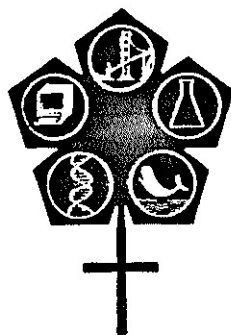


WISEST SUMMER RESEARCH PROGRAM 1992

STUDENT REPORTS

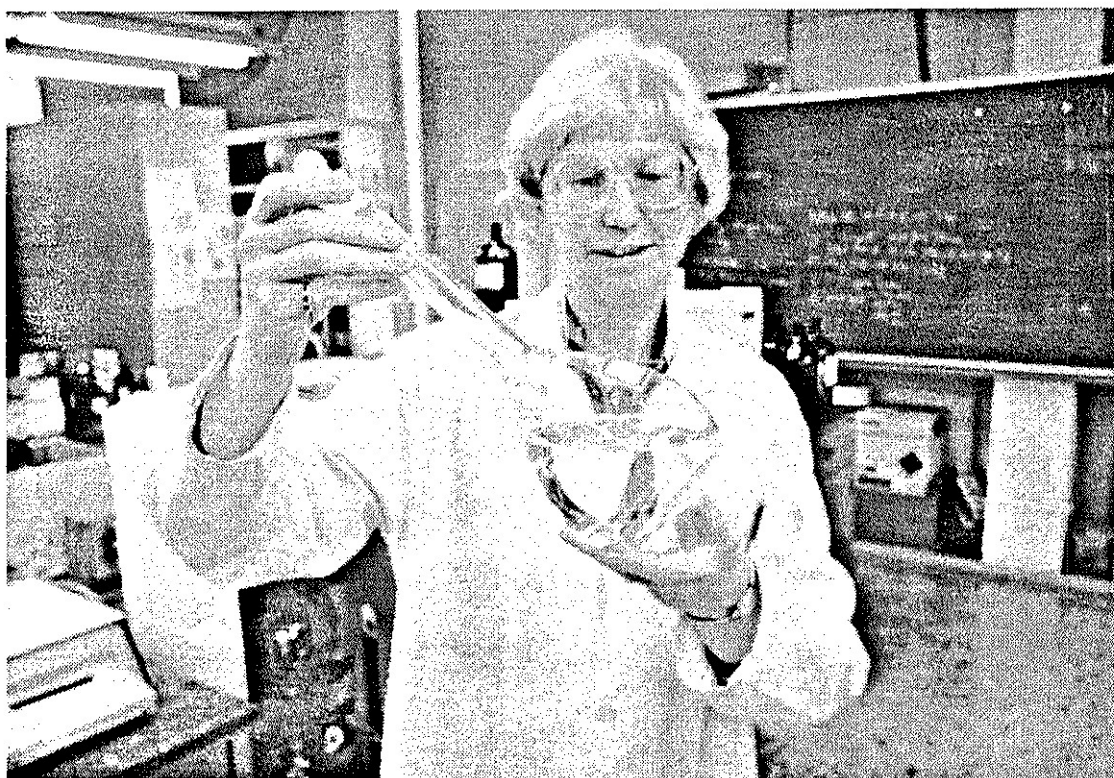


WISEST, Women in Scholarship, Engineering, Science and Technology is a committee of the Vice-President Research at the University of Alberta. It was founded in 1982 by the late Dr. J. Gordin Kaplan, with mandates to investigate the reasons why few young women are choosing careers in the sciences and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

Since 1984, WISEST has organized a Summer Research Program for students from grade 11. In total, about 300 students have worked for six weeks during July and August in research groups at the University of Alberta under the supervision of a faculty member. The girls work in the Faculties of Science, Engineering, Agriculture and Medicine and the boys in the Faculties of Home Economics and Nursing. In the Summer Research Program, young women have hands-on experiences in the sciences and engineering and they meet and work with scientists and engineers, thus encouraging them to become interested in these fields and to consider careers in them. Likewise, the young men in the program experience the non-traditional fields of home economics and nursing. Students who have completed grade 11 in Alberta High Schools are chosen for the program since they are making choices about careers and about the courses which they will take at University. They will also have contact with their peers during grade 12 and WISEST encourages the participants in the summer program to share their experiences with their friends. This sharing has been shown to be an effective way of interesting other young women in the sciences. Two grade 12 students were participants in this year's program, a reward for their effective sharing of their 1991 experience of the summer program with their school friends. The Edmonton Public School Board and the Edmonton Catholic School District are very supportive of the program as are many science teachers in high schools throughout the Province. The success of the program has been very dependent upon their help and we express our appreciation to them.

It has been a great pleasure for me to work with the co-ordinators of the Summer Research Program without whose hard work and dedication the program would not have been able to continue. Each co-ordinator has brought something unique to the program. Dr. Dorothy Tovell, this year's co-ordinator, has continued the tradition of doing an outstanding job and I thank her on behalf of the members WISEST. This booklet is a collection of the students' reports of the work which they did during their six weeks in the Summer Research Program and indicates both the quality of the research and the variety of the projects which they undertake.

Margaret-Ann Armour
Vice-Chair WISEST





Margaret-Ann Armour and Dorothy Tovell (one actively, the other less so) participate in the final luncheon program.



This booklet contains the reports as written by the students at the end of their six weeks in the WISEST Summer Research Program 1992. The students describe their work in the research labs, and also refer to the group sessions which were held each Wednesday afternoon. These sessions included a campus tour, an informal discussion with people who have chosen non-traditional careers, a visit to another lab at the University of Alberta, a field trip to visit the Meanook Biological Research Station, and presentations by the students of their own work. Finally, the students attended a luncheon, with their supervisors, as a concluding event for the summer program. I would like to thank the numerous people whose participation made these sessions such good opportunities for learning.

Several of the students refer to the fact that the program was an opportunity for them to not only work at the university, but also to live in Edmonton. This year a special effort was made to include students from outside the city and its vicinity in the WISEST program, largely due to generous funding from the Science Alberta Foundation.

Each student report is accompanied by a photograph of the student, at work in most cases. These photographs were taken by Paul Dolphin, and I would like to acknowledge his commitment to high standards. It was a pleasure to have his competent assistance in the production of this booklet.

Dr. Margaret-Ann Armour, Vice-Chair of WISEST, was once again instrumental in ensuring that the program not only continue, but expand. Her work on behalf of the summer program has taken many forms, not the least of which is ensuring that funding for the student and co-ordinator salaries is available. In regard to this, we would like to acknowledge the financial support of the SEED (Summer Employment/Experience Development) Program of Canada Employment and Immigration, the STEP (Summer Temporary Employment) Program of Alberta Career Development and Employment, the Winspear Foundation, the Alberta Women's Secretariat, the Edmonton Catholic School District, the Science City Fund, the Science Alberta Foundation, the Alberta Heritage Foundation for Medical Research, and the Glenora Rotary Club. Housing subsidies were provided by the Science Alberta Foundation to assist the out-of-town students with their accommodation costs, whether in the Lister Hall Residences or elsewhere in Edmonton.

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

And finally, to the students. It was a pleasure for me to work with you, to get to know so many of our future scientists and engineers, not to mention the young men who were imaginative enough to spend six weeks in nursing or clothing and textiles. I wish you all the best as you pursue your education and work towards fulfilling careers.

Dorothy Tovell
WISEST co-ordinator

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RESEARCHING CHICK EMBRYOS

By Abby Uppal

This summer, I was given the opportunity to participate in the WISEST Summer Research Program at the University of Alberta. I worked in the Medical Sciences Building in the Department of Anatomy and Cell Biology under the supervision of Dr. Keith Bagnall.

My project, which was part of an ongoing study, involved working with chick embryos and observing their vertebral column development, as well as seeing if we could produce vertebral anomalies. The main purpose of this was to see if vertebral abnormalities would result, such as Scoliosis (the curvature of the spine), and therefore perhaps even discovering the cause of it. With this in mind, one could also then relate it to the human vertebral formation, and possibly find answers to human spinal problems.

The embryos that we used in our everyday procedures were between two and nine days old. There were two general techniques that we followed: the "filter-ring" and the "in ovo".

The filter-ring technique involved removal of the embryo from the egg at two days, followed by placing it on a filter paper ring. Then, the embryo was operated on under a microscope and a somite was removed. Somites are balls of tissue existing as pairs (one on each side of the neural tube), which eventually form the vertebral column. The filter ring method was basically meant for survival of up to twenty-four hours. Immediately after this, the embryo was fixed by placing it in a neutral solution, thus preventing decomposition. The embryo was left alone for twenty-four hours and dehydrated the next day through graded alcohols. This was so that it would be miscible with the medium used later. After dehydration the filter ring was removed, the embryo was put into paraffin blocks, and then sectioned the next day. Sectioning allowed us to get a ribbon of embryo slices which could then be mounted on slides, stained and then assessed.

The in ovo technique differed in that the embryos were operated on within the egg by means of a window, and that they were left to develop for up to seven days before they were extracted from the shell. This increased the survival rate. Once the embryo was removed from the egg shell it was fixed, dehydrated, blocked and so forth, just as in flammes. These two procedures were very time consuming and usually required a few days before they were completed.

When I first began my project, I worked with normal, "unoperated" two day old embryos and mastered the filter ring technique. Then I got used to working with older embryos (three to nine days) by simply cracking them out of the shell and then fixing, dehydrating etc. At this time I also practiced somite removal. When I was able to use the flamme ring technique, as well as work with older embryos, I started working with the "operated" embryos. I was then introduced to the "in ovo" procedure. I carried out the different methods on operated filters and in ovo embryos of varying ages, and observed the results. I also learned how survival at that point was crucial.

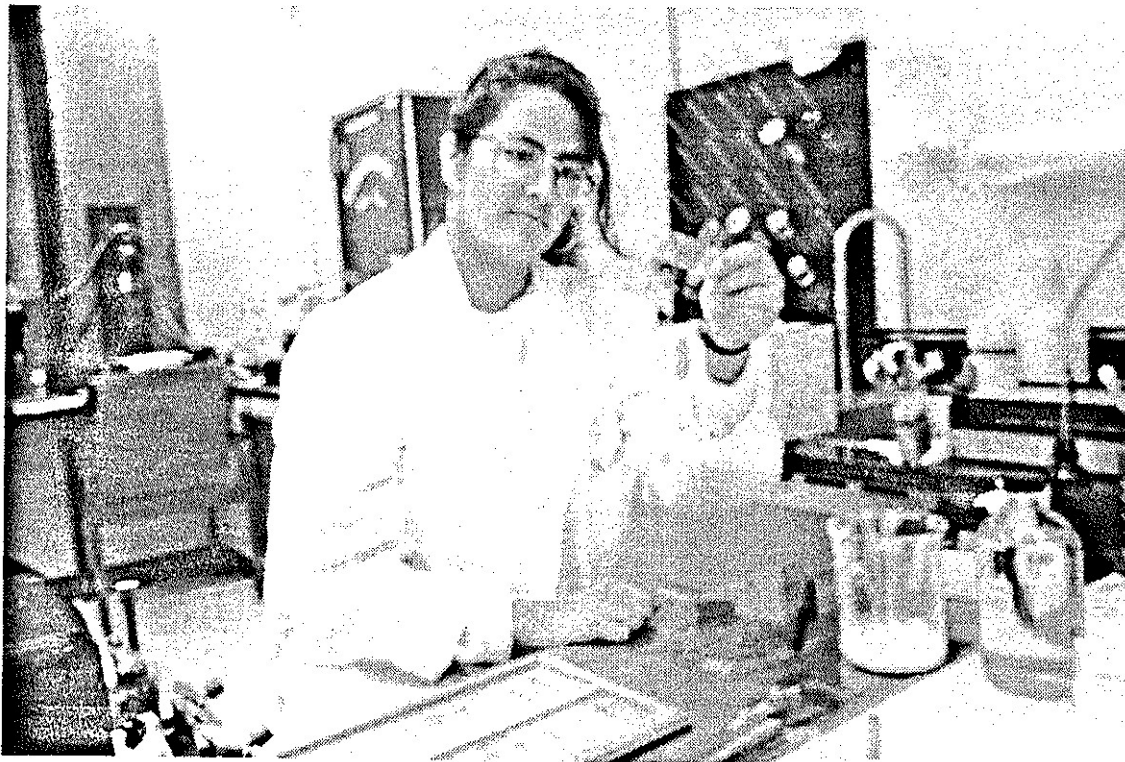
The filter ring embryos were put on flamme preparations (culture mediums) after they had been operated on, and were left for either one, six or twenty-four hours before fixation. This was done in order for us to see what had happened to the removed somite after the allotted hours of development.

Our main reason for removing the somite was to see what happened to the developing vertebrae, and if the theory of "resegmentation" was correct. Most would think that one somite pair corresponds to the formation of one vertebra. However, the theory of resegmentation states that it is the joint contribution of more than one somite pair that forms a vertebra. Thus our everyday research was going towards trying to prove this theory.

During the time that I was here we were not able to produce any abnormalities and therefore we could not draw any conclusions. As the project continues, with the aim of producing vertebral anomalies, eventually conclusions will be arrived at that will either support or disprove our hypothesis.

I was very delighted to have had the chance to work on this project. Each day would either bring smiles from success, or frowns from disappointment, but every minute was worthwhile. At the beginning of the program I never really knew what to expect, but WISEST has taught me a great deal about research. I understand how it can be exciting, yet frustrating too, and how one must always be patient.

Being an out of town student, not only did I become more familiar with Edmonton and the campus, but I also made many new friends. I felt that working with Dr. Keith Bagnall was a great learning experience, and thanks to him I am more aware of the scientific field. I'd also like to say that these six weeks were really enjoyable, since I had the chance to work with two other great people; Mary Chisholm (a fourth year Physiology student assisting Dr. Bagnall), and Gracemy Nguyen (my WISEST lab partner). Furthermore, "Thank You" to the WISEST founders and directors for giving me the opportunity to participate in WISEST '92. The educational experience was very enlightening.





Gracemy Nguyen
Holy Trinity High School

Supervisor: Dr. K. M. Bagnall
Department of Anatomy and Cell Biology
Medical Sciences Building

August 14, 1992

How I Spent My Summer Vacation

It was on July the 6th that I first meandered my way through the alien pathways and towering structures of the University campus. Dr. K. M. Bagnall led the way in our expedition to the Medical Science Building and there, in the Department of Anatomy and Cell Biology, I found my refuge: the "wet" laboratory.

Research was my objective and as Will Henry once said... "*What is research, but a blind date with knowledge?*" Similarly, I was not familiar with any of the information or material I initially faced, nor was I able to foresee any of the occurrences that came with working directly in research. As time progressed, however, I began to feel more comfortable with the procedures and like an experienced matchmaker, Dr. Bagnall ensured that I came out of the WISEST program with plenty of acquired knowledge. In that first afternoon, the essentials of embryology were explained to me and my lab partner, Abby Uppal. Within one week our project with chick embryos was unfolding and the different techniques used were gradually absorbed.

Vertebral anomalies were our desire. We attempted to produce abnormalities in the formation of a chick's vertebral column by removing or disturbing the somites, the eventual vertebrae, of a young embryo. If successful, the development of somites into vertebrae could be more fully understood. This would help in proving or disproving the theory of resegmentation which states that halves of two different somite pairs join to form one vertebra rather than one pair of somites corresponding directly to one vertebra. Furthermore, the knowledge could help in studying conditions such as scoliosis, the curvature of the human spine.

Through WISEST, my eyes were opened to the delicacy and art of science. I found that to my amazement, I was capable of handling the various "scientific" instruments and equipment. Still there were frustrating times when nothing seemed to cooperate. Taking the embryo from the egg, operating upon it, and then creating specimen slides was a lengthy process augmenting the opportunity for mistake. However, I was thrilled after getting noticable accomplishments: the perfect embryo sections.

As with any vacation, parting is difficult. After spending more than 200 hrs working together and going through about 60 dozen eggs, I will not forget my partners Abby and Mary Chisholm. From Dr. Bagnall I've learned many things not solely pertaining to the area of embryology. He placed upon us the responsibility for manipulating our own project independently, letting us learn from our own mistakes. I discovered that research is more than endless experimenting; research includes reading to update information, writing and recording results, and doing the actual work.

WISEST REPORT

By Melinda Jordan

I applied to the WISEST summer research program in April of 1992. I was unsure as to whether or not my High School marks would be high enough for my application to be considered. Since my strongest school subjects were Math and Physics, I chose Engineering. When I received news of my acceptance into the WISEST program, I wanted to make it a good experience.

For six weeks, I worked at the Alberta Microelectronic Centre (AMC). I was supervised by several Electrical Engineers, all of whom helped me whenever possible. Working at AMC gave me an insight as to what Engineers do. I realized that computers and other specialized equipment are vitally important.

My project was to build an Electronic Die. Before the actual building process, I needed to learn some basic logic, Boolean Algebra, and the binary-number system. I also had to become fairly familiar with two Computer Aided Design programs (CAD), OrCad and PCad. After obtaining this knowledge, I started my project.

My first step was to find an Electronic Die circuit in a book of electrical circuits.

Next, I had to enter it into OrCad exactly as it was in the book. I placed all the components on the screen in their appropriate positions, and joined them by wires to make a Schematic design.

The third step was to Create a Netlist. This is a document that tells how all the components are connected. I had to transfer this netlist over to PCad, so that the circuit board could be designed.

Once I had this done, I rearranged the components to make the board as easy to build as possible. Traces (indentations in the circuit board) were placed to connect the parts.

After I finished designing the circuit board, I started the actual building process. A copper sheet, about 1.5 millimeters in thickness was placed on a machine called a Board Maker, which etched the design onto it. The unfinished board was then placed in a tray of tinning solution which caused a very thin layer of tin to be placed over the copper. This was done to prevent oxidization of the copper. Next, one of my supervisors, and I soldered the electrical components onto the circuit board. Power was attached, and the board was tested to ensure that it was working properly.

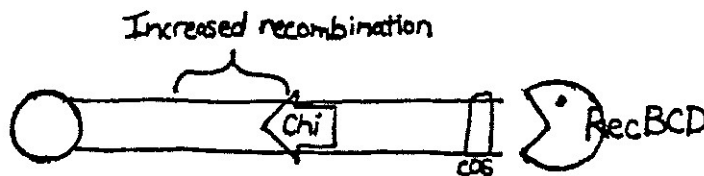
This gave me a souvenir to take home, as well as some great experience in the Electrical Engineering field.



I spent six weeks working in Dr. Susan Rosenberg's laboratory in the area of molecular genetics. We were interested in learning more about a very basic facet of living existence: the nature of recombination, and subsequently mutation, of homologous chromosomes in the cell. For the sake of their quick reproduction cycles, largely studied gene structures, and vast, controllable masses, the bacteria *E. coli* and phage lambda were our means to discovery. Basically, we developed models and theories to explain observed behaviors, then tested the aspects and details of them by plating the appropriate strains in distinguishing conditions. It is this testing which encompasses most of our experimentation in the lab.

I had my hands in on two separate projects during my work experience. The first dealt with the possible inaccuracies of the Darwinian theory (that mutation occurs randomly by an accidental mismatch of nucleotide base pairs). It is generally accepted that the genetic mistakes which happen to be beneficial to a population are the cause of evolution. We have reason, though, to believe that adaptive, rather than random, mutation exists. There may be a mechanism allowing for, or spurring on, evolution when conditions call for it. By using replication temperature sensitive strains of *E. coli* and watching the frequency of their mutations, we are exploring this idea.

