric acid and sometime rinse them with ammonia

- ammonia realy smells bad and salfuric acid is really dangerous, it put two holes in my new shoes

Aug. 7

Upon arrival Erica and I were greeted with warm welcomes. Erica is also a wisest student working in Dr. Spence's lab. We were taken on a tour of the Earth Sciences building. Dr. Spence specializes in water bugs with extreme interest in water gliders. Erica and I were given a brief introduction of the evolution and background of the water gliders before starting our six-week summer job. Three days a week we had to clean, feed and attend to necessary shutdowns and transfers of the water striders. This took up the morning. Every second day the striders were fed. Dr. Spence is involved in field work. Every tuesday we went to George Lake over by Busby. Erica and I got to put on hipwaders and help with the traditional bug count. This is collecting all adult species of water striders, recording, painting, and releasing them back into the pond. Dr. Spence is also experimenting with moths at George Lake. I helped test fly once. There are various graduate students in which I was working with.

Nidia who is from El Salvador I helped mostly. She is working with wasps for her master degree in Entomology. Duties ranged from collecting eggs in the pond, counting the hatched, unhatched, dead, and parasitized eggs. Dr. Spence had Erica and I supervising mating experiments of the water striders. This was to see how likely it was for species of a different kind were to mate and if a copulation was achieved. A couple of times we went to Ellerslie to collect bug traps. These traps were Hector's who is also from El Salvador. He is studying carabid beetles. Erica and I spent a good percentage of our time cleaning bug traps. When cleaning the bugs traps beetles and spiders are picked out and bottled in ethonal. These are the known predators of bugs. This summer job was a great experience and loads of fun. I am very grateful to have had the opportunity

Thank you

Lisa Jawett

Westlock, AB

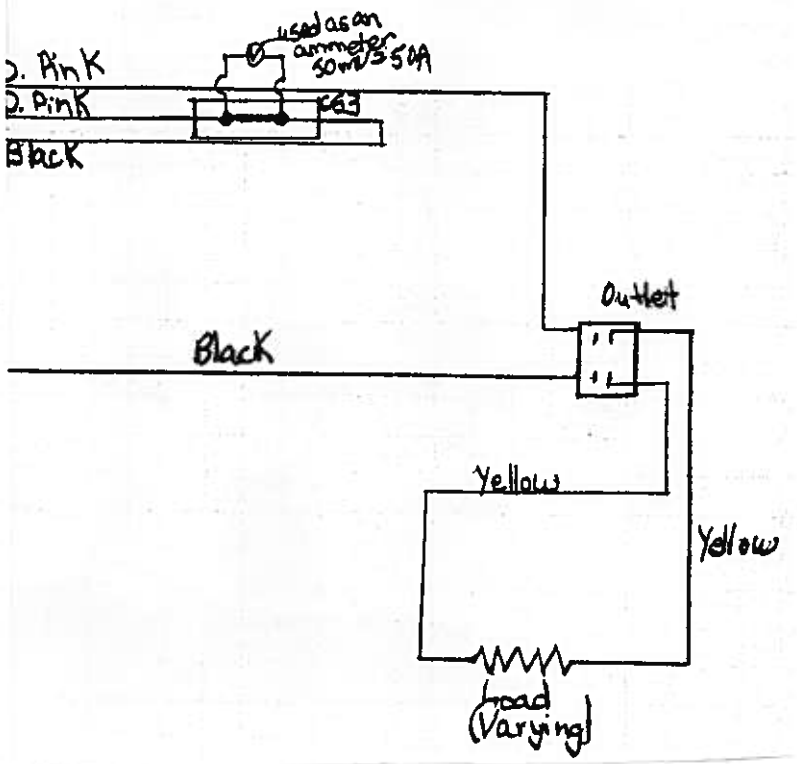
WISEST REPORT

STUDENT:VICKIE KOWAL
DEPARTMENT:ELECTRICAL ENGINEERING
SUPERVISOR:DR. A.M. ROBINSON

DATE:AUGUST 10, 1990

The year is 1990 and the journey is a six weeks exploration through Electrical Engineering. Through this journey, one has encountered several, not all, aspects of Electrical Engineering. Such encounters include the Photovoltaic Energy System, metal resistivity, an electric circuit, the Watsun P.V. 2.0 computer program, and lasers. There have been other encounters that are not only related with Electrical Engineering, but all faculties at the U of A. These include the use of the libraries on campus and working with students of a variety of different cultural backgrounds. All which have been a great experience!

The Photovoltaic Energy System is another name for the solar powered system and it was one of the major encounters on this journey. It consists of solar cells joined with metal strips, perhaps a battery for storage of unused energy, a load, such as a lamp, and wire to connect all of this together. (Here is a diagram of the circuit for a photovoltaic energy system.)



The solar cells are made of a n-type material(phosphorous and silicon) and a p-type material(boron and silicon) which combine and then form a junction between them. The n-type material is negatively charged, therefore, it has excess electrons, while the p-type material is positively charged,

therefore, it is missing electrons and has "holes" in it. When the incident light from the sun strikes the material, these electron-hole pairs are formed. Then a current is produced and the excess electrons are forced from the n-type material through a conductive material and the load and then enters the p-type material to fill the holes. (Here is a diagram of solar cell panels and a detailed look at the process of producing the energy and the current.)