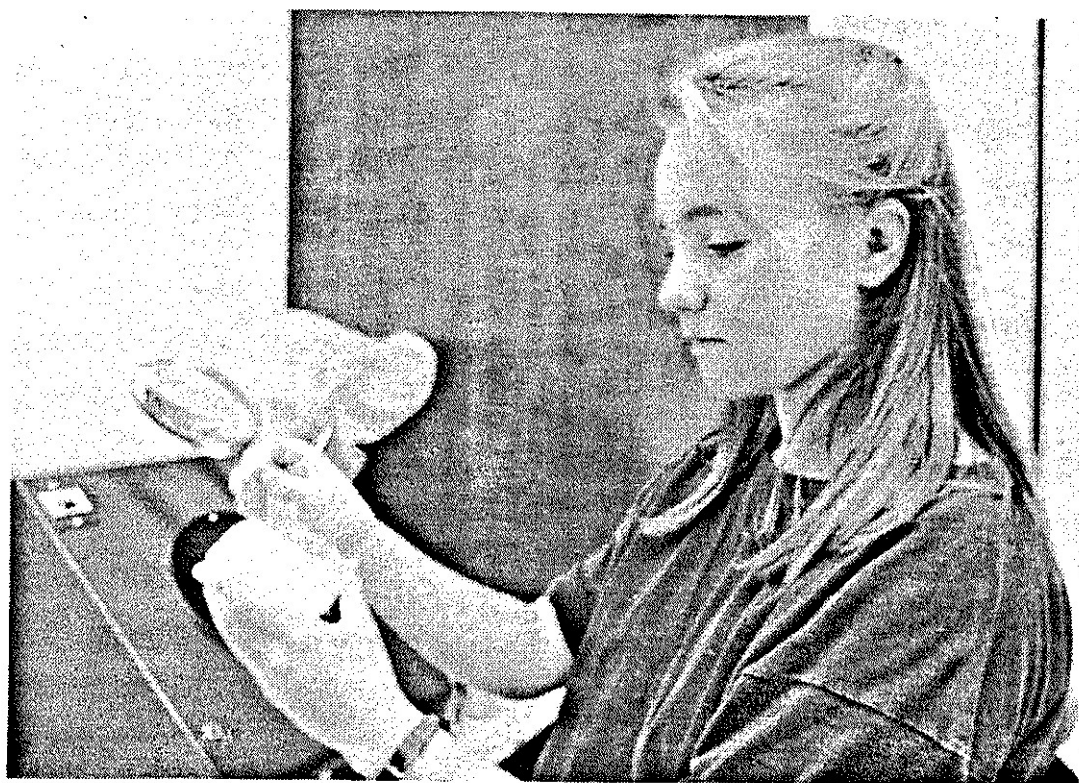
The second project that I was involved in dealt with a theory that was again contradictory to established models. Here we studied the recombination of phage DNA within an *E. coli* cell. It is generally believed that the recombination catalyzing enzyme, RecBCD, loads onto a double stranded break of phage DNA at a specific sequence called *cos*. (see diagram) From



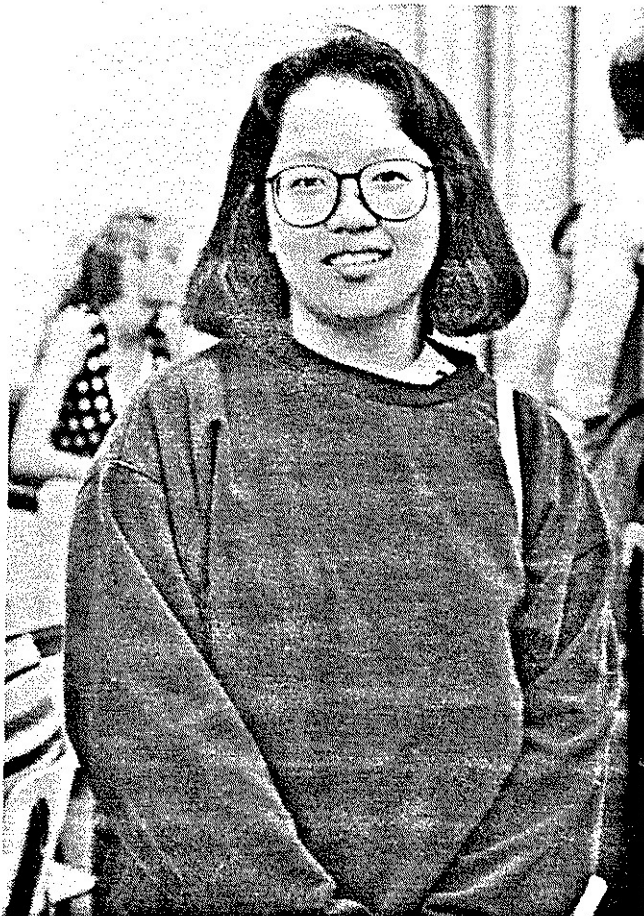
there, it moves along the DNA, promoting recombination until it reaches the Chi sequence (5'GCTGGTGG) where recombination activity rapidly increases. The nature of the message passed to Rec BCD by Chi, and the method by which this interaction is accomplished are the hopeful answers which our experimentation may discover. Preliminary results, though, suggest that certain features of this model may be incorrect. When 'plating' mutants unable to cut the double stranded DNA at *cos*, there-

fore not producing a state in accordance with the model, we did not expect RecBCD to load or Chi to be activated. But... Chi activation did occur in approximately two out of three of the phage lambda mutants. So, it seems that this long-standing model may need to be redesigned.

Unfortunately, scientific discoveries and predicted results do not come often or easily in research. More often than not, one must repeat (and re-repeat) experiments to obtain more accurate results, to confirm previous finding, or because of some mysterious technical flaw. Counting bacterial colonies or doing other menial jobs around the lab can become quite tedious, but the dedication found there was outstanding. The staff was genuinely eager in their quest for undiscovered knowledge, and just as concerned with how I was coming along. Thanks to their patience at meetings and at any other time, I made some sort of sense out of their high-tec talk, and truly benefitted from the experience.



WISEST Summer Research Program 1992



**Violet Poon
August 14, 1992**

The WISEST program this summer has opened and closed some doors about what careers I would be interested in. Working at the Alberta Research Council (ARC) has given me the chance to meet and work with many people in different occupations. There are engineers, chemists, lab technicians, and a mathematician. All these people must work together to achieve their goals. Teamwork and cooperation is important in this working environment.

Before I began working at the Research Council, I had a vision of what it was going to be like. However, it was not like what I had imagined it to be. I pictured myself in a lab with a computer and I was doing many graphic type problems. Because it is the Oil Sands and Hydrocarbons department, I thought I was going to be applying a lot of my chemistry into my work. These two images are unlike to what I have seen and done.

To my surprise, my supervisor, Shelley Lorimer, got me my own desk and phone. I was very impressed and there was even a PC sitting there (it wasn't running until the second day however). I met so many people that I had given hope on trying to remember names. Even on the first day I began to see how important communication is between everyone. The lab techs have to understand what the "office people" want for their experiments and vice versa. I have become familiar with using the computer and worked on Word Perfect 5.1. I was also introduced into other software packages such as Quattro Pro and Harvard Graphics. By the end of the first week I had started on the project that I would be spending most of my time working on.

I worked on a Pulp and Paper Project to examine the ink particle size distribution for the different stages of deinking paper. I went into the laboratory and with the help of Deb Henry, deinked paper. I had the opportunity of using the microscope to look at slides of ink spots from the experiment. I recorded the images of visible ink spots on to a video cassette. I was able to do this through a video camera attached to the top of the microscope and to a TV. There was a VCR hooked up with the video cassette in it. It is a really interesting and useful process.

After I finished working in the lab, I took my tape and brought it to the image analysis program called Optimas. I was able to transfer my images from the tape onto the computer. Using the computer I was able to get a lot of data about my images such as the area and major axis length of the particles. This information was transferred to another program called Sigma Plot that allowed me to use the numerical data to make graphs. I was pleased with the graphs that I had made on the computer because of the little constant supervision that I had. I was able to do different things on the computer that sometimes did and didn't work out but I was able to learn from my mistakes. I think without supervision I learned to do things on my own and I felt I accomplished and learned a lot more this way.

After I was finished making my graphs and obtaining hardcopies of my images, I included them in a twenty page report about my project and what I had done in the past five weeks. I spent hours typing and revising the report. For my oral presentation that I gave to Shelley, Deb, Ross Chow, and Randy Alex, people involved in this Pulp and Paper Project, I made overheads of notes that I made in Harvard Graphics. I spoke about each step that I took to produce the graphs beginning in the lab and ending using the Sigma Plot program. I was glad to share what I had learned with others. I was the first person to do something like this using the image analysis so I felt pretty good being able to do something that others could not.

Besides working on the Pulp and Paper Project, I had to go to an orientation to learn about the safety rules and regulations while working at ARC. I had to take a test regarding the safety rules which I passed. I had my picture taken for my ID card which looked horrible but I was excited to have my own ID card. I went on a tour of the labs and saw a little bit of what is done in the Pilot Plant. I also had to sign a confidentiality contract.

It is hard to believe that the six weeks are also over. I'm very glad that I had the chance to be part of the WISEST program. Perhaps my only regret is that I did not have a chance to meet with other students involved in WISEST and become more comfortable on the university campus. I would have liked to hear and see what the other projects were about.

Although I have enjoyed most of my stay and the people, I felt that sometimes I had to prove what I am capable of doing and what I was doing is important to people who did not work on this project. I do not know if I proved anything to anybody and I realize I don't have to prove anything to anyone as long as I am happy with what I have accomplished in the time that I have been at the Alberta Research Council.

Before the research program began I wanted to enter into a science related field and now I may pursue an engineering career. There is however, a lot of tedious work involved in science and engineering as I discovered while working on my project. I have a better understanding of the difference between engineering and science now and I know that I do not want to work in a lab all day or sit at a desk all day.

Finally, I would like to thank Shelley Lorimer for all the time she has put in helping me and driving me to and from work. There were also the great people who made me feel welcomed at the Alberta Research Council. Thank you Dorothy Tovell and Margaret-Ann Armour for giving the opportunity to experience what a science and engineering environment is.

The Wonderful World of Botany
and my experiences in it.

When I walked in the door six weeks ago, I had no idea what to expect. Who were the people I'd be working with? What did they do? What would I be doing? And what exactly is a peatland?

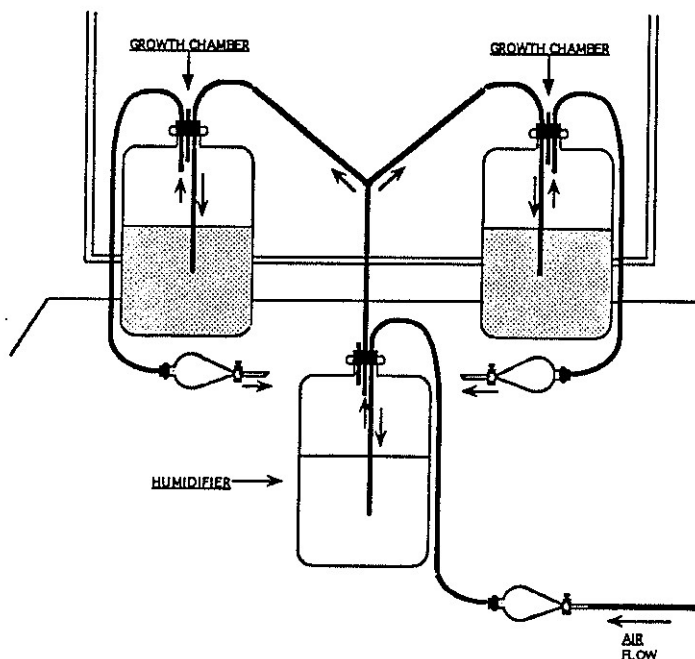
Well, I found out. I'm working with Dr. Dale Vitt, Linda, Sandi, Christine, Heather, Patricia, Barb, Tracey, Elizabeth and the hosts of other people who're constantly going in or out but you really don't know where they belong.

Everyone here works with mosses (or bryophytes in general) and peatlands. Dr. Vitt is working with a private company to find the best species of Sphagnum for their sanitary napkins. (Why would anyone want a kind of moss in their sanitary napkins? Because when Sphagnum is dried, it absorbs water and draws it away from the point where it was absorbed.) Heather's trying to find out what, if anything, will grow on a peatland after it's been harvested. (One of the things peatlands are harvested for is peat moss.) Linda (and the company that is consulting with her) wants to know how much oil Sphag-sorb (which is basically a drier form of peat moss) will absorb. (When Sphagnum's dried it absorbs water, but if it's dried more than that it absorbs oil and repels water.)

When I got here on the first day, Linda gave me a stack of scientific papers and textbooks and said "Read." Well, OK. They were dry. Really dry, especially since I had to go ask someone what every second word meant. But once I understood was I ever glad I read them. Now I know (at least somewhat) what I'm doing and what people are talking about. After I finished reading I started to do what I'm doing now. I run errands, help anyone who needs it, and work on three projects.

The first one is Dr. Vitt's project. A private company has asked Dr. Vitt to help them because the process they use to manufacture their sanitary napkins has a few problems with it. First of all, they're harvesting peatlands which are a non-renewable resource. Secondly, the absorbant board has to be of a certain quality and it has to be consistent. But, that's very hard to get if you're just harvesting a peatland because there's all different species of Sphagnum mixed in different amounts every time. Thirdly, the manufacturing process is very inefficient. The vast majority of the organic material harvested from the peatland ends up in the landfill. What they really want Dr. Vitt to find is the species of Sphagnum that absorbs the most water, that grows the fastest and easiest, and to find the conditions it grows best under. This is so that in the end they can grow that one species of Sphagnum for themselves. My part in all of this's to do the first step: find out if we actually can grow Sphagnum. Well, so far we can. We're growing two species of Sphagnum in this apparatus, and we estimate that they've grown 20% since July 20.





In my second project I'm battling with a computer. I'm trying to find the area of all the peatlands in Alberta using a map. I have to take the transparencies and photocopy them so the camera can pick up the areas to be measured. Then I put the photocopy under a camera that's hooked up to a computer and run the program. The reason this's important is that about 40% of Northern Alberta is covered in peatlands and this is the first true estimate of how much peatland is potentially usable.

But the best project of all has me playing with oil and Sphagnum. The company Sphag-sorb has hired me for the two weeks after WISEST ends to test their product. Sphag-sorb's used to clean up oil spills on land and water, and the company wants to know just how well it does this (how many grams of oil per gram of Sphag-sorb), as well as if it can be improved by drying it more. But I'm afraid that there aren't any results of any kind because I haven't started the tests yet.

I have a lot to thank WISEST for. Not only did it give me a summer job, but it also gave me work experience which was needed very badly. Also, I have a better idea about what I want to do in science now because through the program I was able to talk to people in science. They described what they do, and why they went into it, or they'd give me some helpful hints or suggestions. This has definitely been a great six weeks.

Allison Scott

Final Report
Department of Botany
by Yi Shao

Project 1

For the first three weeks, I worked with a graduated student, Debbie Bigelow. Since not only have wild roses tolerance to a wide range of climate, moisture, light and nutrient regimes, but also they are capable of erosion control and soil building, she is doing a research on propagation of wild roses with the aim of encouraging the use of this species in reclamation. Traditionally, roses are propagated by grafting which is labour intensive and time-consuming. The methods we were using are micropropagation, seeds propagation and cutting propagation. With the method of micropropagation, I subcultured the callus. The new media were prepared with Murashige and Skoog solution (MS) and different concentrations of hormone NAA and BAP were also added. By measuring out the size of callus formed in different media, we had narrowed down the range of concentrations of hormone for optimal growth of callus. Immature seeds were taken out of rose hips we collected outside in early July for seeds propagation. The Data collected from immature seeds will be compared with those from ripe seeds. To test the seeds viability, we submersed all the seeds in water. Those that floated were discarded and those that sank were used for later treatments. Two groups of seeds were treated by mechanical scarification and acid attack in order to weaken the seed coats which are thick enough to prevent embryo from germinating rapidly. The seeds in the third group were all cut into halves so as to increase the contact of embryo with the culture media. The last group was control group. After all, The seeds were separately put into petri dishes and moved to growth room. Double-distilled water were added periodically to each petri dishes to compensate for water loss by absorption and evaporation. From the data that we collected, we could see that cut seeds had a much higher rate of germination. Also I collected data from stem cuttings and entered the data.

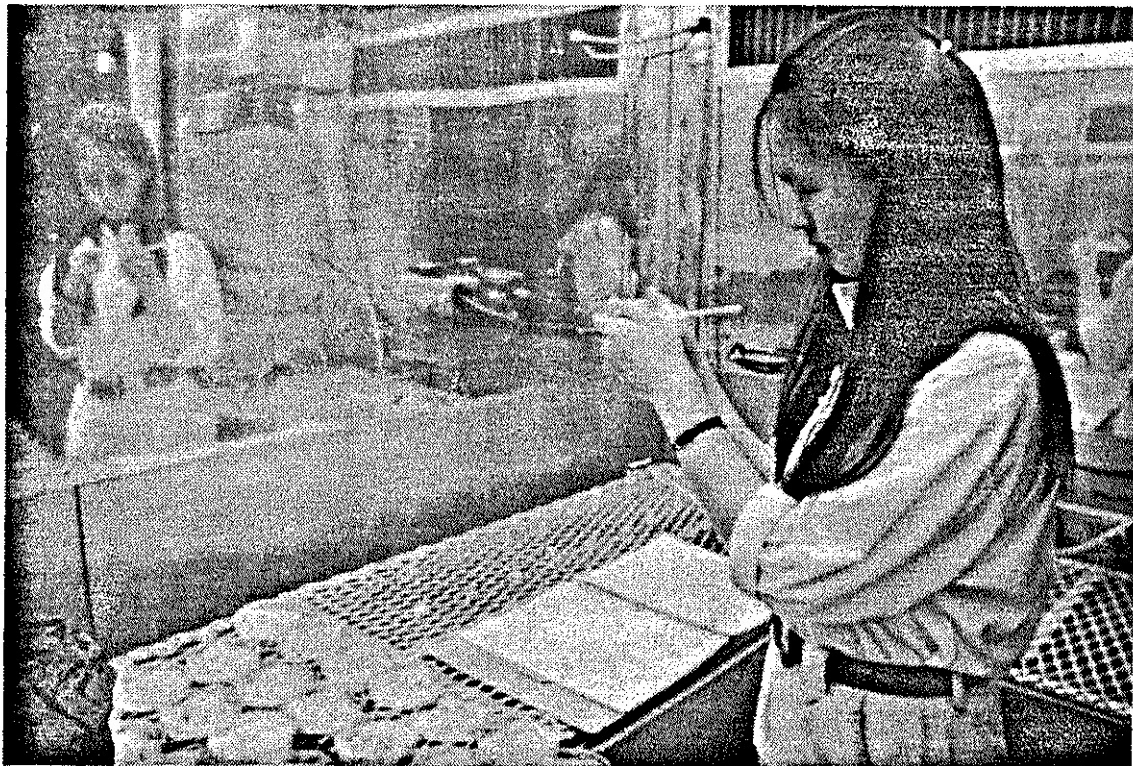
Project 2

The purpose of second project that I participated is to determine the nature interaction between aluminum and manganese (metals which have been implicated as the most important growth-limiting factors on acid soil) on growth of wheat. Dr. Taylor is in charge of this research which requires a series of growth experiments. Under his help, I ran through sequent steps for one of growth experiment. 1200 wheat seeds were surface-sterilized in 20% Javex for 20 minutes and germinated overnight in aerated solution of 0.005 L^{-1} Vitavax. On next morning the seeds were rinsed out and put in nutrient solution containing Ca , Mg , NO_3^- , NH_4^+ . The seeds grew there for three days. During this period, we prepared experimental growth solution. 60 buckets were filled up with 10L distilled water and different nutrient solution. PH of the solution in each bucket was adjusted to 4.5. On fourth days, surprising enough, those seedling had grown up to almost 2 inches high. 600 best seeds were transplanted to Flexiglas solution containing 15 elements. Growing in complete nutrient solution, those seedlings seemed to be very happy. Most of them grew up to 5 to 6 inches over a weekend. Again, I tackled the tedious task of adjusting

PH of experimental growth solution to 4.5 for next two days. Once a day. Total 120 times! Also, I took photosynthetic photon flux density (PPFD) reading and set up hygrothermograph. On day 9, 480 from 600 seedlings were planted to the experimental growth solution. Our young experimental plants were still babies so I had to baby-sit them for several days. Check if they got enough food (nutrient solution) and breathed properly (aeration). Harvest will on Day 22.

Personal response

I still hardly believe that six weeks have slipped away. Nevertheless, what I have gained during these six weeks will never slip away from my mind. I have been more aware of real science and seen how scientists devote themselves to their work in person. Also, I realised it is important to possess patience and endurance to be a scientist. Hands-on experiments improved my lab skill. Especially, I gained sterilize technique. Speaking sterilization, I am reminded how rampant fungi are in lab. They seemed to more favour the media that I provided for the seeds and they even killed some of my seeds. What a bad impression! Getting familiarized with University campus, working in the library and taking valuable advice from the University students will surely benefit my future study at University. All these experiences are what I will never learn from the high school. Here I would also like to extend my appreciation to all the people who helped me during these six weeks.



WISEST SUMMER RESEARCH PROGRAM
FINAL REPORT DARLYCE TASCHUK

During the six week period that the WISEST program ran this year, I held a position in the department of botany under the supervision of Dr. Mark Dale. Much of the time that I spent working was devoted to collecting data at Wagner Natural Area located just outside of Edmonton. There we collected data for three different experiments. It was at this place that I was able to get an idea of what research truly is.

One of the experiments consisted of checking and recording the presence or absence of various plants in an area of land previously used for agricultural purposes. This field is now being allowed to undergo secondary succession. The data collected will enable Dr. Dale to observe the rate in which secondary succession occurs and the new types of plant growth which will develop in the area.

The next set of data collected was derived from another experiment involving secondary succession. This data collecting process was conducted on an area which contained a slight slope and was located very close to a forested area. With this experiment we recorded the presence of only plants which are not normally found growing in an average hay field. Because of its location near a forest, many plants normally found growing in or around a forested area were discovered and recorded. This experiment also will give a clear idea of the succession that the field is experiencing.

The third set of data contained the results of a rather tedious experiment. With this one it was necessary to mark off a quadrat of two meters by two meters and record the exact location of a specific type of plant commonly known as golden rod. We used a system where we recorded each plant's location by assigning X and Y coordinates to it. Damage caused by certain types of insects was also to be recorded. This experiment was to show the relationship between the location of the plants and any insect damage it may have had.

I must admit my fellow workers (Kristi, Ken and Peggy Sue) and I didn't spend all of our time out in the field. Of course when we had completed collecting the data we had to enter this enormous pile of figures into the computer. Hours and hours were spent entering in primarily numerical values. Fortunately, we had very few problems except for the odd time when we would lose complete files of data.

It may seem by now that the only things we did were related to the field work but this just isn't true. We were also able to research some specific topics in the library for Dr. Dale. We were to look up and record information about articles related to the topic of the book that Dr. Dale is currently writing. This was actually very beneficial to me because I was able to become more familiar with the library system here at the University.

We also worked on an experiment which was being performed on the roof of the Biological Sciences Building. This experiment involved the planting of tiny seedlings in particular patterns. The data that was to be collected from it was to help determine

the effects that plants have on each other on the basis of the spacing between the plants. Unfortunately many of the seedlings planted aren't doing very well or have died so therefore we haven't been able make any conclusions regarding this experiment.

Working here for the last six weeks has given me a very good idea of what a scientific field involving research holds. At times it can be interesting and enjoyable but at others it can be tedious and dull. Fortunately, I have discovered that a career involving scientific research can be worthwhile and fulfilling. I feel that eventually when I finish school and enter the workforce, I will be entering into a field involving science. The WISEST program not only gave me the opportunity to learn more about careers involving science but it also allowed me to experience living alone away from my family and friends. All things considered, I feel that this was an incredible experience that I will never forget.



WISEST SUMMER RESEARCH CAMP 1992

DEPARTMENT OF BOTANY

M I S S I O N : Map and count every plant in the world.

Actually, there were only certain weeds and grasses to be mapped and counted and in a very tiny area in comparison to the whole world. The name of this site is The Wagner Natural Area and it's just west of Edmonton near Spruce Grove. This crazy ritual of mapping and counting is called field work and two other WISEST students, a supervisor and I spent about three weeks in the field. Specifically, we were researching secondary succession in a hay field. We set up 75 one by one half metre quadrats in total in the hay field and observed the different weeds and grasses and their heights in ten by ten centimeter squares within the quadrats. This process took about a week. Our next goal was to map solidago plants and look for any relationships in spacing and grouping between the normal solidago plants, the plants with galls, and plants with moth damage. We set up 15 quadrats, two metres square, and measured the position of each solidago and whether or not it had moth damage or number of galls, if any, or both. In case you are wondering, a gall is a build up of plant tissue on the stalk of the plant caused by insect larvae. This process took us two weeks to complete and by that time we were field worked out and sick of the hot dry weather.

The other three weeks were spent doing a lot of smaller jobs and one big task which will never be finished, entering all the data we collected into the computer. Some of the smaller projects included weighing grass, about 800 lunch bags full, graphing some of the results from the mapping, and going to the library and doing literature searches. Since succession takes years to study, we didn't have the opportunity to see the complete results but in most research results are rarely seen in short periods of time anyway, so we weren't missing out. We also spent some time counting and separating about 2000 seeds the size of poppy seeds for another experiment. After counting out the seeds we waited for them to germinate in the petri dishes and then transplanted them into soil trays to let them grow larger yet. The plan for this experiment was to observe the growth patterns and the competition between the plants when planted in certain patterns and at set distances from each other. Unfortunately, the seedlings did not make it far past the third transplant into the larger pots where they were planted in the patterns.

As you have probably noticed, most of our work was tedious and involved doing several repetitions of the procedures. But I have learned from my experiences as well as talking to other people that all research is tedious and repetitive and a person has to be willing to go through

it all for results, minor or major. Right now, I don't think I want to go into research and if it weren't for this program, I wouldn't know that and could have wasted time and money getting into something that wasn't for me. WISEST Summer Research Camp helped me to narrow down some of the career possibilities in science and the experiences I have had will be valuable to me in choosing the field I want to go into. One thing is for sure, I know botany isn't for me but nevertheless, I enjoyed the learning experience.

The program was also valuable in the sense that I have gotten to know my way around campus, some of the shortcuts, and little bits of advice and information that will help me out and when and if I come to university, and this information will put me ahead of others who are unfamiliar with the U of A. As well, since I am from out of town, I stayed in Lister Hall and got a taste of life in the residences. People from all over Canada stayed in the residences throughout the summer and I had the opportunity to meet some of them and get to know them. I also had a great time with my roommate, Kim, an aspiring geneticist and an avid moviegoer.

I cannot say enough about how this research camp has aided me in narrowing down my career choices and the many learning experiences it has given me. I wish all the WISEST students the best and hope to see them at the University of Alberta some day.

Kristi Askin



The WISEST Program: an experience in botany

By Gillian Mastromatteo

Working in a lab boring? Absolutely not! My experience in the WISEST program this summer was filled with new knowledge, new ideas and new friends. I wasn't sure what it would be like to actually do research in a lab, but now I know: it's great! This is because of two things:

- 1) The wonderful people who worked in the lab with me - Carole, Darin, Ian and Song - who answered my many questions and with whom I've shared a lot of laughs; and
- 2) trying out new ideas, carrying out the experiments and actually getting results!

When I heard I'd be working in a botany lab, I was confused because I was told I'd be doing a project in biochemistry. I thought botanists went tramping into the forest, studied the leaves, shapes, etc. of plants then gave them horrendously long Latin names too difficult to even think about pronouncing. But I was surprised to find out botany also included working with the insides of the plants and their cells, too.

For the first couple of weeks, however, I learned my way around the lab. I learned how to use the spectrophotometer (which was used in my project and measures the optical density of a solution, or how much light can pass through), the pH meter and the centrifuge. I made plenty of solutions - some of which turned odd and unusual colours - and did loads and loads of dishes and glassware. I had a mini-project where I put all their many shelves of chemicals into alphabetical order - the English alphabetical order, that is. The people I worked with insisted that they were in order. Just what alphabet they used, I'm still not sure! So for the first three weeks, I got to know where everything was and how to use the various equipment. Then I really got started on my project.

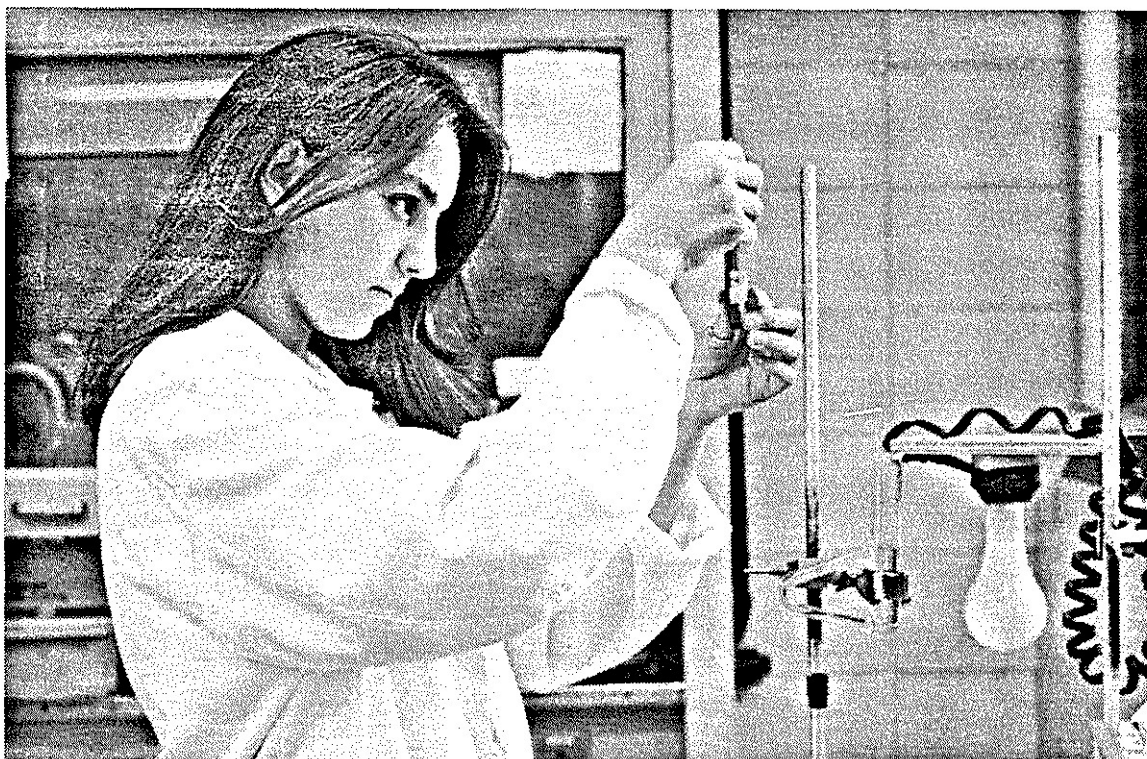
I worked with peas - ordinary yellow & green peas, piles of peas, buckets of peas. I'm sure Mendel can sympathize! I took extracts of peas that had been shelled, put into a blender, put through the centrifuge, and had a million other things done to them. Needless to say, what I had left did not remotely resemble the peas I had started with. And also needless to say, I am seriously considering giving up eating the vegetable! What I had left was a solution containing the enzyme I was working with. It has a horrendously long name, but is called dehydrogenase for short.

My project involved the next part: the assay. An assay is a procedure where the enzyme, added to a solution containing other chemicals, is incubated in a water bath at a certain temperature. During this time a chemical reaction takes place, and the product can be measured by the spectrophotometer. For my project I tried changing the different variables of the assay to see which gave the best results. Among the variables were the pH, the temperature of the water bath, and at what temperature the enzyme was stored between assays.

All in all, the WISEST program was a great experience. Because of it I'm sure I'll study science once I get to university. It may not be botany, but now I have a better idea of what research is all about.

I'd like to thank Dr. Cossins for volunteering to "put up" with having a WISEST student around, and Carole for being a terrific supervisor. Last of all, I want to thank WISEST for giving me this opportunity. It was extremely beneficial, and I've learned a lot because of it.





WISEST REPORT

When I sent my application to WISEST, I lacked the confidence in myself to believe that there was a chance for me to be accepted. I was afraid that my marks were not high enough nor was I decisive enough about my future career plans. But there was no harm in trying. When news arrived of my acceptance, I wasn't sure how I felt about it. On one hand, I was ecstatic about living in Edmonton for six weeks working on campus, but on the other hand, I thought that I wouldn't fit in, I felt that I wasn't smart enough. However, WISEST is a program for average young women who are interested in the sciences, and want a taste of the campus lifestyle. There weren't any Einsteins, or geniuses, just a group full of my peers who were seeking a little experience to aid the many decisions that lay ahead. The warm and friendly atmosphere is most welcoming especially for an out of town student like me. The fieldtrips and weekly meetings gave me a sense of belonging, and swapping stories and experiences opened the doors to the benefits and disadvantages of being a woman in a male dominated field. But programs like WISEST give my peers and myself a chance to change that unequal balance, we will make a difference.

I have many interests in several fields when it comes to science. My concern of the environment and my interest in ecology led me to the Forestry department. I was fortunate enough to work with two girls who lived in Edmonton; (a nice asset for a rural student) and we spent many hours learning and also having fun. Forestry introduced me to the library system, which is a vital part of any science. I was confronted with the research aspect and the actual writing processes that one is not as aware of. In Forestry my supervisor was Dr. Ross Wein, who not only introduced me to Forestry but to other sciences as well. For the last two weeks of the program I entered the Chemistry department under the supervision of Cheryl Yacyshyn, where I experimented with chromatography for the most part. I quickly learned the procedures, and the labware that was involved in experimentation. It was a nice change for me and I enjoyed my time there very much.

WISEST has not only given me experience in the male dominated fields of science but also I have a taste of what university will be like and I look forward to the next fall. As for any career decisions, Dr. Wein has given me an address of a former student of his that became a vet, so I have written to her and I am looking forward to her reply. WISEST gave me the confidence I lacked, and I now feel that I can do anything or be anyone. The many friends I have made here will be missed, but looking ahead, I see a bright future for all of us.

Carol Langridge

CHEMISTRY AND FOREST SCIENCES

"Will he be back tomorrow?"

"I'm not sure...I thought it was going to be sometime next week."

"Didn't he just get in yesterday?"

I did find it somewhat unusual that our Forest Sciences supervisor, Dr. Ross Wein, wasn't in the conference room to meet Carol, Senh Kin and I on the first day of the WISEST program. After looking for a man in the sea of faces and being met instead by Ruth Ann Gal, imagine our surprise when the three of us then discovered that no one in the Forestry department whom we encountered seemed to know exactly when he would be back!

When, after two weeks of literature search and sorting through field supplies (dishes, sleeping bags, taking inventory and other tasks) for the graduate students we did meet Dr. Wein, he decided that it was his responsibility to make us more aware of the whole research procedure. That is, we learned not only that Forestry encompasses much more than cutting down trees and studying the effects of clear-cutting, but that research is quite unglamorous: as we discovered, researchers spend a great deal of time pouring through journals in the libraries, photocopying articles and entering them into computer files for further reference.

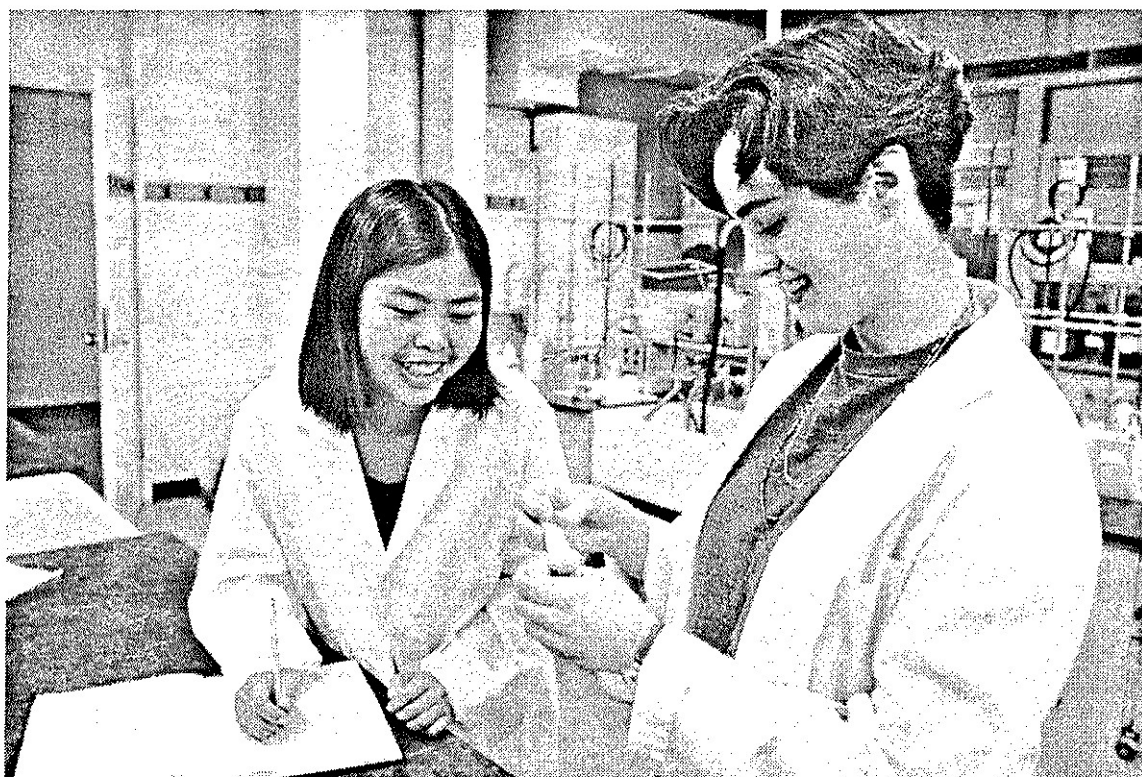
Chem was fun! Carol, Senh Kin and I were later placed in one of Dr. Margaret Ann Armour's labs, under the supervision of a fourth-year chemistry student named Cheryl. Along with Heather, another WISEST program member, the main purpose of our work was to perform and test experiments designed for the first-year students.

While Heather busied herself with a project of her own, Carol, Senh Kin and I were introduced to chromatography, which is a simple technique used in a wide variety of fields to purify and identify organic compounds. As the procedure is relatively easy, the three of us caught on quickly, and Cheryl soon had us experimenting with purple and red petunias. We first crunched up our petals with sea salt and a range of solvents using a mortar and pestle, and then minute samples of our mixtures were placed near the bottom center of a piece of thin layer chromatography (TLC) paper. The piece of TLC paper was then set upright in a beaker filled with another solvent, and as the solvent moved up the paper, the petunia juices, theoretically, would then separate into bands of colour. Unfortunately, rather than distinct bands, we got blue-ish smears.

We were testing not chromatography itself, but the type of organic compounds that would work well in the experiment. The petunias did not separate as well as was expected, but grass turned out better than Cheryl had anticipated; she was excited to discover that the grass contained two - and in one case three - yellows!

I enjoyed the chemistry experience for other reasons as well. Not only were we involved in actual experiments in a hands-on way, but the people I met were sociable and didn't mind the presence of three rather sudden additions to their workspaces. Thank-you, all of you, for being welcoming. I think that the best thing about my experience was in getting to know Carol and Senh Kin, but I do also feel that I have a better understanding of how research is conducted, and I ended up wishing that I hadn't had to leave Chemistry a week early.

-Michelle McPherson



Sehn Kin Diep and Michelle McPherson

The past six weeks in the WISEST program has been an eye opener into the scientific field. I have had the pleasure of working in two departments: forest science and chemistry. In forest science I worked under Dr. Wein with Ruth Ann and two other WISEST students. The project we were working on was the regeneration of trees after forest fires. We did literature search in the library, computer work in the computer room and equipment maintenance in the storage rooms. By the time I was through I had gotten to know the Cameron library quite well and I had learned to master the on line system thoroughly. While we were in the department of forest science we visited the Devonian gardens and the Canadian Wildlife and Forestry building. In forest science I discovered that there is much more to forestry than just cutting down trees; it was astonishing to find that forestry contained such varied fields.

The other two WISEST students and I were later transferred into the department of chemistry. Our supervisor was Cheryl, working under Dr. Armor, showed us how to do T.L.C.s. We did chromatography work on flowers, trees, dyes, vegetables and grass. Our main purpose was to determine if the chromatography lab would work with almost anything an experimenter could bring in. In doing the labs, I have learned that patience is a must in the field of research because of the need to perform experiments

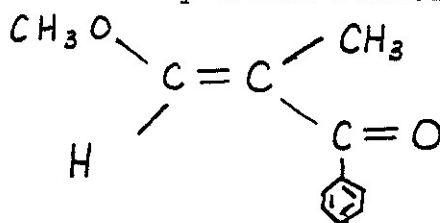
repetitively until satisfactory results are obtained. Sometimes we have good results and sometimes we have no results, but I have learned that each experiment is important in finding the answer.

The WISEST program has been an excellent experience, I had lots of fun and was able to meet many different and interesting people. My experiences here have given me an insight in to the advantages and the disadvantages of being a scientist. This insight will help me later in life when I have to chose a career, wether it be in science or another field. My thanks and my gratitude to the people in WISEST for a great summer.

Senh Kin Diep.