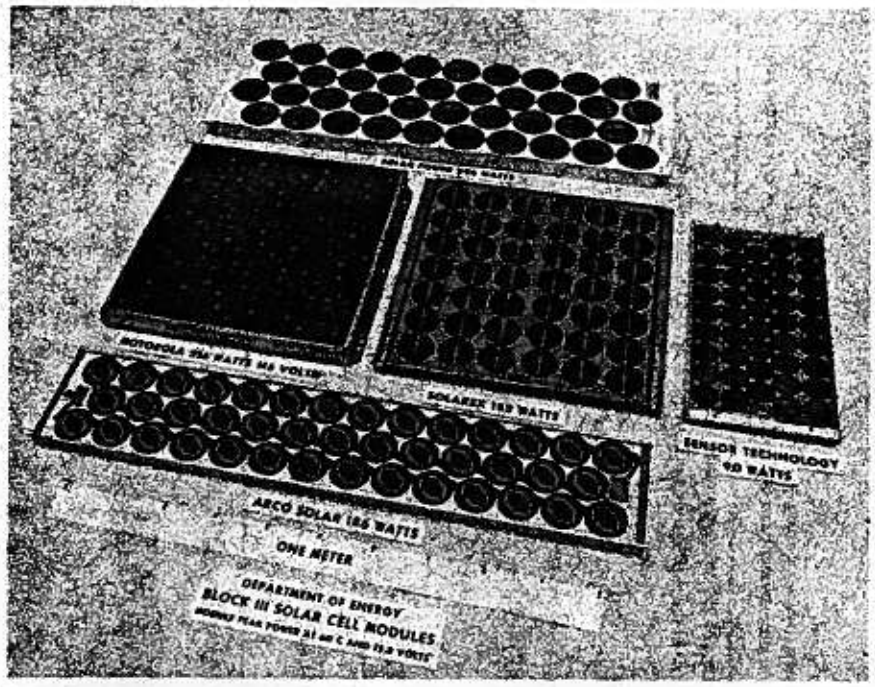


Figure 8-1 Four Block III PV modules. (Photo courtesy Jet Propulsion Laboratory.)

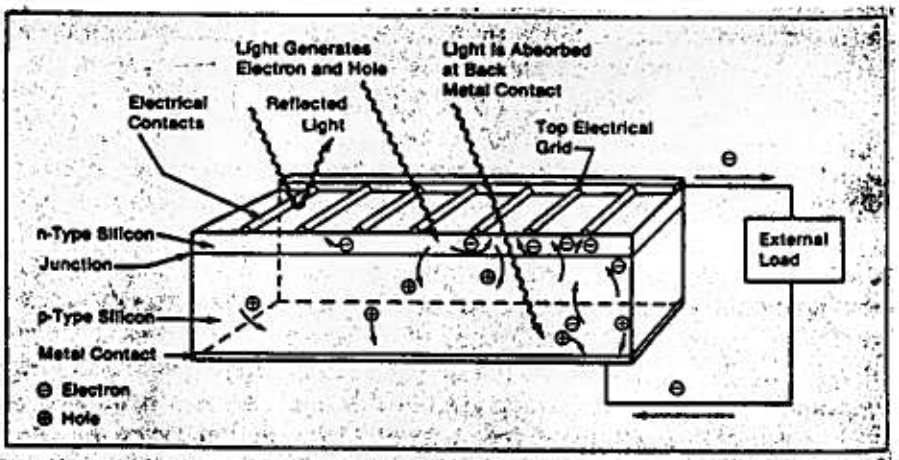


Figure 2-8. Light incident on the cell creates electron-hole pairs, which are separated by the potential barrier, creating a voltage that drives a current through an external circuit.

As the electrons travel to and through the load, the load is being supplied power. To figure out the amount of resistance required by the circuit and load to provide the greatest amount of power output, one has to complete a couple of curves. The first curve is an I/V curve(I=current and V=voltage) which is used to find the resistance and is produced by using an instrument in which the resistance can be varied. The second is a power curve. (Here are both curves, separate and together.)

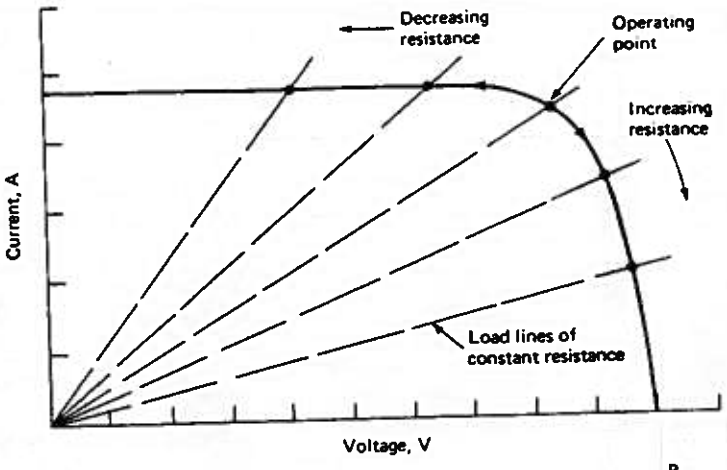


Figure 4-11 The load's operating point on a solar-cell *I-V* curve.