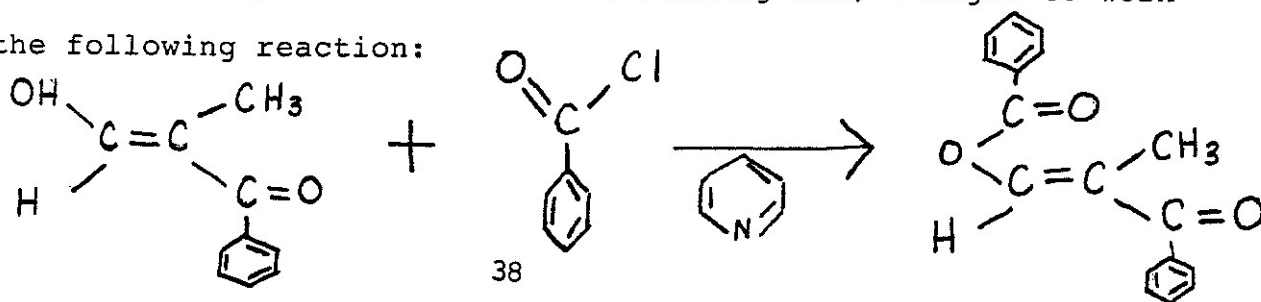
During my six weeks of WISEST research, I worked in the Department of Organic Chemistry, supervised by Dr. Karl Kopecky. The aim of my work was to aid Dr. Kopecky in his attempts to synthesize florescent organic molecules. As my knowledge of organic chemistry was fairly limited, I usually carried out reactions he designed, yet this often proved to be more difficult than I had anticipated. Thankfully, his summer student Brenda and his PhD student Shawn were quick to teach me new techniques and procedures, which made the lab equipment and chemicals seem much less intimidating.

The first reaction I performed was completed in about one day and gave me the compound 2-benzoyl-2-propen-3-ol, which was used to begin other reactions. I first made use of it while trying to produce the following compound, however, this was not as straightforward as my first reaction.



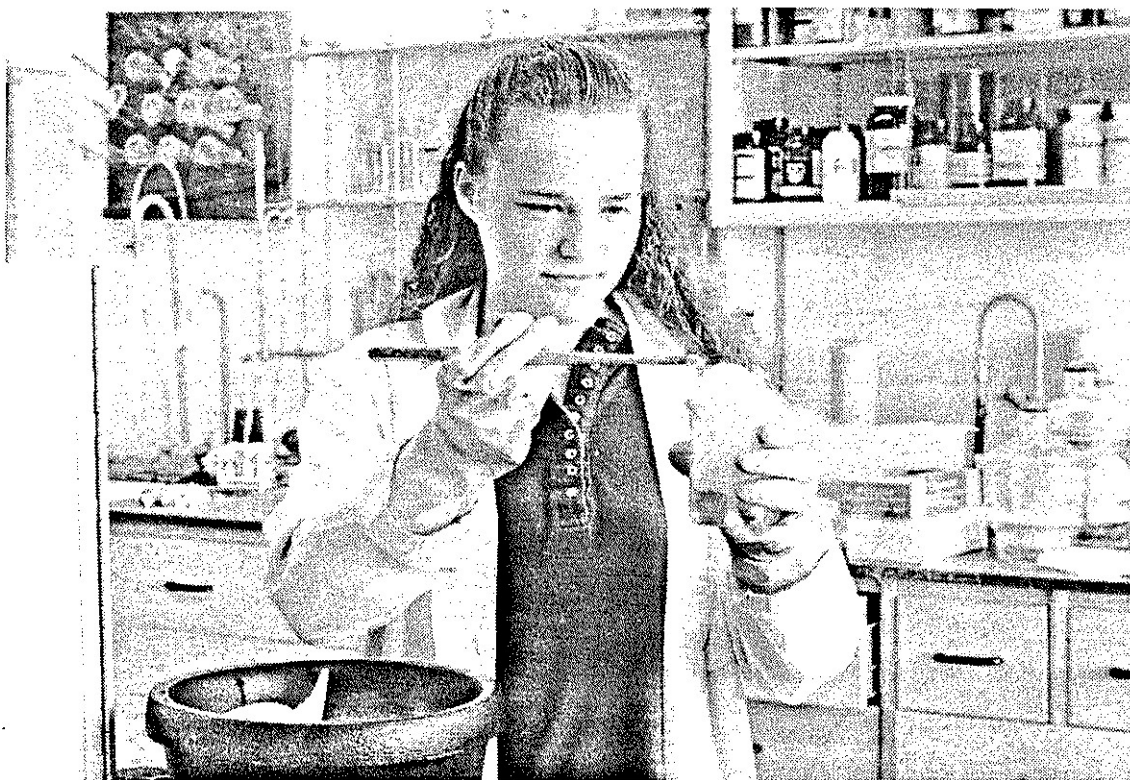
Eventually I obtained an oil, and after analyzing its NMR (nuclear magnetic resonance), I discovered that I had not produced the proper compound. I carried out several repetitions of this reaction, each time with some minor procedural changes, but still had no success.

By this time I had completed about three weeks of the WISEST program, and as my research time was running out, I began to work on the following reaction:



This experiment was much easier to carry out and after recrystallizing my product several times I obtained an extremely pure sample. This sample was then saturated with ozone and added to some heated dibromoanthracene which served as a dye. The compound was luminescent and as a result can be further analyzed in Dr. Kopecky's research.

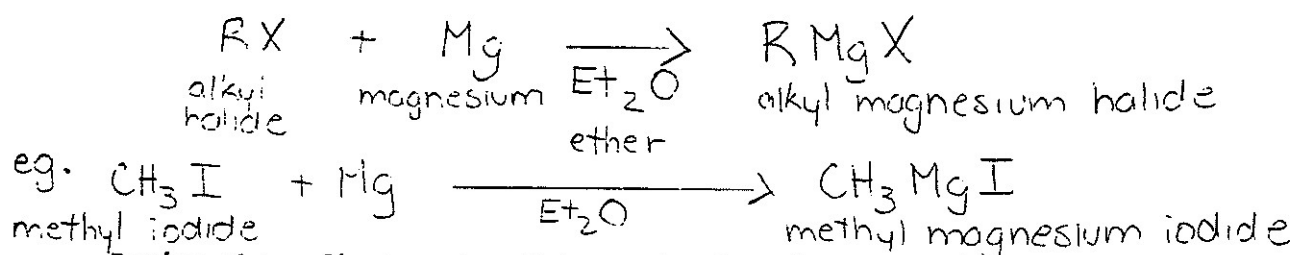
This success came as I neared the end of my six weeks at WISEST, and finally helped me to understand why those I had met found research so rewarding. I also discovered how patient a researcher must be, considering all of the daily mistakes that occur in any laboratory. Finally, and most importantly, I met new people, explored the campus, and, thanks to everyone involved in this program, I enjoyed a wonderful summer.



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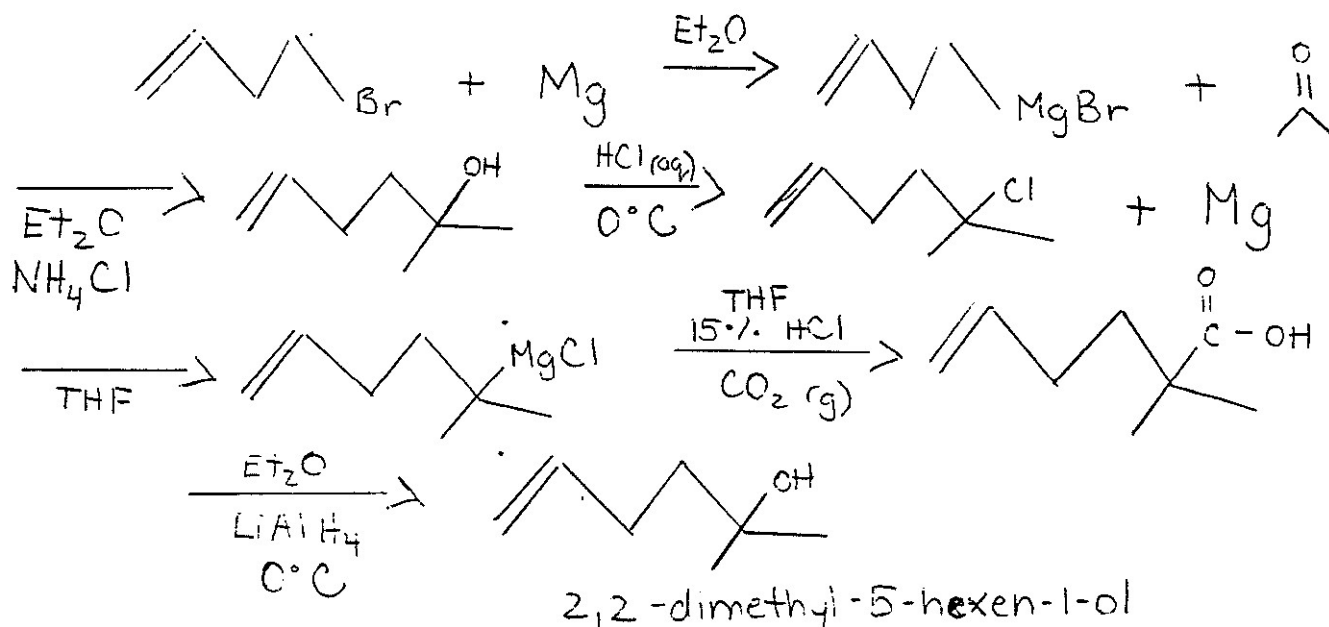
During the past six weeks, I have worked in an organic chemistry lab for Dr. Dennis Tanner. It's really very interesting work, if you like chemistry, because you get to do so much that a high school program cannot provide for you. We ran all kinds of reactions so I got to experience things like distillation and recrystallization. I also learned about all the equipment a chemist uses from a gas chromatography machine to a rotovap to a separatory funnel. I think I have learned more about chemistry in these few weeks than I have in all of high school chemistry.

My first couple weeks of Wisest was spent running and analyzing a Grignard reagent reaction. A Grignard reagent is when an alkyl halide (RX) reacts with magnesium (Mg) to give an alkyl magnesium halide (RMgX).



During these first weeks, I learned a lot about gas chromatography, infrared spectra, and mass spectrometry, which are all ways of analyzing your results. I especially learned about gas chromatography as we made ten samples and I had to shoot each sample three times into the machine and then analyze all thirty charts and record the results.

In the weeks to follow, I did two more major reactions, the first being the synthesis of 1-bromo-2,2-dimethyl-5-hexene. This was a very long process as we first had to make 2,2-dimethyl-5-hexen-1-ol which is prepared as shown:



After we had made that we got on to the actual synthesis of the compound (another lengthy process). I guess what I learned the most from this reaction was about distillation and using all the different glassware and equipment. I also learned how delicate a reaction can be and what great care is taken to ensure everything goes along smoothly.

The second reaction I did was to make c1ccc(cc1)C(=O)CCOc2ccc(cc2)C#N. Everything went really smoothly and it was a lot of fun. You also wouldn't believe the sense of accomplishment you get from holding up a vial at the end of the reaction containing a compound that wasn't there before but that you had made. From this reaction I learned about recrystallization, using a separatory funnel really well, and how to analyze mass spectrometry charts better.

The program was a really wonderful experience for me because it confirmed my interest in chemistry and definently opened up more career options. Dr. Tanner was a great guy to work for (along with his whole research team) because he assisted me in all aspects of the job and provided me with so much information. He was such a great help and he knew so much about everything. The program was a great success and I appreciate the opportunity I was given to be part of it. I will never forget my summer working in a real chemistry lab on the U of A campus.



WISEST REPORT
By Kirsten Mack

I had the opportunity to work on a research project in the area of chemical engineering for my summer. I had the great privilege to work under the supervision of Dr. Suzanne Kresta. Like every one of you, my project was always exciting--NOT; but it was a lot of fun and I learnt a lot in the six weeks I was working. My teachers would have been so proud if they could have seen me. Now when I explain this to you try not to get too confused because I didn't understand it all at first either.

For the six weeks I worked on different experiments for a company in Calgary called Plasti-Fab. They make polystyrene beads which are used in a lot of different things, for example styrofoam insulation. To make polystyrene, a stirred tank filled with water is used and styrene is poured into the tank. A large impeller then mixes up the styrene, breaking it into drops, something like oil in water. After styrene breaks up it reacts to make polystyrene and goes into a stage called the sticky stage, where the particles have a tendency to coalesce. This can create a lot of waste because if the particles form one big blob, which does occur, the only way to get out the mess out of the tank is with a jack hammer.

What I did in the morgue... I mean the lab is I performed experiments to try and find a more efficient, more economical and cleaner process for Plasti-Fab. I worked with a miniature tank proportional to the one at Plasti-Fab. Now I didn't use styrene because I don't think they make jack hammers that small, but I did use already made polystyrene particles. I got different results by changing different things in the tank. I put in a measured amount of particles and with different changes in the tank every time, I took pictures of the pattern the particles make. We changed around impellers, baffles, speeds of the impellers and also off bottom clearances. Different impellers do different things, some are good at mixing like the pitched blade turbine and others are good for keeping the particles separated like the A310. Plasti-Fab uses one called the retreat blade. Different baffles are also used, the baffles are put in to stop a swirling motion in the tank. There are four different kinds of baffles: the D baffles, which are what Plasti-Fab uses, and three different types of rectangular baffles. The off bottom clearance is simply the distance of the impeller off the bottom of the tank. For the pictures we also looked at the tank from different photo planes. A photo plane is created by a light source that shines between two mirrors back to back about ten millimetres apart. This creates a thin sheet of light shining into the tank to create a plane as to where you want to see the flow pattern in the tank. The plane only shows you a small strip of the flow pattern in the tank, like in the centre or at the wall.

The results of the experiments were quite positive and not very surprising. The best configuration according to the knowledge of Kirsten(me) would be for Plasti-Fab to totally get rid of

whatever they have that they think works, and instead put in two pitch blade turbines, along with two rectangular baffles. The D baffles really don't do anything helpful and the retreat blade is ok, but it doesn't mix things very well, especially at the top of the tank. Where as the two pitch blades feed into each other while the two rectangular baffles stop any swirling motion that might occur.

Working in the WISEST program has definitely been a great experience. My knowledge for engineering, science and the campus has grown tremendously, and I am so glad I had this opportunity to get a taste of what I was looking about going into in university. I realize the complications of what seemed to be the simplest processes. It was fun to work with my supervisor and the students in the lab. Believe it or not my interest in Chemical Engineering has grown and I hope to return to this campus but next time learn in a classroom instead.



I have been assigned to the Home Economics Faculty, and the Clothing and Textiles division in particular. Specifically I work in the Clothing and Textiles Collection. It is a museum collection comprising approximately 15,000 artifacts. There are many artifacts of European and North American origin, dating back to the early eighteen-hundreds. There is also a selection of cross cultural clothing and weavings. It contains a large number of old Peruvian, Guatemalan, and Mexican woven textiles and apparel, and also a impressive display of Middle-East and Asian clothing.

I do little work on the actual artifacts themselves; instead I do more office-style work. The first two weeks I was here I went through all the conservation reports held by the different divisions: Curatorial and Conservation. I was to make sure there were backups of all the reports in all the places needed. Since I have completed that I have been working on the hanging artifacts, implementing a system by which care and display is made easier¹. All through this I have been working with the visual records, maintaining order and re-organising that which needs to be re-organised². When I write this, August fourth, I am half-way finished doing the work with the hanging textiles. When I finish that, I will be going through the 1991 donations and putting them into order; in effect I'll be saving them from the cavern³.

However, being a go-fer has been almost secondary to what I've had to learn to do some of the jobs I'm doing. I've had to learn a bit of the theory of basic conservation; what damages the artifacts, how to hold the artifacts, what basic care is needed, what materials are safe, etc. I also did a very little bit of conservation on two artifacts: removal of particulate matter through suction⁴. 'Twas fun. I have about six pair of the white photographers gloves they make you use at home.

I also noticed some very interesting things during the program. During the lectures on non-traditional careers, a couple of the female lecturers took indirect shots at the Faculty of Home Economics; to the tune of "My parents didn't tell me to go take cooking in home-ec, they let me choose my own way...."

¹Translation: Putting little styrofoam blocks with accession numbers printed on the side onto the hangers...

²Translation: Putting slides into display holders...

³This big room in the back hallways of the basement in the Home Ec building.

⁴Translation: Vacuuming two rugs....

My supervisor has a B.A. and a M.Sc.. For her masters she held a Fellowship to the Smithsonian Institute in Washington. The lady who actually shepherds me around most of the time has her B.Sc. also, and will probably pick up her masters of conservation studies (or something like that) at Queens University. They don't even teach cooking here (the closest thing is nutrition studies) anymore. They have one apparel design course, but that's only there because it ties into the History of Textiles course. We have pig brains in the freezer downstairs! This place is more a Chemistry lab than a sewing room!

Sorry, I'm getting kind of off topic. What I wanted to say was that University is a far far different world from High School. So don't immediately dismiss a course just because it has "Home-Ec" or some other prefix that had a wimpy connotation in High School. This place where I work is most definitely not a wimpy place.



Annan Harley

I have had the opportunity to spend a second summer involved with the WISEST Summer Research program.. Since I found last summer's experience so enjoyable, I entered the contest to return and was accepted. This year I having been working with hazardous chemicals in organic chemistry under Dr. M A Armour. Although chemistry is not something that I would like to pursue in my post secondary studies, I found it to be very interesting and educational.

I spent the first week of the program doing some of the introductory undergraduate chemistry labs in order to familiarize myself with some common procedures. After that, I learned as I went along by asking questions and by making many mistakes. I found that the people in my lab were very willing to sit down and explain things to me and offer suggestions when I was having little success with my research.

For the remainder of the program, I was given a personal project to work on involving the synthesis and disposal of methoxychlor (a pesticide used to kill mosquitos). Because the synthesis of methoxychlor is an undergraduate lab, finding a disposal method is useful in order to cut down on the cost of sending chemicals away to be disposed of and will teach students about disposal and its importance.

Methoxychlor is synthesized by the condensation of anisole and chloral hydrate in the presence of sulfuric acid as a catalyst. (see figure 1) Theoretically, it is broken down into dimethoxybenzophenone by the addition of ethanol, sodium hydroxide, and bleach. (see figure 2) However, I found that this

figure 1

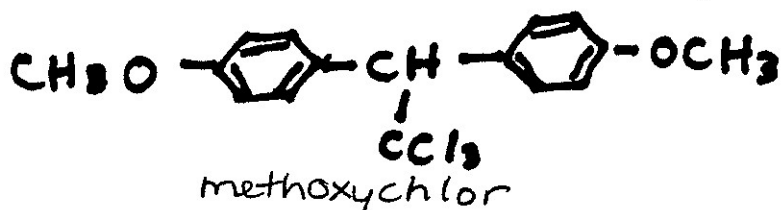
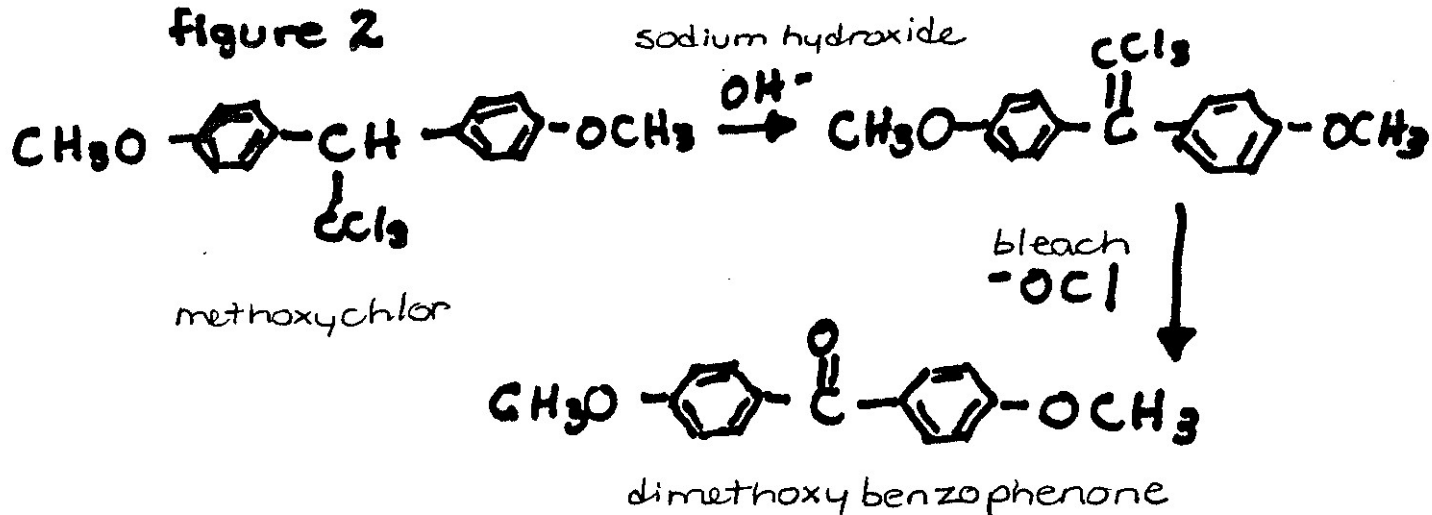


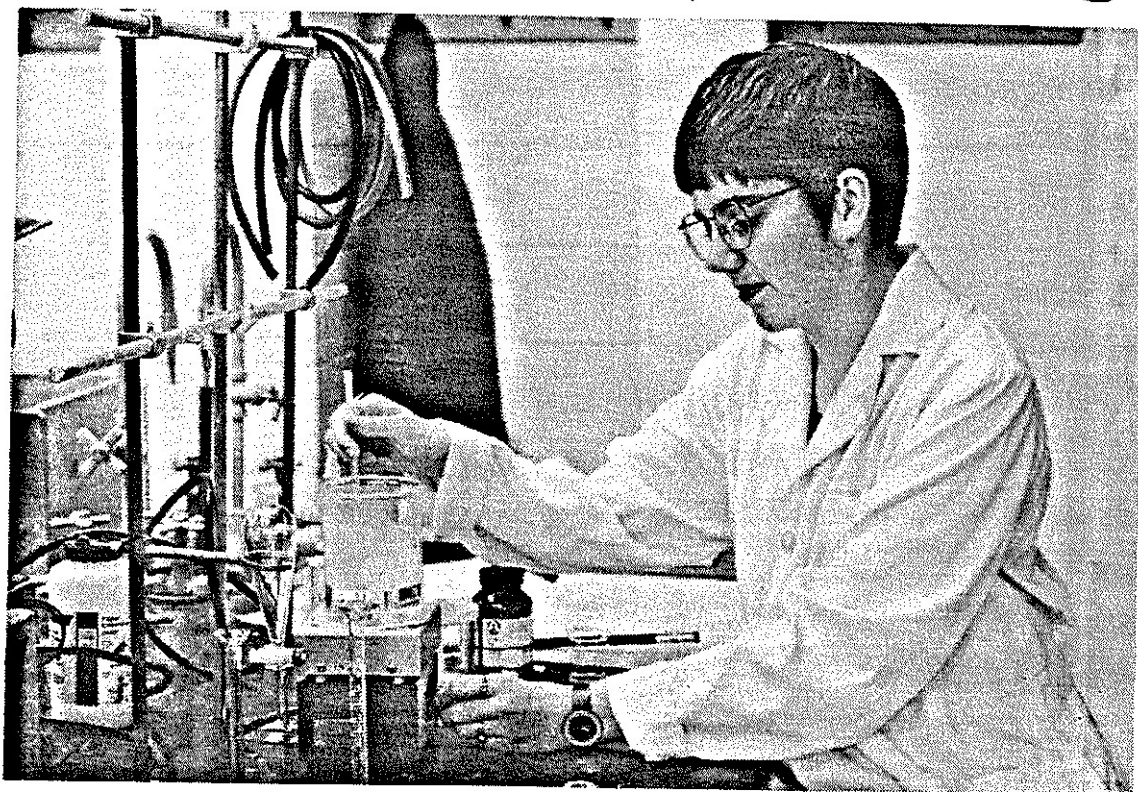
figure 2



theory was not correct in practice so I spent several weeks trying to manipulate the procedure to cause the breakdown. Unfortunately I ran out of time and was unable to solve the problem. Although I found this disappointing I still learned a lot, and by discovering that a problem existed with the procedure I came one step closer to solving the puzzle.

I feel fortunate to have spent two summers working in this program. I have made many new friends and learned much more about chemistry, and campus life in general. Some days I found the research tedious, but there were also days when I had free time and I was allowed to just experiment with different equipment and chemicals. My experience with WISEST this summer hasn't convinced me to be a chemist but it has taught me more about non-traditional roles and it has interested me enough to enroll in an undergraduate chemistry course in the fall.

Heather Nicholson



WISEST Summer Research Program Final Report

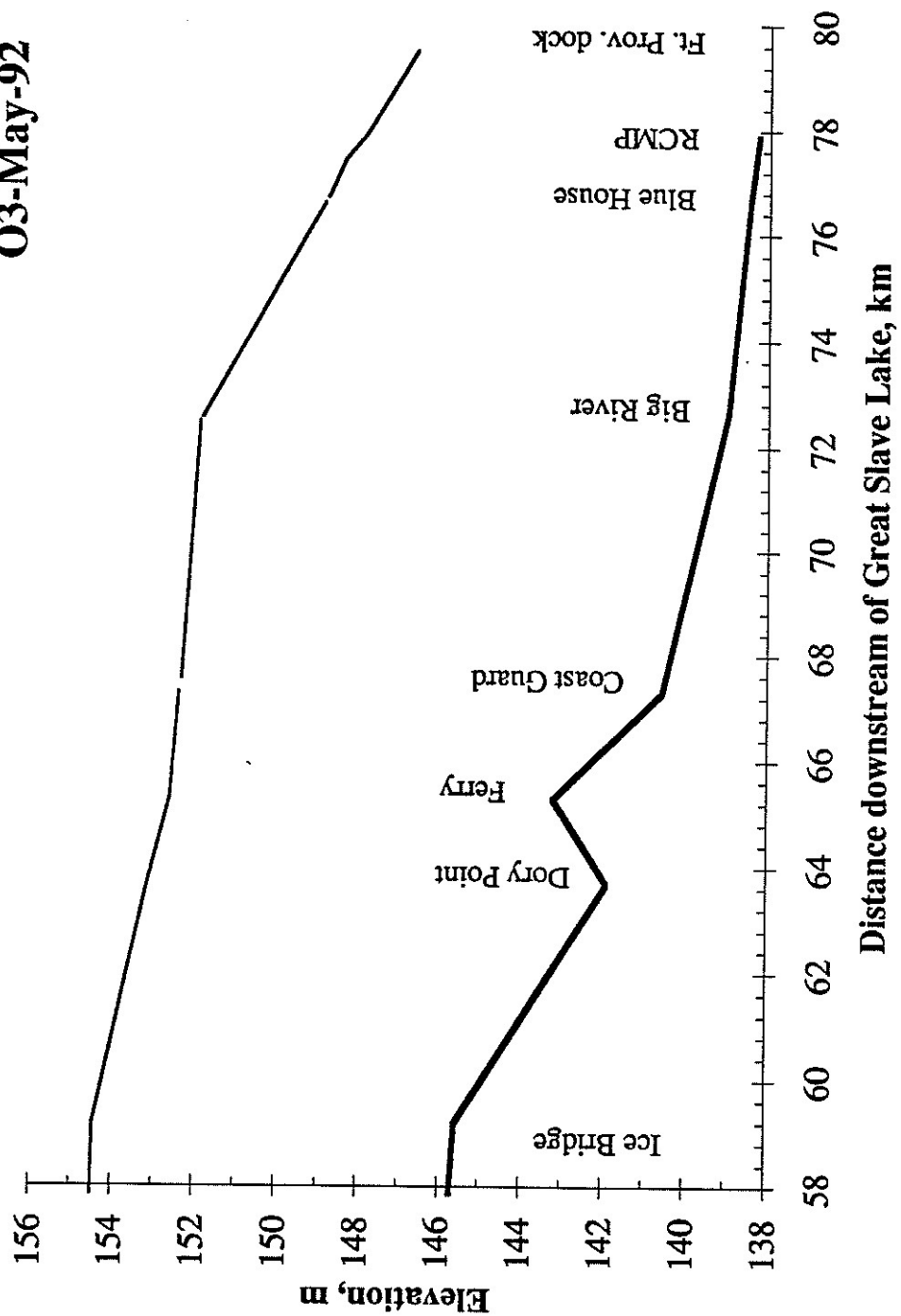
Natasha Broemling
Civil Engineering -- Water Resources
Dr. F. Hicks

The T. Blench Hydraulics lab is a small, low building nestled between General Services and a parking lot. Conversations in its lunchroom range from religion to (surprise, surprise) hydrology, and programs in the computers run anything from solitaire to Microsoft Excel. In the back is a huge, noisy, somewhat gloomy and always wet "shed" of machinery: curved flumes, straight flumes, and many rusty flumes. In the flumes (which resemble large, glass troughs) water flows over the sand creating small scale physical models of rivers, and although I never worked with any, others in the lab often explained their experiments to me. I did, however, spend time in the back: on a narrow, rickety balcony that spans the north wall. Here were thousands of unorganized documents, a potential gold mine of information. For about a week Lianne (an undergrad) and I slaved over the computers typing entry after entry to create a directory. But it wasn't as bad as it sounds, it was interesting to see the patterns forming between authors and their subjects of specialty and my eyes were definitely opened to some of the problems facing engineers.

The computer work didn't stop there. Dr. Hicks is working on a three year study of an area of the Mackenzie River near Fort Providence. The highway which links Yellowknife and beyond with the south must cross the river at this point, either by ferry in the summer or ice bridge in the winter. Unfortunately there is a period of time when neither the ice bridge nor the ferry is operable -- spring breakup -- and at this time a helicopter is used to carry goods across. Since a permanent bridge isn't feasible (ice buildup is a VERY powerful force) Dr. Hicks is hoping to compile a set of patterns that could lead to a general prediction of breakup. If this is possible, then the ferry might become operable sooner. My involvement was mainly with water levels and temperature. In the spring extensive measurements were taken (some from helicopter, some by dataloggers (little machines which can be programmed to take various measurements) and some by plain people) and I compiled these into first charts and then graphs. I even filmed the water level profiles (graphs) so that through animation we could get a better feel for the reaction of the river to various ice jams. It was wonderful knowing that the work one was doing contributed to an important study.

I had a few days of photocopying, but it was hard rather than boring because the maps had to be enlarged just right so that Lianne could plot the open water and one day we went to chemical engineering to get the probes and multimeters that had been used in the spring to take data calibrated. The probes were placed in a slush filled dewar with another highly accurate probe and compared. Both the technicians in chemical engineering and chemistry were very cooperative, which was fantastic. Another day I was allowed to attend

03-May-92



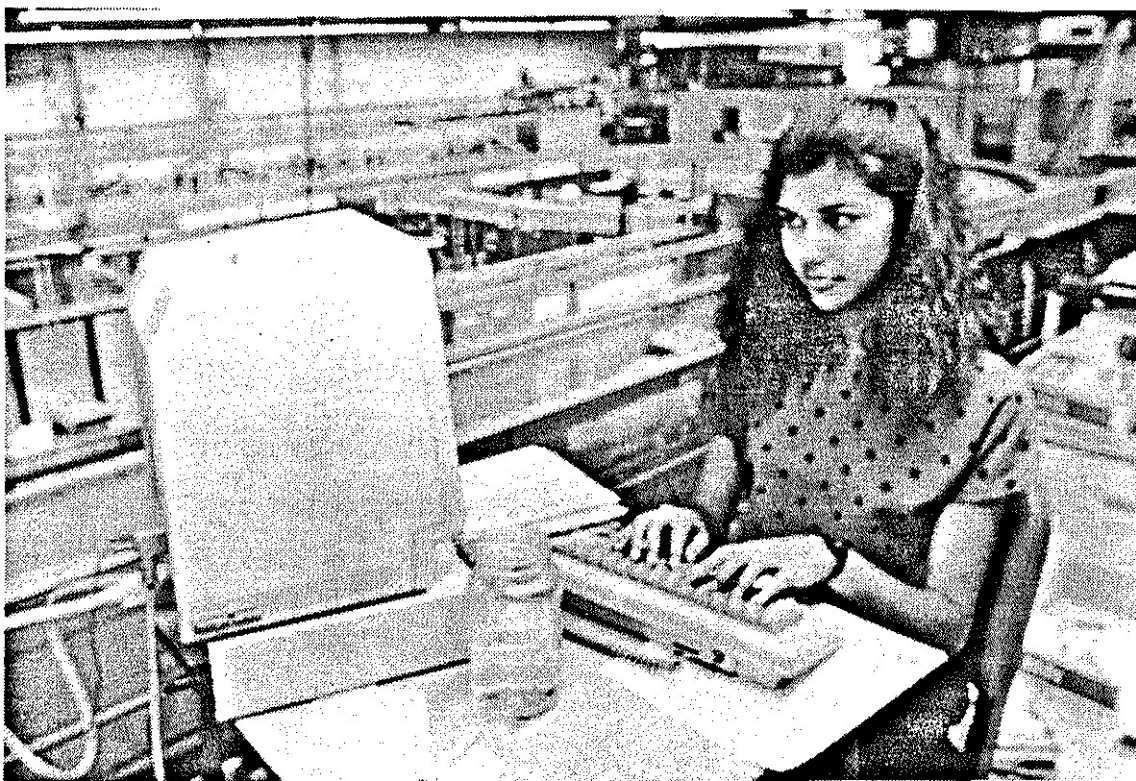
a lecture with the grad students, and the lecturer was so good that even I was able to understand the process, and for a week I did a rather unsuccessful library search on anastomosing rivers (braided and meandering are the other types), but even this was good because I became better acquainted with the library. I've rarely been happier than the day I realized that the five texts I had borrowed were only one day overdue and therefore there was no charge! I also learned a lot about geology, (right Lianne?!).

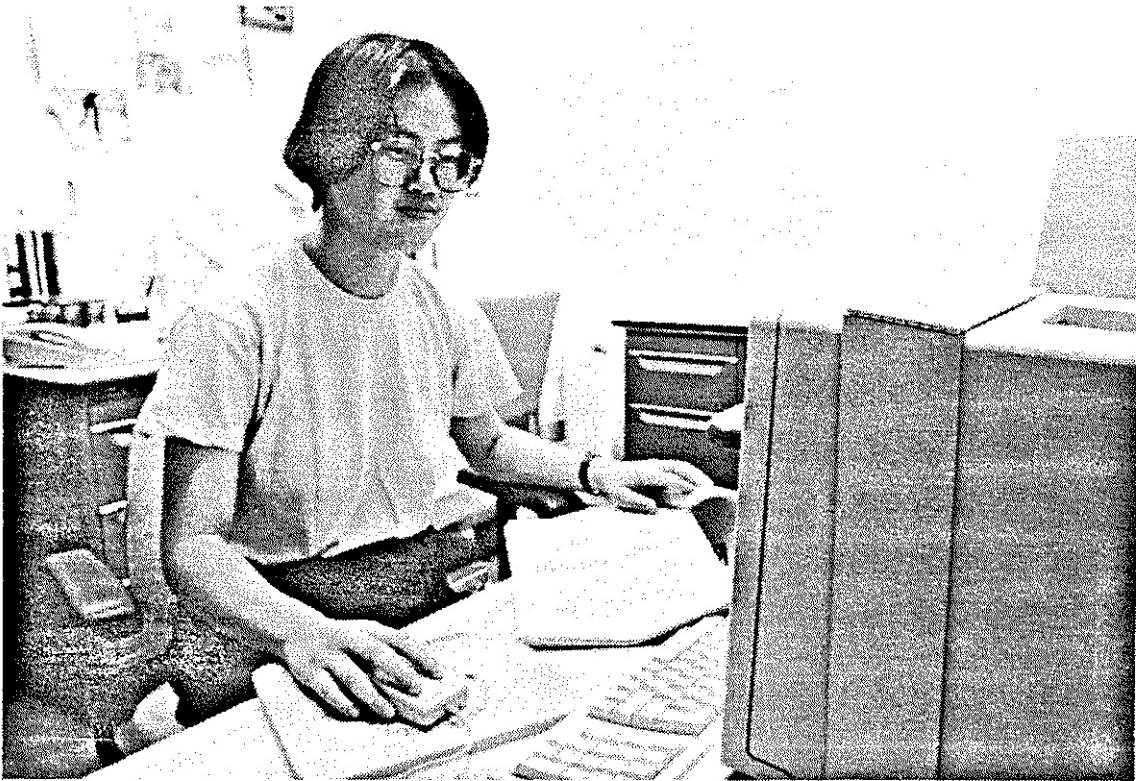
Of course there were many tedious moments, but they were all worth it in the end, and the weekly meetings I had with Dr. Hicks were always a real lift.

These six weeks have been such a fantastic experience for me that I just may have to reconsider my decision to go elsewhere for my education, and it's a real tribute to the many experiences I encountered that even lunch at the Faculty Club didn't outshine the rest.

I would sincerely like to thank the organizers of WISEST who provided me with this opportunity, everyone at the lab who forgave the incessant ringing of the doorbell and my many questions, Lianne who always had an explanation, and most of all Faye. I couldn't possibly name all the things that you have done.

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Working in the Department of Computing Science by Karen Mah

For six weeks of this summer I had the opportunity of working with WISEST, in particular the Department of Computing Science at the University of Alberta. Unlike what is generally expected of a summer job, it was more of an interesting learning experience. My supervisor, Carolyn Morris, exposed me to the administrative side of computing science, while Dr. Jim Hoover presented me with the research side. In this way, I was able to get an overall picture of what this area of study entails.

I was involved in three projects throughout the course of my workterm. My first assignment was to learn how to upgrade from AppleShare 2.0 to AppleShare 3.0 on a Macintosh file server. All the computers in a laboratory are connected to a file server which has the hard drive with all the applications on it and is responsible for the exchange of information between connected client workstations. AppleShare is the software program that enables the file server to accomplish these tasks. The new version includes an added feature that spools print jobs, allowing for more than one person to send their documents to the printer without chaos resulting from mixed output. This project was not one of great difficulty; it involved merely putting disks into drives and selecting the appropriate settings. Although I encountered some minor problems during this project, I did manage to upgrade the file server to AppleShare 3.0 successfully.

My second project involved revising the laboratory manual for Computing Science 114. As a result of this project, I spent a lot of my time working in the computer laboratory in Assiniboia Hall, which is equipped with SunSPARC workstations. The main software that is used on these workstations is OpenWindows, which allows for programs to be written, compiled, run, and debugged using window applications. Since I have not had the opportunity to work with OpenWindows, this was a suitable project for me. While I worked through the manual and experimented with the many features, I added to the sections already there and even wrote up a few other sections to make the manual more useful. Although this may not appear to be an important project, it provided me with valuable working knowledge of OpenWindows.

Rewriting the manual also changed my perspective on how documents can be formatted. Before this project, it had always been my impression that using a word processor was the only solution. It was not until I began revising this document that I began working with text editors and formatters. The vi editor and LaTeX were a little difficult to use at first; I was used to the straightforward method of inserting text using a word processor. However, any minor problems were easily overcome, and now I realize the advantages of this method of formatting documents.

My third project involved working with Dr. Jim Hoover and Mary Marchand, another Computing Science WISEST student. Both of us regularly went to Dr. Hoover's office to work with him, Dr. Rudnicki, and Kathleen Kippen, a graduate student. These were informal sessions where Mary and I were exposed to the more interesting aspects of computing science. Our activities included reasoning through logic problems, looking at proofs that were coded in Mizar (the language in which proofs have to be written in order to be checked by the Mizar proof checker), and talking about some of the research that each person was doing. I enjoyed reasoning through the logic problems the most, and the following is an example of one:

Three men, name them A, B, and C, entered a hat shop in which there were 3 white hats and 2 black hats. The men stood in a row such that C saw both A and B, B saw A but did not see C, and A saw neither B nor C. The shop assistant put some hats on their heads while they kept their eyes closed (we assume our men are honest) and the remaining hats were hidden behind the counter. After they opened their eyes, they tried to guess the colours of their hats. Here is what they said:

C: I do not know the colour of my hat. B: I also do not know the colour of my hat. A: If both of you do not know, then I know the colour of my hat.

What was the colour of A's hat?

Lecture Notes on Formal Systems and Logic in Computing Science HJ Hoover and P Rudnicki

I would like to thank WISEST for giving me this wonderful opportunity to experience computing science at the University of Alberta. I would also like to thank Carolyn Morris, Dr. Jim Hoover, Dr. Piotr Rudnicki, and Kathleen Kippen for introducing me to some of the many facets of computing science and for making this an enjoyable learning experience.