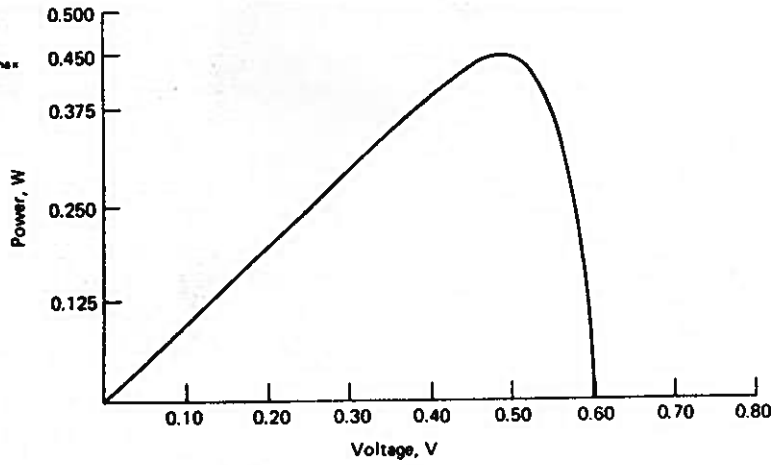


Figure 4-7 A silicon solar-cell power-versus-voltage curve.

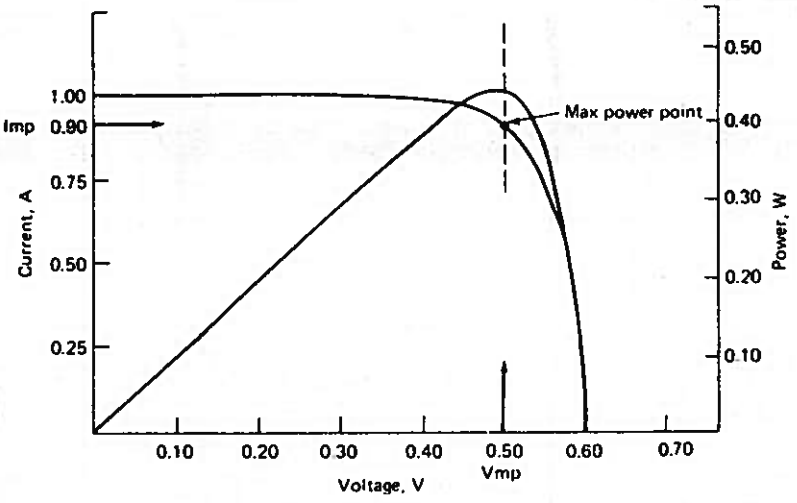


Figure 4-8 Finding the maximum-power current and voltage for a silicon solar cell at a given insolation.

If the solar cells are not in top working condition, there will be a change in the I/V curve. The following two graphs are examples of these changes, the first being an example of a bad cell in a panel of cells in parallel and the second being an example of a bad cell in a panel of cells in series.

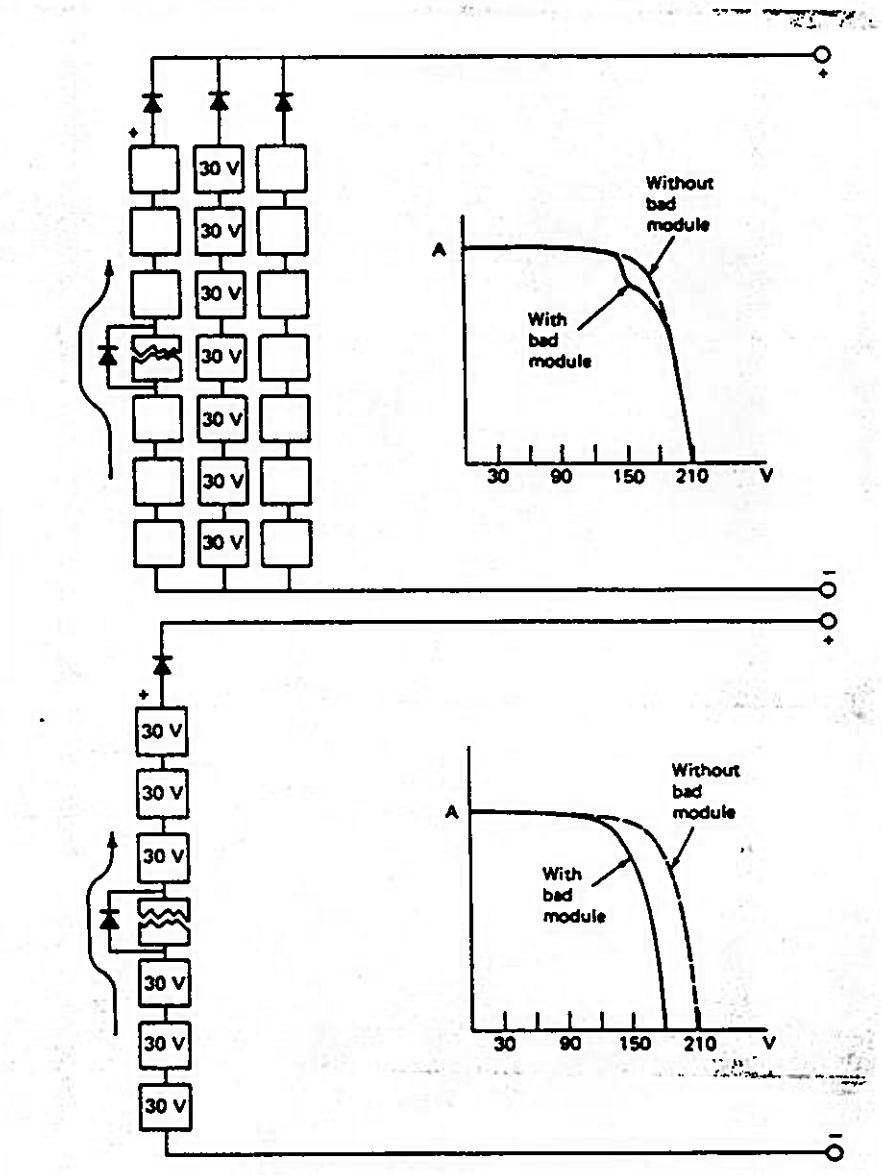


Figure 6-13 Current-versus-voltage curves of an array, and a branch with an open-circuited module in it.

Each cell should be tested in order to find the problem cell. This is done through a process of shadowing. Shadowing involves covering each of the cells with a piece of non-transparent paper and the voltage reading is taken. The reading is compared to the voltage reading taken before any of the cells were covered.(Note:This is done at a constant radiation intensity.) The cell that doesn't show a significant decrease in the voltage reading should be looked at closely for it may be damaged and,therefore, not working.

If one includes battery storage in the Photovoltaic Energy System, one has to put diodes between the panel of solar cells and the battery. The diodes prevent the loss of energy collected in the battery through the solar panel. Each of these concepts that are related to the Photovoltaic Energy System are covered through this expedition through Electrical Engineering.

Calculating the resistivity of metals and wires was a mathematical encounter. One had to use the formula $R=p(l/A)$. R=resistance
p=resistivity of the metal
l=length of the metal piece
A=area-calculated with the two other dimensions of the piece other than the length

The Constant Wattage Test was another experience on this journey. It involved a test on a circuit to try and answer the question "Do resistors change in their ability to resist the flow of electricity as their temperature changes?". This question needs to be answered so that efficient resistors can be used in an integrated circuit.

The Watsun P.V. 2.0 computer program was encountered on those days that the sun could not be seen at a consistent rate and intensity, the rainy and cloudy days. It is a program that simulates the Photovoltaic Energy System in a variety of arrangements. This program is not in top working order and it is not thoroughly understood. These two problems are the reasons for exploring Watsun P.V. 2.0 so that it is in good working order when someone wants to seriously use it for an experiment. (Here is a printout of a simulation using Watsun P.V. 2.0.)

August 10, 1990

My name is Carmen Smentek and I am working ~~on~~ with Glenda Tek in the Department of Soil Science, under the direction of Dr. Anne Naeth and Dr. David Chanasyk. The study of soil science is important because understanding the soil to the fullest extent possible is essential to its efficient use and preservation, for we depend on the soil every day of our lives. The wheat and other grains we eat rely on the soil for their nutrients and the soil also has underground freshwater streams from which we get well water. During the time we have been here, we have worked on several projects. These projects involve a productivity study, a study of the effects of mining on farmland, and a study of the production rate of several types of soil.

The idea behind the productivity study is to look at the productivity in terms of plant growth of the land in the Keephills area before it has been mined. This is done to get an idea of how much forage is produced before and after mining. The mining done at TransAlta Utilities is strip mining of coal. This means they strip layers of soil from the earth and after they remove the coal they put all the soil back into the hole. This obviously upsets the balance of nature. TransAlta Utilities attempts to keep the productivity of the land the same before and after mining, and the productivity study is a good way to determine this. We were responsible for sorting the clipped samples into weeds, grass, legumes and dead matter. This was to determine what exactly and how much of what is growing there.

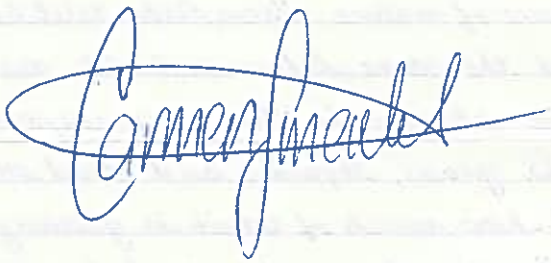
The second project we worked on was also at TransAlta Utilities, except that for this project we were near Highvale, Alberta. This project was started in 1986 and its purpose is to determine ways of improving already mined sites. Our ~~resbo~~ responsibility here was to read the penetrometer dial and record it. The penetrometer is an instrument pushed into the ground at eight different intervals, the deepest being eighteen inches. The penetrometer measures soil pressure in pounds per square inch. This is useful for determining how well a plant will grow in a certain area, because you know how much ~~resistance~~ resistance the roots will be facing.