August 14, 1992

Mary Marchand

The WISEST experience is one I will never forget. It gave me the chance to experience working in a scientific field, something few women my age have the opportunity to do. For six weeks this summer, I lived in the city of Edmonton, became familiar with the University of Alberta campus, and worked in a field not traditionally open to women, Computing Science. This summer job was far more challenging than anything I could find in my small town.

After our initial WISEST meeting on July 6 I was introduced to Gordon Atwood, my supervisor. He guided me in my task for the summer of running the backups and restorations for the entire Computing Science Department at the University of Alberta. My primary job was to run the daily, weekly, and monthly backups on 114 computers. In order to do this I had to learn about computer networks and become familiar enough with the system to complete these tasks. I also restored files that were accidentally altered or erased.

In addition to my regular duties I also met daily with professor Jim Hoover and another WISEST student to study first year university logic. As I found out logic is a large part of computing science. I never imagined that common sense had so many rules. It now seems that I can prove any sort of nonsense to be true. We spent some of the time discussing problems such as:

Person A says, "I am lying." Is this statement true or false?

This only an small example of the logic we studied.

The part of the program that I found most interesting, besides the actual job, was the chance to visit labs and learn about other jobs such as, DNA research, micro-engineering, medical research, etc. I visited a botany research lab and discovered that there is a great range of diversity within the field of science itself.

Anyone wishing to put in a little hard work for a rewarding summer should look into the WISEST program. I feel very fortunate to have been picked for this program and given the opportunity for such an eye-opening experience. Even though at times I missed my family and friends while I was in Edmonton I loved the WISEST experience and would gladly give up my summer for a chance to do it again.

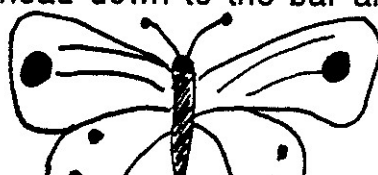
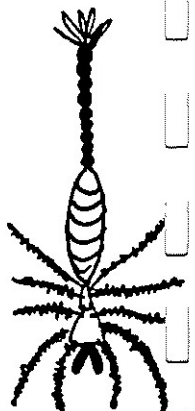
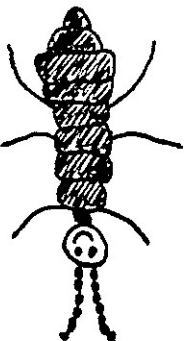
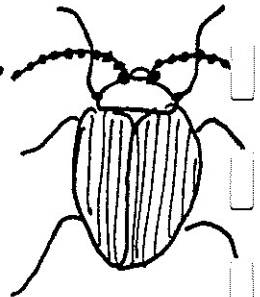
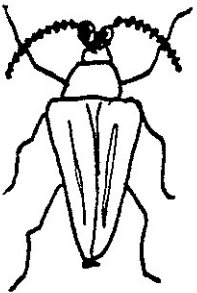
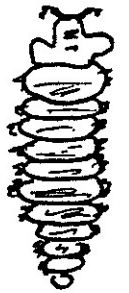
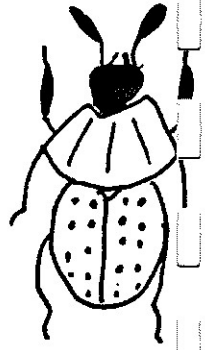
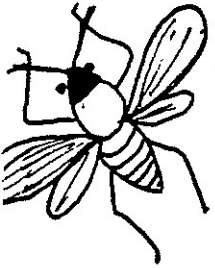
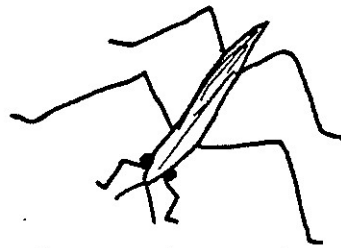
BUGS ARE NEAT

"Holy Cow! There's no way we're going to spend our whole summer in a dank little lab filled with bugs. Do you know how many diseases they carry?" That's what we wanted to tell Dr. Tovell when she called us in June, but being the lazy people that we are, we decided it would be too much of a hassle to change things. It's a good thing too. Now look at us six weeks later handling all sorts of bugs and loving it (we even ate some for dinner last night).

The lab itself was better than we expected. It is bright and clean, and sometimes very amusing. For instance, for the first four weeks our desks faced one way mirrors, i.e. we could see out, but other people couldn't see in. We saw all sorts of people stop and check themselves for mussed hair or spinach between their teeth. Some were very hot, and some had, well, character.

Not only were the people outside the Earth Sciences Building keeping us laughing, but we had our own collection of interesting people inside. We didn't see too much of Dr. Spence, but when we did, he always had an interesting story or job for us to do. For example, we spent a whole day counting spider eggs and spiderlings from Dolomedes egg sacs. It lost its excitement when we found egg sacs that contained over seven-hundred eggs. The person that we spent the most time with was Nora Berg, a lab technician. You would think that a lab technician would have her hair in a bun, and her head in the books, but this is not so in Nora's case. She was a lot of fun, and she made work fun too. Nora almost always had something interesting for us to do, like pitfall trap sorting, or leaf weighing, and she was also fond of the occasional coffee break. We worked with other people in the lab and in the field such as, Rosalind Barrington-Leigh, Hector Carcamo, Scott Digweed, Shawn Francis, Christian Klingenberg, Jari Niemela, and Dylan Parry.

On a typical day (there weren't many), we began by cleaning and feeding the waterstriders. This consisted of cleaning out the dead flies from the tank, and dumping in new frozen flies. Occasionally we would have to shut down or start up a new tank. After that, we would sort pitfall traps, pulling out beetles, spiders and ants from chunks of soil, unless someone brought us something else to do. At the beginning of our fifth week we started a new experiment for Dr. Spence which involved the feeding and observation of one-hundred individual gerrids (waterstriders) in their own tubs. As the days went on this part of our job got easy, as the bugs started to die very quickly. Lunch was always a fun part of the job too! Often we would head down to the bar and get sloshed (JUST

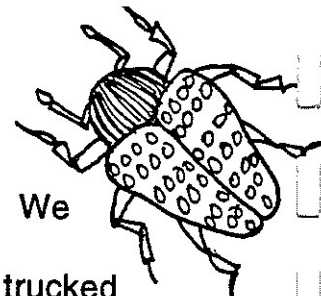
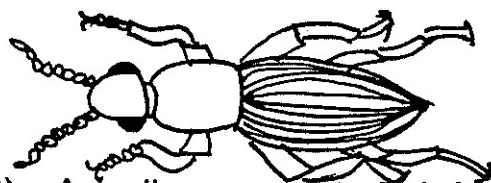




Elizabeth Cselinacz

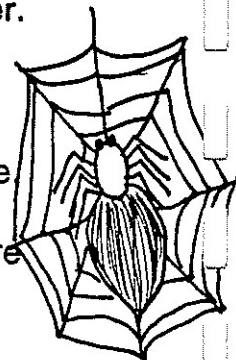


Keltie Mann

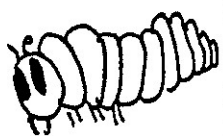


KIDDING). Actually we went to Hub Mall to check out the men. We collected many VERY interesting specimens.

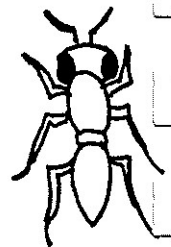
Speaking of the hunt and capture, every Tuesday we all trucked up to George Lake. An hour and a half can feel like a lifetime when your squished between two people and all you want to do is sleep. Nothing really compares to tromping around a muddy pond in chest waders that are too big for you at ten o'clock in the morning. We've had our experiences of falling in at first, but by our last trip out we were expert gerrid hunters. We found Zach to be an expert rock hunter. He'd just stick his head under water and pull out rocks with his teeth. Then he'd shake all over you, and bark at his rock for ever. Zach is Dr. Spence's dog, but he stuck to Christian like glue. After collecting the gerrids, we counted them, measured them, painted them, and set them free.



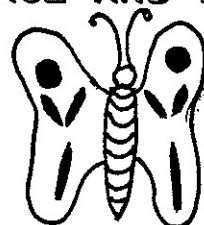
We also went on field trips other than the ones to George Lake. We did our own exploring in the basement of Earth Sciences where we discovered a geology museum, and a paleontology museum, where we found a forty million year old gerrid (they're everywhere!). Upstairs we visited the Electron Scanning Microscopy Lab, where George Braybrook showed us what he does with the microscope and gave us pictures of tiny insects magnified until they looked like monsters from a Japanese horror movie. At the Provincial Museum, we encountered bugs that needed no magnification. Terry Thormin gave us a guided tour of the Bug Room. We touched the largest millipede in the world and saw insects that might scare an African Lion hunter. But for the most part they were harmless and most interesting. Then we were let loose in the museum for a half an hour to explore.



Working in the WISEST program has given us ample opportunity to explore the world of science. Even though we never thought entomology would be rewarding we have made many new friends and had many new experiences. We found it a unique and valuable way to spend our summer. We learned how to identify certain types of insects, that millions of species of insects exist, and that if you are not afraid, a lot of work is left to be done in the field of entomology. Most importantly, we learned that we, as women, have the skills and the duty to contribute our unique outlook and experiences to the world of science. It may take a real man to kill a spider in the bathtub, but in the future it may take a real woman to identify it, pick it up, and set it free.



ELIZABETH CSELINACZ AND KELTIE MANN



Tanya Lyons

WISEST Summer Research Program '92

Department of Forest Science

The work I did this summer was very interesting, partly because it was something I knew very little about and had never done before and partly because it was so varied. The six weeks were split almost half and half between work in the lab and time in the field. I did research for a number of grad students, which was great because I got to learn about all the different projects which they were working on. I also got the chance to see different people, work in buildings spread across the campus and in locations throughout the province.

I was really impressed by the technology and machinery available for research and also by the method of thinking that allowed the scientists to get so much information from the numerous measurements and readings they took. I learned that there are many factors which need to be monitored or controlled when doing research, because it's not only the very obvious conditions that can affect the growth or production of an organism. You need to think things through completely and double check everything. A lot of the work was repetitive and almost mechanical because you had to use the same procedure for every sample, which meant doing the same action hundreds of times. I realize the importance because it equalizes all of the environmental differences and compensates for human error. Repetition also shows that certain results weren't just an accident, it gives them credibility.

Everyone who I worked with was really good at explaining to me what their project was, how they were going to study that particular aspect and what they were trying to prove. I could go home at the end of the day with enough of an understanding to tell my family or friends what we were doing and why.

On campus I was involved in experiments with peat moss samples, measurements to determine the surface area of spruce branches and needles, and with the growth of aspen shoots in the greenhouse. In the field at Hinton we did site preparation, photosynthesis measurements, pigment extractions and sample collections from control and experimental spruce trees. In High Level and Calgary we planted a number of plots of aspen from across the province which had been grown from roots in the greenhouse earlier this year.

One thing I really noticed was that everyone had a desire to discover, to find out exactly why things acted the way they did. I became interested in what they were doing too, and I think that was one of the best things the whole program taught me. I learned that if you want to know something you should try to find it out, that it's okay to go further than the simple memorization we learn in high school and take what you've been taught and at least attempt to think for yourself.

A Genetic Experience

For the past five weeks I have been working in the Department of Genetics under the supervision of Dr. Reha-Krantz.

Dr. Reha-Krantz has been researching the DNA polymerase. In simple language this means she is trying to find out exactly how a strand of DNA replicates.

We work with bacteriophage in the lab to help us study the DNA polymerase. Bacteriophage is simply a virus or phage that infects bacteria. The virus we are working with is called T4. One advantage of using this virus is the presence of similar protein sequences in human and T4 DNA polymerase.

I am working with two different types of phage. One is a mutant phage (a virus that has some sort of mutation) and the other is called wildtype(normal phage).

My summer project is broken down into a series of smaller steps. Since I have very little genetic education, my first step was to learn some of the terms associated with genetics and to understand the nature of Dr. Reha-Krantz's research. This was solved by many sessions with lab assistants.

My next step was to learn how to grow bacteria and phage. This was the tricky part since many of the lab techniques were new to me, but with the help of my teachers, Cindy and Rachelle, I managed to grasp the techniques quite easily.

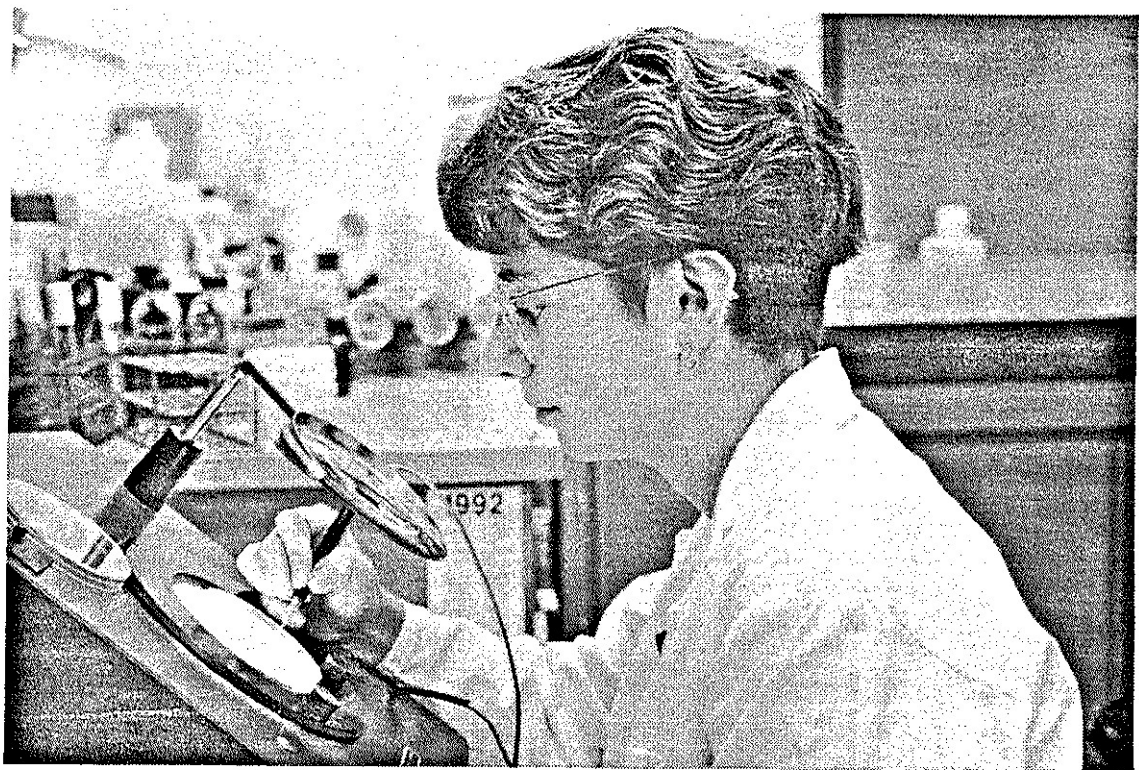
I then had to characterize my phage. To do this I compared the phenotypes of the mutant phage with those of the wildtype phage. For example, mutant phage are very often more temperature sensitive than wildtype phage. I had to spot these phenotypes and learn how to tell the difference between the two phages.

My next step was to start looking for second sight mutations in my phage. These second site mutations are different mutations that correct the original one. This is where I left off in my project, but I did manage to discover that my second sight mutation is located near my original mutations.

I have learned many new things this summer including how to run autoclaves, how to prepare the media for the Petri dishes, and how to do serial dilutions, but most importantly I know what I want to do after I graduate.

I now understand how important genetics is to our lives, and I want to learn more about it. I see genetics as a way of finding a cure for cancer, AIDS, or even the common cold, and I hope to join the team of researchers who are striving to find those answers.

Kimberly Ross





CONFESSIONS OF A FORMER ANT KILLER
(or My Experiences at WISEST)

Name: Michelle Munchua
Date: August 14, 1992
Subject: WISEST

I have not always been a patron of the insects. As a nine-year old , I used primitive lasing techniques to extinguish ants by radiation - in other words, I used to burn them using magnifying glasses. No doubt, it being a crude and vulgar way to treat other life forms, I later ceased. (But then, as a nine-year old, I had little respect for any squishable form of life smaller than myself). This has since changed.

It was not until my senior high school years that science became remotely interesting to me. I instantly took a liking to chemistry and biology. I agreed with all the laws of physics, but I shortly thereafter discovered that physics disagreed with me. Under these conditions, my respect and admiration for other squishable forms of life smaller than myself grew.

Of course, the next logical event following my heightened awareness of all creatures, especially the small, had to be my acceptance into the WISEST program for the summer. It was a nostalgic event - my first job. Sigh. For the next six weeks, I was to work under the supervision of Dr. William G. Evans in the Department of Entomology (the study of bugs). My project was to determine the flight take-off threshold temperatures of ground beetles in relation to habitat odors. I had no idea what this meant at the time. However, I have since learned that the former translates into the following problems: At what temperature will ground beetles (Bembidion obtusidens) fly? And how do they respond to long-range chemicals from their home in Wells Lake, Saskatchewan?

My first day was largely spent touring the Entomology Department (including the wonderful room where tse tse flies are bred), as well as parts of the Chemistry and Physics buildings. I recall taking a great deal of notes as various techniques were shown, and certain concepts explained to me. I had much to learn. I later received the privilege of working with a wind tunnel designed by Dr. Evans, himself. And I also felt a bizarre thrill as we stepped into the unlighted freezer (to look at soil samples), where I pondered what would occur in the event of the singular steel door suddenly locking shut.

The truth was the reversal of Edison's statement, however. My experience resulted in being only 2% perspiration and 98% inspiration, thanks to Professor Emeritus Dr. W. G. Evans, my supervisor. Rarely do I meet someone who truly loves his/her work. It was a great pleasure and an honor to assist such an individual. Note: this is not an attempt to patronize members of the University elite, but a sincere statement of gratitude.

In 1592, Henry IV of France said, " I want every peasant to have a chicken in his pot." (Poultry in motion?) Well, I can neither say that I have a frozen 2kg Lilydale in my kitchen, nor can I say that I have reached the farthest that I can go. But I would like to thank Dr. Dorothy Tovell and Dr. Margaret Ann-Armour for taking me a step closer to that goal, and for giving me a chance.

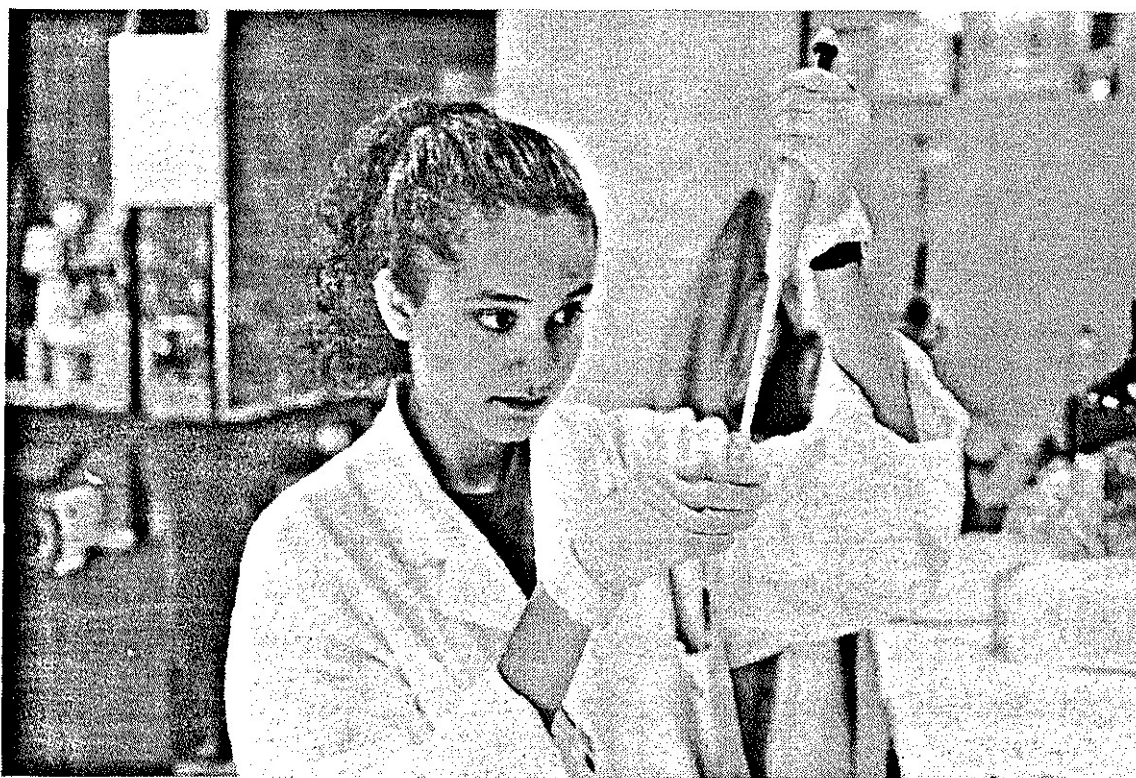
WISEST Program: Final Report

I am working in the Food Sciences Department, and when I first heard what my job was I must admit that I was really disappointed. When I was told that my job for the next 6 weeks of summer would be to determine the glycoalkaloid content in potatoes, I laughed. I was expecting the job to be as some medical technologist finding a cure for cancer or something, but to my surprise and initial dismay, I was to be working with potatoes! Well really, what were glycoalkaloids anyway? I just could not understand how something like this was a 'science-related' job. But to say the least, I had a lot to learn. In fact my project is being done for a company who had a type of potato product out on the market that had to be pulled from the shelves because of its high levels of glycoalkaloid which, by the way, are toxic and in large quantities can be fatal.