The third and final project we worked on is called Sandy Spoil. Spoil is mineral matter, with no organic material, which lies between each layer of coal.

It is not considered true soil however. The project goal is to determine what combination of spoil and fertilizer produce the most forage. There were two types of spoil: brown (oxidized) and grey (unoxidized), and these were used in various combinations with or without topsoil or fertilizer. There were five repetitions of each treatment, ie: Brown spoil without topsoil, with fertilizer, to lessen the percentage error in the experiment. Our responsibility was to clip all plant matter and weigh it, wash all the roots and weigh them as well.

During this program we have also had experience with placing data into Mac Intosh computers. We had to input all the raw data and produce printouts in a well-organized, readable chart.

I think this summer program was very beneficial for me. I learned a lot about things I would never have learned about otherwise and I was most impressed with the dedication of University employees to their research. I got along well with my co-workers and I liked working with the computers and working outside at the mine site. I thoroughly enjoyed myself this summer and I will recommend this program and WISCST to anyone who expresses an interest non-traditional vocations. Thank you for this opportunity.



The WISEST program has given me opportunity to experience and see what a chemist does when he/she does a research. Some major things I have learned to do were: using the scale to measure the substances, analyzing the reaction tubes with the gas chromatograph, measuring the melting point of a solid substance with a machine, and degassing reaction tubes with a set of vaccuums. Beside from running ~~the~~ the experiments, I also learned to balance chemical equations.

The meetings I liked best were when we had guest speakers in non traditional field and sharing with other WISEST students what we did. The guest speakers shared great information with us. They remind us not to be afraid to take a chance in entering the science and technology field. They give me confidence in entering these fields because they are very successful at their career. Sharing with other WISEST students about what we do ~~was~~ was interesting. It gave me an idea of what to consider as a career.

I enjoyed working in the chemistry lab and will miss it. I have learned many things in the past six weeks. I feel very fortunate to be chosen as a WISEST student because I got to experience what few students have. It was great working with Eve, Chris and Dr. Tanner. They gave me good and clear instructions. The people in the lab are friendly and made me feel comfortable

working here. I also made some new friends. I'll always remember this summer because I had fun working!

Thanh Le
August 17/90

Week 1

- Run reactions using Freon 11, 112, 113, neopentane, and p-Dichloro-benzene
- Learn~~t~~ how to use scale to measure the amount of each substance.
- Use the viscometer to determine the the viscosity of the solution and record the time.
- Calculations of, the density of the solution is determined.
- Titrated chlorinated neopentane ~~and~~ to find the concentration of chlorine.

Week 2

- Inject about 0.6μL of the solution into the gas chromatograph (GC).
- Read graph process by the GC to determine what each compound is by the peaks shown on the graph
- Calculations of the mono ($+^{Cl}$) to the poly ($+^{Cl}_{Cl}$, $^{Cl}_{Cl}+_{Cl}$, and X^{Cl}_{Cl}) is made

Week 3

- Using hydrogen pressure to do a reaction.
- A Parr apparatus is used to hold the starting materials
- ~~Chris~~ Watch Chris ~~put the~~ attach the apparatus to the hydrogen pressure system. He also explains what's going on.
- After 2 hours, the reaction is done. I then extract the catalyst with pentane and Bicyclo [2,2,2]

octane is obtained.

Week 4 + 5

- Basically doing the same thing as week 1 except different solvent is used.
  - New solvents are CH_2Cl_2 (methyl chloride) and CCl_4 (carbon ~~tet~~ tetrachloride).
  - The viscosity is determined and so is the density.
  - Learn how to use the vaccuum to degas the reaction tubes so the solutions could be as pure as possible.
  - After the tubes are degassed about 3 times, I sealed it.
  - Distilled CCl_4 to ~~[illegible]~~ run more reactions
  - Clean some reaction tubes which must be done carefully. Safety precautions must be taken to avoid spilling the sulfric acid.

Week 6

- Run reaction using ethyl chloride.
- Inject solutions into the GC for Dr. Yang
- Sublimated the bicyclo [2,2,2] octane
- Use melting point machine
- Calculated the molarity of the ethyl chloride.

W.I.S.E.S.T. REPORT
(Mechanical Engineering)
Lili Nguyen

When I first learned that I got a job from WISEST in Mechanical Engineering, I was very excited. Not only was I guaranteed a summer job that would be interesting, I was also getting involved in something that would lead to a future, an experience that would still be beneficial to me 20 or 40 or 60 years later. My main motive for entering the program was for the technical experience. I speculated about the sort of work I would be doing. My friends had joked that I would be sent out for coffee or else be a subject of experiments. Nevertheless, I still looked forward to working in an environment that interested me. As it happened, the six weeks in Mechanical Engineering now constitute my most productive and enjoyable summer.

The first two days of the job I was taken on tours all around the Mechanical Engineering building. I was also shown a part of the Biomedical building where the development of prosthetics(a facet of biomechanical engineering) took place. In the Mech Engg building I was shown the wind tunnel, ice tunnel, water channel, robotics lab, a variety of experiments, such as in biomechanics where apparatus was being designed to correct and align backs and knee joints, and shown the displays of equipment no longer in use that were still big enough or strange enough to impress and scare anyone who wasn't in mechanical engineering.

The experiments I would be working on for the next six weeks related to testing the life of equipment used in drilling oil wells. Firstly, there was the corrosion fatigue test of sucker rods. A load is placed on a sucker rod in an environment of sodium chloride solution. The rod was stressed until it cracked, and the number of cycles it lasted recorded. The second experiment was X-ray diffraction. The object of this was to determine the residual stress of a sucker rod. X-rays were taken of rods peened either once or five times. I learned how to develop the slides produced and analyze them using a microdensitometer. This machine scanned the slides and graphed the density of the resulting iron and steel rings. Measurements and calculations were done to obtain the residual stress. Much to my amazement, I could not only do these, but could even partially understand them.

The greatest amount of time was spent on the wear testing of Austrian Scrapers. These plastic scrapers would run over the surface of a metal tube, being stopped periodically. Measurements then took place of the flute height, of the scrapers, and their hardness. The tube's thickness, hardness, and roughness were also taken, as well as the debris resulting from the scraping. The contents of the Materials Engineering lab and the machine shop became less bewildering as I learned how to use more and more of the equipment. One especially valuable

experience was organising, graphing and making spreadsheets of the data collected, since I had never used a computer for anything other than word processing.

In my spare time I learned how to develop film and prints, slide down the banister, make videotapes, and weld with an acetylene torch, stick weld, and TIG weld. I also saw how the CNC(computer numerically controlled) lathe was used, and what it could do. And-yes! I learned how to make Engineering numbers.

1-2 3 4 5 6 7 8 9 10 (Nice, huh?)

I still don't know how to juggle, or ride a unicycle, but I definitely gained the technical experience I wanted. I definitely had fun. And I definitely want to go into Engineering.

Ms. F. Ardakani
WISEST
C/O Department of Chemistry
University of Alberta
Edmonton, Alberta
T6G 2G2

Dear Ms. Ardakani:

This letter will outline my activities at Meanook Biological Research Station this summer as one of the WISEST candidates.

I worked in ten day shifts, each beginning on a Monday, and ending on a Wednesday. My particular duties involved working on an aeration project where liquid oxygen is injected into the lake through a diffuser.

Our shift worked on sampling water at Amisk Lake on the first Monday and Sunday of every shift. Each Monday we took samples of water using a drop sleeve to test for dissolved oxygen and phosphorous content. The following Sunday we also tested for ammonia, nitrates, and methane content.

We used machines such as the fluorometer, and, as well, tested for water temperature at various depths by lowering a type of thermometer.

During my shifts I worked in the laboratory at various times. This work consisted of preparing samples of lake water, and reading chlorophyll levels. This is quite an involved process which involved filtering and freezing samples, using ethanol to help collect the cholorphyl. At other times, I did conductivity readings at different depths. The temperature was a constant for each of these readings. When needed, I made a premix solution and a reagent for injection into phosphorous samples for reading phosphorous levels on the spectrometer. I was often required to do acid baths, rinse test tubes and glassware. Janice, my supervisor, tried to involve me in as many things as possible to keep the job interesting.

I also assisted in other projects, in order that I might learn more, and to stimulate more interest. Some of the things I worked on included the following: preparing filters for weighing zooplankton specimens; typing out a bibliography for the zooplankton project; working as a spotter while scuba divers dove for plants in Lofty Lake; helping to take samples of benthic invertebrates for another project; working on filtering water samples for ammonia and nitrates; and lastly, I helped to read phosphorous levels.

My accommodations consisted of a small private room in a trailer,

with the bathroom down the hall. There was a regular cook hired to work during the week, but I was asked to prepare one meal on a weekend, and help the cook prepare one meal during the week. After work, we spent time swimming at Narrow Lake, and often rented a Video machine and watched movies. As well, there was a recreation room provided, with a ping pong table, and an outdoor volleyball court. Some evenings we had campfires, at which we sang songs and had a wiener roast. One evening, one of the students brought out his telescope, and we all took turns looking at Saturn.

I hope that this letter enables you to understand my duties at Meanook Biological Research Station more clearly. I enjoyed my work there very much. I would be very interested in returning to Meanook next summer, as my experience this summer has reinforced my desire to study biology at the University of Alberta after grade twelve.

Thank you very much for your help this summer, in conjunction with the WISEST organization.