One factor that lead to the importance of this project is that the potato is an extremely valuable food source and it makes up a large percentage of our food intake, but it contains these toxic glycoalkaloids which can cause severe poisoning. In fact, potato glycoalkaloids are one of the most serious toxic components in the human diet and they can't be removed by cooking, baking, nor frying the potato but are easily triggered by poor handling. Therefore although few people realize it, knowing the glycoalkaloid content in potatoes is very necessary, and that's where the significance of my job fits in. The approach that I used was an Enzyme Immunoassay for Potato Glycoalkaloids, which is a recent, extensive, and interesting method for finding glycoalkaloid content. I must admit that at first I found the job quite tedious but once I started getting results for my experiment and found purpose in my project, it all came together and it

was great! In fact, by the end of the six weeks I even considered going into the field of Food Science. I mean food is something that we interact with everyday (or at least it's always on our minds) so everything we learn about it affects and concerns us.

Food Science is such an interesting and essential field of science that I had never even known about, but thanks to my experience within the WISEST program I was introduced to a new possible future career path. And although my initial reaction towards the job was negative by the end of the six weeks I not only learned a lot but I also made some money, discovered a new interest, and had a lot of fun!



Angela Kaida

IMMUNOLOGY ---by OOI-LIN PHEH

This summer I spent six weeks in an Immunology lab in the Medical Sciences Building at the University of Alberta. Under the supervision of Dr. Linda Pilarski, I did a combination of lab work and analysis of the results. Immunology is the study of the immune system, which is basically concerned with the white blood cells. Its main and foremost function is to defend the body against foreign substances. There are several types of white blood cells including B-cells and T-cells, generally classified as lymphocytes. T-cells kill foreign substances by attacking directly. B-cells which come from the bone marrow produce antibodies, marking or inactivating foreign substances. White blood cells have receptors on their surfaces which are very specific about what they receive. To find out what kind of receptors or markers, as they are also called, are present on a cell population, antibodies are added to them. Certain antibodies bind with specific markers so by looking at the binding we can tell what kind of receptors are present on the cells. Via a procedure called immunofluorescence, antibodies are added to the cells. A dye is attached to the antibody so that a machine called the FACSCAN can record how many antibodies have bound to the markers on the cell surfaces. In other words, by seeing which antibodies are positive (have bound) we can tell what kind of markers are on the cell. The FACSCAN uses lasers to determine the size and granularity of the cells, as well as identifying markers present by examining the wavelengths produced by the dyes after they become excited by the laser. It is an amazing product of technology as it can analyze more than 20 000 cells within seconds!

I had an experiment which took up the whole six weeks. The procedures for the experiment consisted of purifying normal blood to eliminate red blood cells, proteins and other unnecessary substances while retaining the white blood cells. A simple and reliable method of isolating lymphocytes from whole blood is achieved by the use of a ficoll-paque solution and a centrifuge. The centrifuge spins the blood so that the erythrocytes sink to the bottom, while the plasma sits on top and the needed white blood cells are in the middle, between the ficoll and the plasma. The interface, as the layer of white blood cells are called, is harvested and the rest of the blood thrown away in the biohazardous garbage. Immunofluorescence is done to check which markers are present. The purpose of my experiment was to check if a marker called RHAMM is stimulated in B-cells when a mitogen, SAC, is added. SAC is a bacterial product that stimulates B-cells. RHAMM helps cells to locomote and migrate to sites of infection. SAC is added in different dilutions and cultured for different amounts of time. The dilutions that were used are 1/2500, 1/5000, and 1/10 000. As you can see, the amounts needed are very minute in quantity, but the results are definitely not!

The first step of the experiment is to purify blood. Once the white blood cells have been isolated, they are put in culture with the different concentrations of SAC and stored in an incubator until they are ready to be harvested. The culture medium keeps the cells happy as it provides nourishment and the incubator ensures the right temperature and mixture of oxygen and carbon dioxide are constant. I harvested the cells on days three, five, and seven. By doing immunofluorescence on those days, as well as on day zero, a comparison can be made to see which dilution of SAC stimulates the most B-cells to express the marker, RHAMM. After immunofluorescence is done and it has been run through the FACSCAN, histograms are printed out to analyze. The results thus far have shown that RHAMM is stimulated, but at different timepoints. On day three, for example, RHAMM is expressed quite readily with the 1/10 000 dilution, but by day

seven it has decreased significantly. On the other hand, the 1/5000 dilution appears to have the highest level of RHAMM on day three, but by day five it has already decreased and does not come back up on day seven. Other markers besides RHAMM were also checked for and in some of the results the level decreases on day five, but comes back up on day seven. The different and various results that have shown up might be due to the different blood types used. In this experiment five blood samples were used from five different donors. This could be a factor in the varying results as each individual has been exposed to different environments and foreign substances so the receptors on their cells are different. For the last step I used one blood sample and cultured it with the 1/5000 dilution, then harvested it on the different days. By eliminating two of the variables I could concentrate on the timepoints, therefore I used only one blood sample and one dilution of SAC (1/5000). My only variable was the timepoints. A direct comparison could then be made of the levels of RHAMM on different days. RHAMM appears to have the highest level on day three.

Working in this lab has given me an invaluable insight into medical research and has given me an opportunity to actually "jump in with both feet" and get involved with the research. The WISEST program not only gives you a chance to work in a scientific field, but you meet many other high school students from all over Edmonton and even out of town and visit other research labs. In addition, the people I work with are great! Talking to other summer students in this lab, I have also gained insights to not only the U of A, but other universities and the experiences these people have shared with me will definitely help me when I graduate. This summer job has taught me many things, not only about Immunology, but about what lies ahead of me in a few short months. The best part about this summer? I had lots of fun!





Jill Kleebaum

When I found out I would be working in the Department of Immunology I knew very little about the subject. Now, after spending six weeks on an entire floor dedicated to a group of fanatical immunologists I feel my knowledge of immunology has been somewhat enhanced.

The first week that I spent in the lab I was extremely confused. I had no idea what most of the equipment was or what any of the strange people running around in the white lab coats were doing. However, after spending six weeks in the lab, I now feel like one of those strange people and have some idea of what lab research is all about.

My specific project for the summer involved testing the activity of a certain protein molecule called CD-45 which is found on the T- cells in the immune system. CD-45 breaks phosphate bonds and releases phosphate groups from molecules. To test the activity of this molecule I combined a mixture of chemicals that bonded with the free phosphate groups and caused a color change to occur in the sample. By comparing the amount of color change with a standard curve of known phosphate concentrations combined with the same group of chemicals, the amount of activity could be estimated. Before actually testing the samples I first had to verify that the assay was working and tested only the activity of CD-45. To do this I added an inhibitor that bonded to CD-45 thus not allowing it to break any phosphate bonds. After spending many days trying to inhibit the reaction I was finally able to prove that the assay worked. I then went on to do experiments involving the assay by testing the effect that other chemicals had on the activity of CD-45. My results proved to be interesting and I was able to show inhibition of the molecule.

One of the best ways to learn something is by hands on experience and the WISEST Summer Research Program offered me an excellent opportunity to do this. Through my project I learned a lot about many aspects of scientific research. This includes all the lab skills I learned and the familiarity with the lab equipment that I acquired. I also experienced what real scientific research can be like. I found that there can be a lot of technical difficulties and repetition but at the same time it is also exciting to anticipate and obtain desired results. The atmosphere of the lab I was working in was very positive. There was always somebody more than willing to help me out and offer advice on what to do. I was introduced to many new career options that I had not previously realized were possible that I will seriously consider when I choose a career for myself.

Not only did I just have a valuable experience by working in the lab but I was also introduced to many new people and given a good opportunity to get to know the university campus. I consider my entire summer as a WISEST student to be an extremely positive experience and I would highly recommend it to any future students who are considering applying.

The Study of Nerve Growth Factor

By Katerina Carastathis

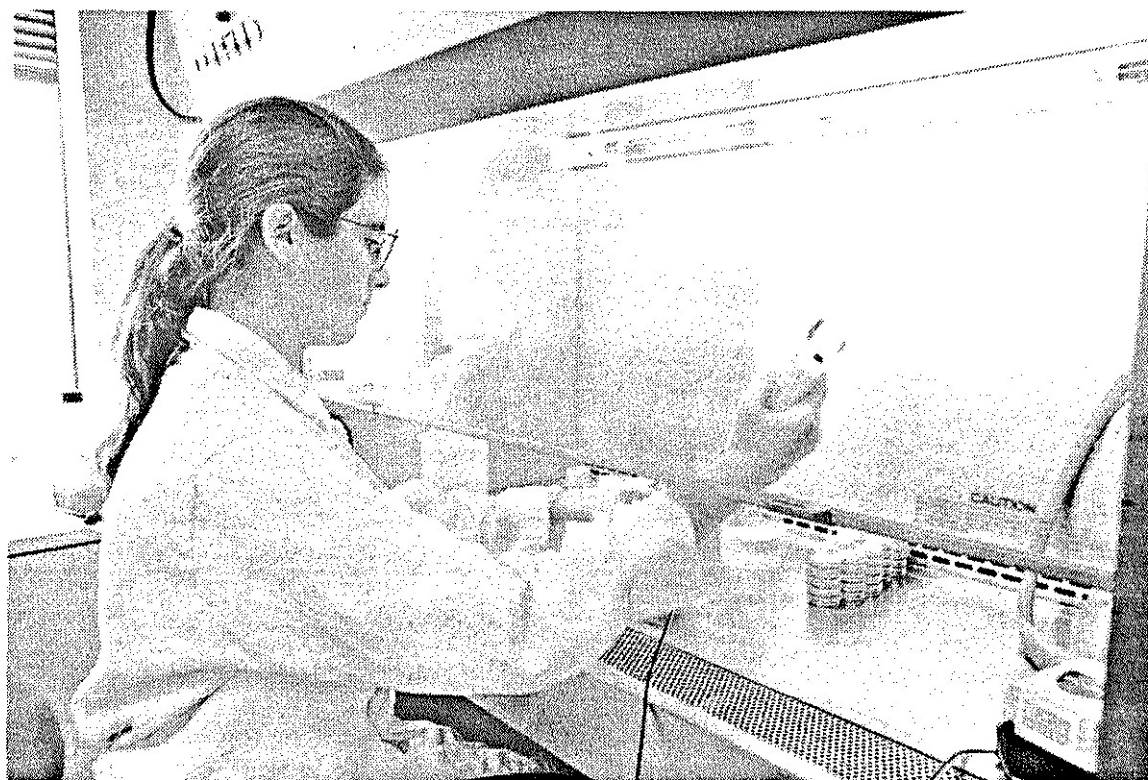
This summer I had the opportunity of working in a medical lab under the supervision of Dr. Siminoski. Dr. Siminoski is trying to determine what controls the production and release of nerve growth factor. Nerve growth factor (NGF) is a protein essential to the survival and maintenance of sympathetic and sensory neurons. To discover what may affect the regulation of NGF, Dr. Siminoski and his lab are running a series of experiments.

In these experiments, cells are cultured in flasks until they become dense. They are then removed and plated in Petri dishes, with a concentration of about three million cells in each dish. The cells are drugged with the substances to be tested, for three days. On the fourth day, the cells and medium are harvested and the cells stored for later analysis. The medium is measured for NGF and for protein by assays. A NGF to protein ratio determines whether the substances act to increase or inhibit cell activity in general, or just NGF production. The data is then analyzed and graphed on the computer and the results are studied.

Unfortunately, I was not able to complete an experiment from beginning to end. During the first few weeks I was learning how to work in the lab and why the work was being done. I practised doing an experiment so that later on I could do the real one. Dr. Siminoski told me to test three enzymes and a drug involved in a nerve-affecting disease to see if NGF release was affected by any of them. The experiment started out well, but on the fourth day,

before the cells were harvested, it was discovered that they were contaminated and thus useless. I was very disappointed, especially since there was no time to redo the experiment.

The WISEST program has enabled me to experience hands-on research that I could not have experienced otherwise. I discovered that research is both rewarding in success and frustrating in failure. I would like to thank Eve and Olivia Tsai for all their help and their friendship. I would also like to thank Dr. Siminoski for providing this opportunity and WISEST for organizing this program.



WISEST 1992

This summer I spent six weeks working in an Endocrinology lab at the University of Alberta. Under the direction of Dr. Diane Finegood I performed many tasks to aid her lab with their research on diabetes. Not only was this program an asset to me in terms of learning and knowledge, but it also provided me with an opportunity to meet some interesting and intelligent people.

A major breakthrough in the treatment of the disease diabetes has been the development of procedures to transplant cells from a healthy pancreas to an infected animal or person. Although islet transplantation has been successful in humans there is still much we do not know about the causes, symptoms, and treatments of diabetes. Dr. Finegood's lab is currently studying the metabolic patterns of diabetic, post-transplant rats and dogs. Throughout my six weeks I had the opportunity to help with many experiments including clamps, secretions, FSIGT's, tissues, and hemodilution studies. In addition to this I monitored and exercised rats, analysed glucose samples, and helped perform surgery on two rats. I have gained a great respect

for the dedication and perseverance required to be a scientist, as well as a wealth of knowledge about diabetes and science in general.

The Wisest program offers students a unique chance to explore new avenues and hopefully learn about themselves and where they want to go. Women are playing an increasingly large role in science and related fields and the encouragement this program offers will ensure that this continues to happen in future generations. All of the people I have met through Wisest and the lab I was assigned to have been very positive and friendly, which is largely what has made this experience so enjoyable for me. I would recommend this program to anyone who is the least bit interested in science. Not only will you learn about what is out there and what science and technology offers you, but you will meet interesting people and have a great time.



Summer with WJSEJ 1992

For six weeks this past summer, I was under the supervision of Dr. Janet Robertson in the Department of Medical Microbiology and Infectious Diseases. The first week, I was oriented around the lab -- making solutions and medium, and learning about different pieces of equipment in the lab. For example, I was introduced to three different centrifuges, pH meters, and the autoclave. Also, I learned basic bio-safety in the laboratory -- the dangers and the safety measures.

The next week I began my project that dealt with the sizing of DNA. I grew strains of *Ureaplasma urealyticum* and selected strains (serovar 3) to grow batch cultures. This was done by a Metabolic Inhibition Test (MIT). Antigens (the *Ureaplasma urealyticum* strains) were tested for growth inhibition to dilutions of antiserum (rabbit anti-*Ureaplasma urealyticum* III). Once I had selected the strains that I required, I grew batch cultures for harvesting the cells. To do this, I grew the cultures in broth and then proceeded to collect the cells through triplicate centrifuging -- ultracentrifuge, refrigerated centrifuge (Sorvall), and microcentrifuge. Next, the cells were embedded in agarose, where the DNA was prepared for pulsed-field gel electrophoresis on the CHEF (clamped homogeneous electric field). The cell membranes were dissolved in Proteinase K, and then cuts were made in the DNA with restriction enzymes. These enzymes recognize specific DNA sequences and cut the DNA. This linearized the DNA for the CHEF-- to determine the length of the DNA. Interpretations were based on the migration of molecular size standards -- yeast chromosomal DNA. Pictures were taken of the gels, and the sizes of the DNA were determined. The DNA on the gels were then transferred by Southern Blot method onto a nylon membrane for further probing.

I was also able to observe and occasionally help other laboratory workers in the projects they were doing and the methods they used.

In addition to the laboratory experience, I was introduced to the University of Alberta campus and several of its buildings. I was exposed to the library system, and I was given scientific journals to enhance my knowledge. As well, I had the opportunity to attend student lunch-hour seminars on various topics -- ranging from the use of animals in science to the reports of summer research projects. This experience has confirmed my ambition to enter into the medical world. It has also provided me the feel of what it is like to be involved in the research that is shaping the knowledge of tomorrow.

Paula Ostashevski



LORI SHIRVELL
AUGUST 12, 1992

During the last six weeks I have been working with three doctors from China, under the supervision of Dr. Alexandra Lucas, in the Department of Cardiology on atherosclerosis and coronary disease. I am part of a research team studying two different treatments of coronary artery disease: (1)PTCA, (2)laser angioplasty. We have been using cholesterol fed White Leghorn Roosters and Marek's Disease Virus infected roosters in our study. The cholesterol fed roosters are put on a 2% cholesterol diet, with 10% peanut oil added to their regular food.

PTCA (Percutaneous transluminal Coronary Angioplasty), is done by inserting a balloon-tipped catheter into the diseased coronary artery and reducing the stenosis by inflating the balloon with controlled pressure. The purpose of this procedure is to compress the atheroma into the intimal lining of the artery, thereby increasing the blood flow in the artery. Complications do arise from the PTCA. There is a 30% to 50% chance that restenosis will occur. This is believed to be the result of platelet activation and release of growth factors at the site of the endothelial damage.

The second type of experiment we have been working on involves the use of lasers. Five different types of plaque have been identified: fatty, fibrous, thrombus, calcification and ulcerous. It is this build-up of plaque that causes the hardening of the arteries. The radiation given off by the laser vaporizes the plaques. It eliminates them by converting solid materials to gases that are soluble in blood. X-rays are taken of the diseased artery before and after the laser. The diameter of the artery is always smaller after the laser.

I really enjoy the work I have been doing this summer. The doctors I work with have alot of patience and have taught me a great deal of things. Not only did they teach me how to cut open and stitch up a rooster, I got to follow them to the hospital. Over the past six weeks I've been given the chance to go up to O.R. and observe a triple bypass, witness a stress test and an ECG, and attend two seminars that were held in the Cardiology department at the hospital.

By being part of the WISEST program, I have finally decided what I want to do with my life. Not only has it confirmed my desire to be a cardiologist, it has given me an inside look on what being a doctor is all about.