Sincerely,

Pamela Thiell

Pamela Thiell

WISEST: Women in Scholarship, Engineering, Science and Technology

Mary Grace P. Gamboa
Department of Botany
August 10, 1990

The WISEST program has given each of its participant an experience and a challenge to remember. Being chosen as one of the thirty-seven students for the WISEST program had been and will always be a priviledge and help for me to come to terms with my desired career. I know what to avoid or what to partake in my choices in the future. I came into the program having no a idea of what I want to be and hoping that this will help me narrow down all the areas of my interests into one particular career. Although this program has not determined the exact career for me, it had helped come face to face with what I have to face in order to get where I want to be. The hands-on experience proves to be helpful if not beneficial to students as well as class studies. The six weeks period I spent at the University was made easier by working with a supportive supervisor who takes time out to teach us and answer any questions I might have.

I was assigned to the Department of Botany in Plant Biochemistry under Dr. Edwin Cossins. They got me started in the lab by introducing me to the chemicals they use. There are over 500 chemicals in stock on the shelves which leans around the walls of the lab. I updated their inventories of organic chemicals and entered them into the computer and organized the books in one of the offices. My first assignment was to make a medium which is used to grow samples used in research. I was then told to figure out the amount of 95% ethanol and distilled water to add in order to get 400 mL of 50% ethanol.

95 parts ethanol + 5 parts water = 100 parts solution (mL)
50 parts ethanol + 50 parts water = 100 parts solution

95 parts ethanol + 95 parts water = 190 parts solution ---> add 90 mL of water
100 mL of 95% + 90 ml of water = 190 mL of 50% ethanol
x 2.10 x 2.10 x 2.10
210.5 mL of 95% + 189.5 mL of water = 400 mL of solution

I learned how to produce different kinds of solution. I made 2L of Wash Buffer which is made of 2.4g Tris and 9.35g NaCl. Less than 2000 mL of water should be added because the next step would be to adjust the pH to 7.5 with a pH meter by adding KOH (potassium hydroxide) with a concentration of 4N (very concentrate). As reading nears desired pH, I would use a lower concentration such as 2N so as not to go over. After obtaining the required pH, I added enough water to get 2L. If the reading went over the desired pH, I could add drops of hydrochloric acid to the solution to lower the concentration.

Working in a lab which is filled with radio active substances and chemicals should be with caution and whenever you need to work with them, gloves should be worn and disposed into a garbage for radio-actives. I was told to assist a graduate student with her research concerning enzymes which acts as catalyst in plant cells for vitamin metabolism. We took the pea plant as our basis for this research.

---------> Purines (DNA, RNA)

Folic Acid

> Amino Acids --> proteins

The folic acid found in plants is used to produce purines found in DNA and RNA and amino acids which produces protein.

Folic Acid ---------> Derivaties
------> 10-formylTHFA (Tetrahydrofolic acid)
------> etc....

Folic acid has a lot of derivaties produced when the catalytic enzyme reacts with it. There are three different enzymes which we are interested in and that is synthetase, cyclohydrolase and dehydrogenase. We are also trying to show that cyclohydrolase and dehydrogenase could be found together and synthetase separated.

To obtain the synthetase enzyme activities, these are the steps to follow:

1- Each test tubes should contain 0.9mL (changes according to amount of enzyme used, mixture should add up to 1mL when it is added) of mixture made up of;

   0.1 mL Triethanolamine Buffer
   0.1 mL MgCl2 (magnesium chloride)
   0.1 mL ATP (adenosine triphosphate) This should be made everytime it has to be used, so the old solution is dumped.
   0.1 mL THFA (After adding this into the test tubes, the tubes should be covered or kept away from bright lights)
   0.1 mL KCl (potassium chloride)
   0.3 mL H2O (but this changes as amount of enzyme to be added changes) e.g if enzyme used is 0.01mL --> water added is 3.9mL or if enzyme is 0.1mL --> water added is 0.3mL
   0.1 mL NH4 formate

2- This is added using pipettes.
3- Adjust the incubator to 30 degrees and place rack of test tubes in for 2 minutes.
4- Fill bucket with crushed ice and obtain appropriate test tubes of enzymes from the fraction collector rack from the cold room.

   NOTE: Enzymes were obtained from pea cotyledons which had been grinded and filtered and sent through a column of Matrex Green A. This separates the enzyme according to density. This is then collected in the fraction collector rack which is filled with test tubes numbered from 1 onwards.

5- After 2 minutes, adjust timer to 15 minutes then start adding and mixing the enzyme into each distinct test tubes.
6- After 15 minutes, adjust timer to time taken while adding the enzyme and add the 0.36N HCl which is used to stop enzyme activities or reaction. It drops the pH from 8.0 to 2.0.
   Time taken in adding the acid should be equal to that with enzyme so that the products for all test tubes are equal.
   If 0.36N HCl is not enough, it could be made from a 4N HCl.
   To make 100mL of .36mL HCl:

$$4x = 0.36 \times 100mL$$
$$x = 9$$

9 mL ---> 4N HCl
+91 mL ---> dH2O
---
100 mL ---> .36N HCl

7- Take rack out of incubator and leave for 10 minutes.
8- Check the absorption of each test tubes by filling the two cuvettes with first the control test tubes and placing them into an ultra spectrophotometer set in O.D. 350 (wavelength). Adjust the absorption reading to 0.000 and discard one of the cuvette found at the first cell but leave the other as the control. And add the second sample and obtain the absorption reading.
9- After doing this steps to all of the test tubes, determine the peak. The peak is the test tube with the highest absorption meaning the highest cell activities.
10-The results are then plotted into a graph with the computer.

To obtain the dehydrogenase and cyclohydrolase enzyme the steps are quite the same but the mixtures are different.

Test tubes with the high peaks in synthetase absorption are mixed and sent through the column of Sepacryl S200 which acts just like the Matrex Green A. And this is done to the test tubes of high peaks for both dehydrogenase and cyclohydrolase. As we found out that they are found together (i.e., both had high peaks in the same test tubes), test tubes were both mixed together and sent through the column. Then the process of finding the enzyme activities resumes again.

While doing these experiments, we were also doing the same research on enzymes found in the mitochondria of pea seeds.

All steps are performed at 4 degrees Celsius.

1- Took some dried pea seeds and washed and rinsed them with water.
2- Soaked the pea seeds in water for 18 hours.
3- Planted the seeds in a container filled with vermiculite and covered it with foil. It was then left to germinate for 3 days.
4- After time period, rinse out the seeds in cold water.
5- Separate the testa (seed coat) and seedling from the tissue (cotyledons). Should obtain 300mL of tissue.
6- Soak cotyledons in ice-cold water to slow down the metabolism and make it easier to extract the mitochondria.
7- Grind the tissue with mortar for 3 minutes by hand.
8- Filter through one-layer of cheesecloth which was soaked with dH2O to remove large particles.
9- The supernatant was then centrifuged in 700xg (1000rpm) for 7 minutes to remove starch grains and other cellular debris.
10-The supernatant is transfered into another centrifuge tube and spun for 5 minutes in 21,000xg (14,000rpm) to sediment the mitochondria.
11-Mitochondria pellet found stuck on the bottom of tube is separated from supernatant and resuspended using a wash buffer.
12-This is then centrifuged for 5 minutes in 14,000rpm to collect more purer mitochondria pellet which is separated from unwanted tissues.

13-Add Tris Buffer and Glycerol.
14-Check synthetase, dehydrogenase and cyclohydrolase enzyme activities.
15-Add Streptomycim SO4 and centrifuge to separate from nucleic acids (DNA, RNA) for 25 minutes in 16,000rpm.
16-Check activities of precipitates in different % saturation.

So far, the results that we are getting are successful and I am quite disappointed that I had to leave right away. But for all it's worth, I had an excellent time helping with this research.

****

WISEST

I worked in the zoology department in a lab where limnological research took place. I spent the first two weeks learning how to use the computers, spectrophotometers, color and turbidity meters and conductance and ph meters. In the first two weeks, I also learnt many techniques for preparing the samples for analysis for example filtering, weighing dried and wet sediment and centrifuging. The following four weeks namely consisted of using my newly acquired Knowledge on the anylis of water samples. I measured conductance, ph, color, and turbidity, and tested for phosphorus, chlorophyll and dissolved oxygen. When there was "nothing to do" I had to rinse glassware which had been washed in acid overnight. I didn't have a chance to get out into the field so I ended up in the lab the whole six weeks. The thing I liked about my job was that I researched with the other members of the lab. It was a rewarding and enriching experience and I really enjoyed myself.

THE WISEST SUMMER PROGRAM 1990

Monica A. Peters

THE WISEST SUMMER PROGRAM 1990

Through WISEST, under the supervision of Dr. F.L.Weichman in the Department of Physics, I have become better acquainted with the University campus, the requirements and expectations in the courses at the University, and most importantly, what employment in research entails. During the six weeks of the program I have been involved in a number of different experimental projects, broadening my knowledge in several areas in the Physics Department as well as other areas in the Faculty of Science. As well, I have the opportunity to continue working for Dr. Weichman for the duration of the summer to finish my investigations concerning the main instrument I have been working with.

The very first day I was shown a photomultiplier to start research on bio-luminescence; the emmision of photons from finger tips. Professor Weichman explained how the system was set up, and how it changes photo impulses into electrical impulses. The photomultiplier tube functions as follows: A series of dynodes are connected in a zig zag pattern down the tube. A voltage of about 1,500 volts falls across the series of dynodes. When a photo-electron is dislodged from the first dynode it is accellerated towards the second dynode which in turn excites the emission of a number of secondary electrons. These are accellerated toward a third dynode, until the end of the series is reached. The tube has twelve dynodes and an amplification of 10^7. The pulse of electrons striking the last dynode is transfered from an electric current pulse into a voltage pulse which is then amplified and recieved by the counter. The substance or matter being tested is inserted through a four layer, light proof cloth sleeve, and placed directly under the opening in the tube.

After two weeks of testing peoples hands for signs of luminescence without any success, I then began working with luminescent material similar to the material "glow in the dark" objects are covered with. Although the main objective for the work on the photomultiplier was to set up and test the equipment for one of professor Weichman's third year labs, I began to study how photon rate decayed in the material over time. The curve from our calculations did not come out as we expected, and thus we were delayed a week trying to understand why the decay rate acted as it did.