A WISEST SUMMER
Marni Mishna

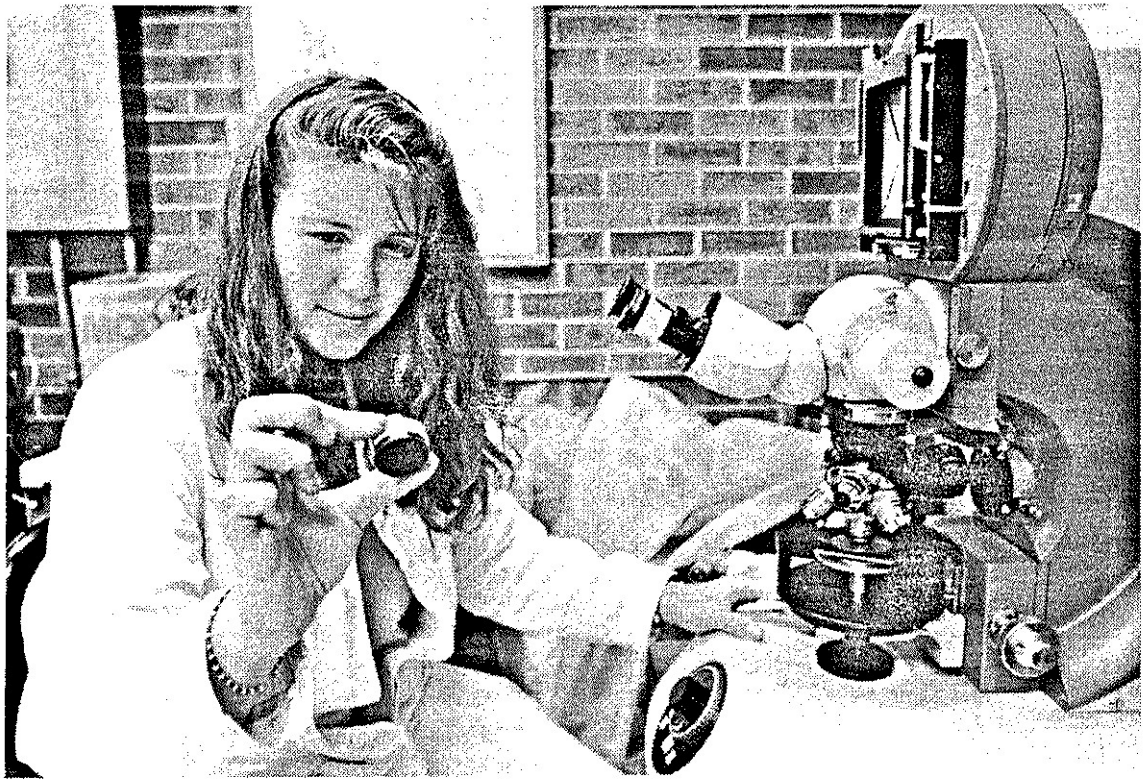
Mechanical Engineering is perhaps one of the most non-traditional areas of work for women. But, none the less, I found myself in a tribology (the science of wear, friction and lubrication) lab this summer with a group working on the problem of wear of oil rig couplings. The issue at hand was finding a coupling (i.e. a metal connecting piece for the sucker rods that are deep down in the oil well) that would wear less against the wall of well and therefore require less frequent replacement, and save the oil people the time, money and effort involved in replacing worn walls, couplings etc., or at least significantly reduce it. The particular experiment that I was most closely involved with dealt with different coatings of the coupling.

The experiment, run by grad student Gaby Sonego, simulated wear by running couplings along pipes, repeatedly back and forth for a total of 300 km. The thickness loss, hardness, surface roughness and weight loss over five intervals- 0, 10, 100, 200 and 300 km were compared. Other controlled factors in the experiment included weight hanging perpendicularly to the pipe (known as side load, simulated with springs), lubrication (water, sand), and type of coating on the coupling.

There were several readings that had to be taken at each stage and this is where I came in. My work this past summer included preparing the tubings for mounting on the large wear simulation machine-i.e. cleaning and taking 0 km interval measurements. I learned the necessary, and accepted tediousness of experimental science at this point of my summer. I learned it again as I polished past tubing samples for photographs, and as well when I did repeated statistical equations with results of previous tubing tests.

On the brighter side, I gained various skills that I don't think I might have otherwise acquired. I now know how to transform a negative into a black and white picture. As well I used tools that I have never previously touched and operated equipment that I never even imagined existed. Most importantly I got an excellent opportunity to talk with engineers, graduate students and others about engineering, university and the variety of options available to me as a student and as a women. This really helped make the uncertain future a bit more clear.

My WISEST experience has been extremely valuable to me. I found the project that I was involved in interesting; it involved a wide variety of skills and as well, taught me about mechanical engineering and the scientific process. I also began to realize how uncommon women are in mechanical engineering, and even engineering in general. This became to me, almost a challenge to enter the field. Hopefully through enjoyable yet informing programs like WISEST this will continue, and the gender barriers will fall





WISEST

For six weeks I worked in the department of Mechanical Engineering with Dr. Ken Fyfe. During this period of time I gained experience in writing programs on the computer with certain programming languages and also I learned what mechanical engineers do.

My job was to create meshes on the computer. Meshes are shapes that are divided into parts and can be used to calculate and display sound pressures . Such as if you wanted to determine the sound pressures occurring in a car you would create a mesh in the shape of a car and then you would proceed on to calculate the pressure and display it.

To create and display the meshes I had to write several programs on the computer. I used programming languages such as QuickBASIC, Fortran and I used PostScript so I would be able to print my meshes out. All of this took time, learning and practice. But I learned that there is no substitute for continued practice!!

I believe that WISEST is a very interesting and educating program It encouraged me to further my studies in math and sciences and it taught me alot about scientific research.

I would like to thank everyone who helped put WISEST together and gave me a chance to experience it. I would especially like to thank Dorothy and Dr. Ken Fyfe for their time and efforts - thank you!!

Zeynep Koybasi

WISEST Summer Research Project 1992

When I received word that I was accepted as one of many students to be part of the WISEST 1992 Summer Research Project member, I was overwhelm by the idea that I would be working in the Faculty of Nursing.

At first, my ideas on nursing was that I would be working inside a hospital, doing rounds and taking to patients, but there is a totally different and unique side to nursing which involves research and how research is used to improved the amount of caregiving the nursing profession can give to it's patients.

I work with Dr. Anne Neufeld, Acting Dean of the Faculty of Nursing. She is a very energetic person and I envy her on the amount of time she spends on her research projects. Other members of our research team includes Dr. Margaret Harrison and her assistance Sandy MacPhail and Kyle Thorsteinson. Our busy secretary is Trish Kryzanowski who works with us every Thursday and Friday. Other member who work with Dr. Anne Neufeld include Pauline Lea, Dorothy Forbes and Alice MacKenzie.

There were several research projects that I work on which includes: Women as Caregiver, Male as Caregiver, Women in Transitions and Parent-Infant Project. I spend several hours a day on each of these projects.

The "Male as Caregiver" projects has several main problems: what are the social relationship of male who are caregiver and what are male caregiver perceptions of social support and reciprocity. The Volunteer must be caring for someone who is over 60 and confused. The research is a semi-structure interview, taped recorded and then transcribed, this is called qualitative research and there is no result so far - 8 interview so far out of 60 (20 people * 3 interview).

The "Women as Caregiver" projects has same question as male caregiver only reversed. All interview are done and all data is collected and the process of analysis of data and making some general conclusion are on the way. However, results are still being developed.

The "Parent-Infant Project" is interested in learning more about how mothers and fathers teach their baby new things, the responses of the parent to having a child. The research includes home visits (3 months, 12 months and 18 months) after the baby leaves the hospital, each visit would take 1 1/2 hours. The home visits includes a problem for the baby to solve and the reactions between mother, father and child is observed. The mother and father also fill out responses to questionnaire about their marriage and the stress of raising a child. The only results are the 3 months visits which are now being feed into the computer and we are now right in the middle of the project.

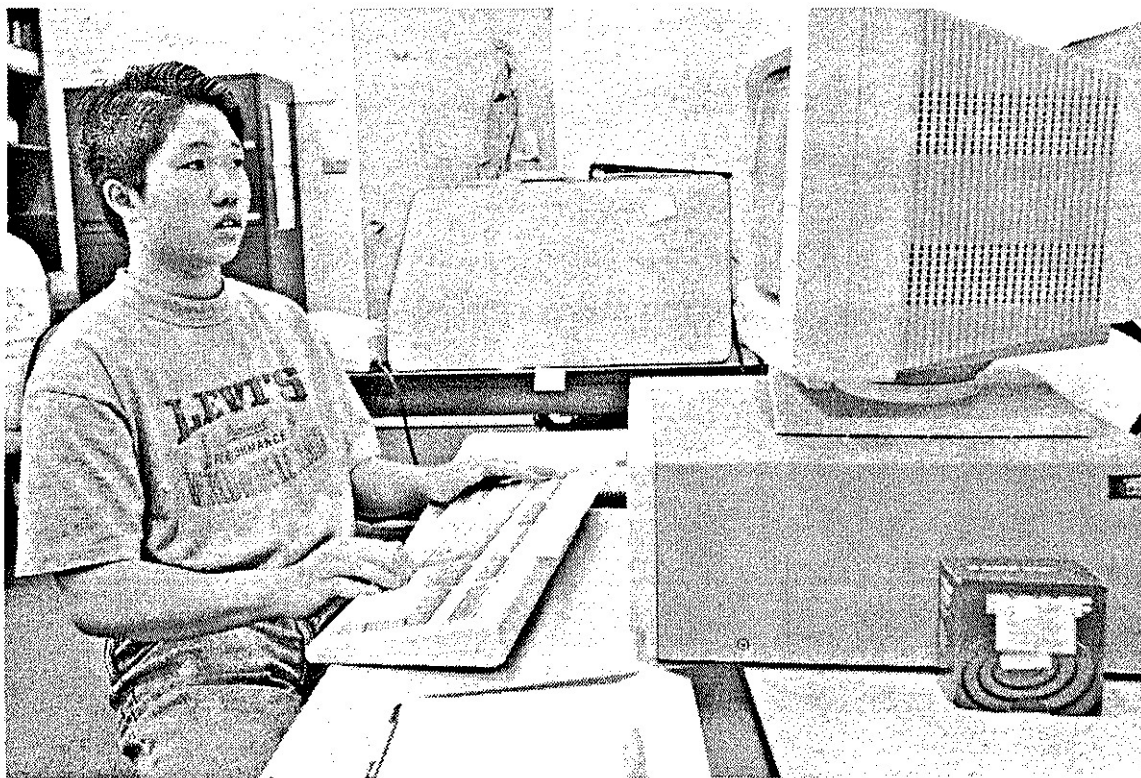
The last project is "Women in Transitions" and the questions is when women reach retirement age, what are their choices and what do their choose to do with the last part of their life. It includes women returning to the work force after being out for a long time, women who had their first baby and How do they received or get support with these changes. It is a semi-formal interview, qualitative research, taped recorded interview which are transcribed are coded

and conclusion are drawn from these coded sentences. This project is almost complete, Part I is done, Part II is in the middle of being analysis and searches are being run now on the coded segments and common ideas are being drawn up.

I also do library searches to locate journal articles for the professors to read on the related topic that they are studying. Several research assistance work on each project with the professors making the major decisions, the professors develop their thesis and the research assistance help them in proving their assumptions.

This summer was quite interesting and I hope that in the future that many students will discover the WISEST Program and will gain as much experience as I have. I would like to thank also the two other "GUYS", Austin Chen and Hari Amarnath, who work with me in the Faculty of Nursing and kept my lunch hours "eventful," and Dr. Dorthoy Trovell, Dr. Margaret Ann Armour and the rest of the WISEST team who gave me the opportunity to be part of their wonderful program.

- Alfred Wong -



WISEST Report

"Let us, then, be up and doing, with a heart for any fate,
still achieving, still pursuing, learn to labour and to wait."

Robert Browning

This quote encompasses two very important aspects of future career choices and life in general. It was through the WISEST program that enabled me to see them more clearly and gain a better understanding of them. These two aspects are that of freedom to choose any path you wish to take and also that in order to achieve your goals you must learn to work and persevere. In the past six weeks, the WISEST program has emphasised the first aspect simply by introducing us to non-traditional fields. It has opened up many more paths for us to take and has shown us that we were not confined to those fields that are expected of us. Secondly, by actually working directly on a long term research project, it has shown us that it takes lots of patience and work to get, or not even get, the results needed. Thus, in general, for me the WISEST Program has both been a great learning experience and a lot of fun.

My name is Austin Chen. For the past six weeks, I have been working in the Faculty of Nursing in the Clinical Sciences building. The research project I was assigned to was a study of the adult geriatric day program in Alberta. The project was to evaluate the effect that these programs had on the participant's quality of life and to see if it was effective in delaying the entrance of these elderly into long term care facilities. The data for this project had to be collected from a various number of people in the programs and done many times to see if there was improvement. So in this study there were 14 day programs in Alberta that participated.

My role in all this was to enter all the data that was collected from these sites and these interviews. In the six weeks, I have entered the patient data from only from four of the sites and even that was a very big job. Right from the second day I was introduced to the computer lab and had already begun entering the data. I was a little scared at first of using the program because I thought I would somehow mess things up but within 3 days of entering data I was quite able to handle the program with ease. I learned how to use programs like Ethnograph, SPSSX, and Wordperfect.

Aside from entering data, I also did a lot of visits to the actual programs so I could see exactly what I was dealing with so that the data didn't seem too impersonal. So I especially enjoyed the time when I went with my supervisor to attend these interviews. Since these programs are scattered all over Edmonton and area, I got to travel to towns such as Camrose and Vegreville to see the day programs there. Just recently I got the actual chance to conduct one of the interviews of one of the participants myself. Though I was a little nervous I got through all right.

One of the extremely interesting experiences I had while working in Nursing, was to visit some of the various departments

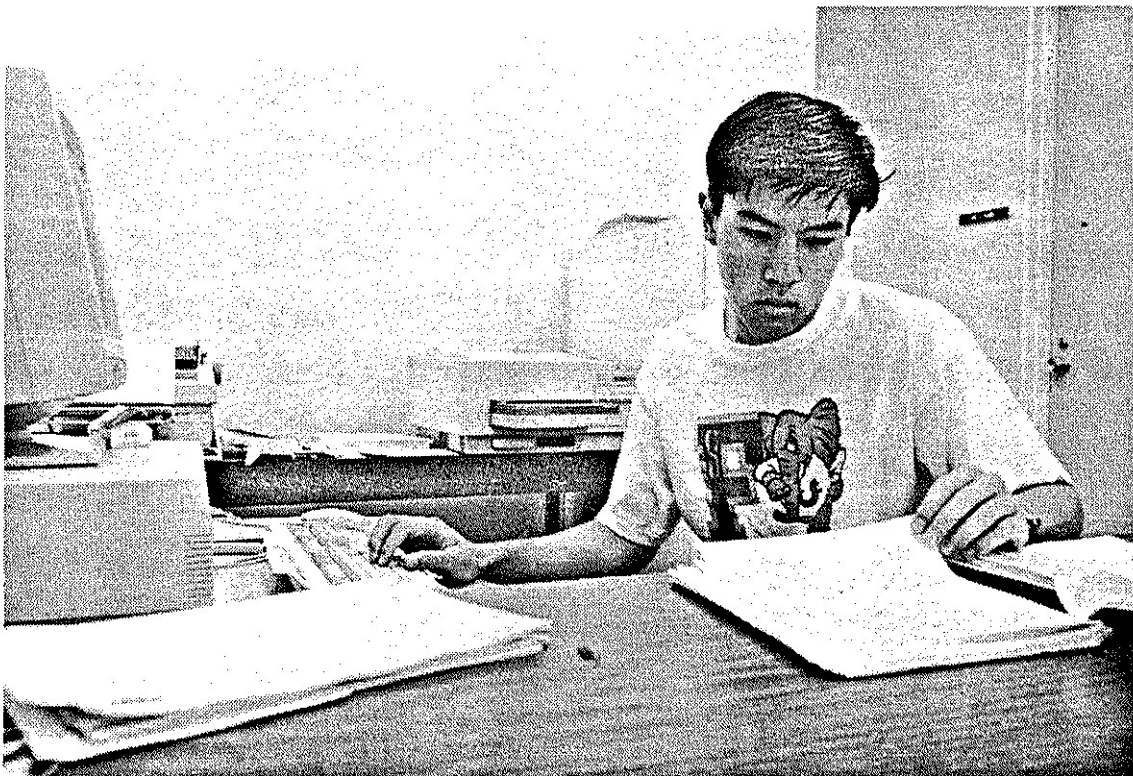
of the hospital and talk to some of the nurses there and to see what they do. This was probably one of the biggest eyeopeners for me because I did not know exactly what they did, so I entered with what nurses were generally seen as. What I did find out was that the nurses work very closely with the doctors and that it was difficult to distinguish the two because they shared so much of the responsibilities. I visited the emergency ward and also the neonatal Intensive care unit.

I had not realized before this point that the nursing profession and healthcare was such a diverse and expansive field. I really had a chance to break down some of the stereotypes about nursing. The Wednesday afternoon sessions, I thought were another great experience. This is because I got to know the other students, see other labs and learn about other projects.

The WISEST program has brought me experiences that will change my views and opened more doors for me in my future career choice. It has been a great six weeks!

By Austin Chen

** I would also like to thank my supervisors, Diane Godkin and Dr. Janet Ross Kerr for helping me with my work and helping me to feel comfortable on the job. Thank You!



WISEST: Final Report

When I received the letter saying that I was going to spend my summer in the Faculty of Nursing, I was sure that I would be going on rounds in the hospital and get to see nurses attend patients. But I found there is a totally different side to nursing, which many people, including myself, didn't know about. I learned that nurses' actually do extensive research to see if they can make their job more pleasant and more comfortable for the patients.

The project I worked on was the postpartum fatigue women experience in the first year after childbirth. The study was to find out how fatigued women are, both physically and emotionally, in the first year after childbirth. The information that would be obtained from this study would help identify which women would experience more fatigue than others. This way nurses' can better treat those who are at higher risk of fatigue.

Although the project seemed to me quite straight forward, it was anything but. It was a very long, tedious journey that seemed to take many different directions. My job was to establish a code book and enter the data obtained from the new mothers. When I wasn't doing that, I helped my professor and graduate student, obtain other studies relevant to their study, so they could see what others were doing. This helped them better their study, using information from what others had done.

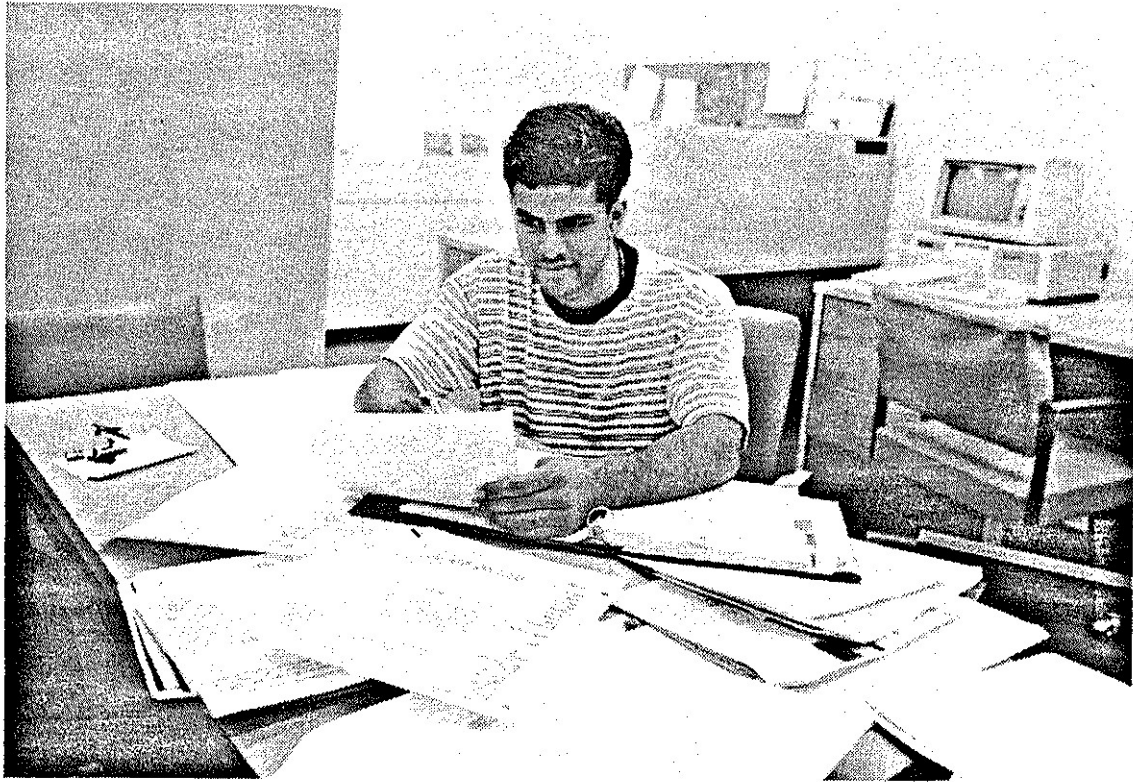
I was fortunate enough to work with a group of kind, compassionate professors. They always had a smile on their face and something kind to say. They all explained what each of their projects were, and why they were working on it. I even got to help them once in a while when my main project seemed to arrive at a standstill.

Another plus I got to experience were the tours of the various wards in the hospital. I got to see what the nurse's role was in different wards of the hospital. I was even taken on a home visit to see how nurses' can help patients in their own home. I got to see how the research being done was put to use in "real life situations".

The summer was a great learning experience. I not only got to learn more about nursing, I got to learn a little more about the university, and how it works. I also got to meet many people. Overall the summer has proved to be a busy, yet enjoyable experience.

by,

Hari Amarnath



Working as a summer researcher in the WISEST program was an extremely valuable experience. Besides learning the value of scientific research, I also learned of many possible career choices and things I would like to do and experience in the future.

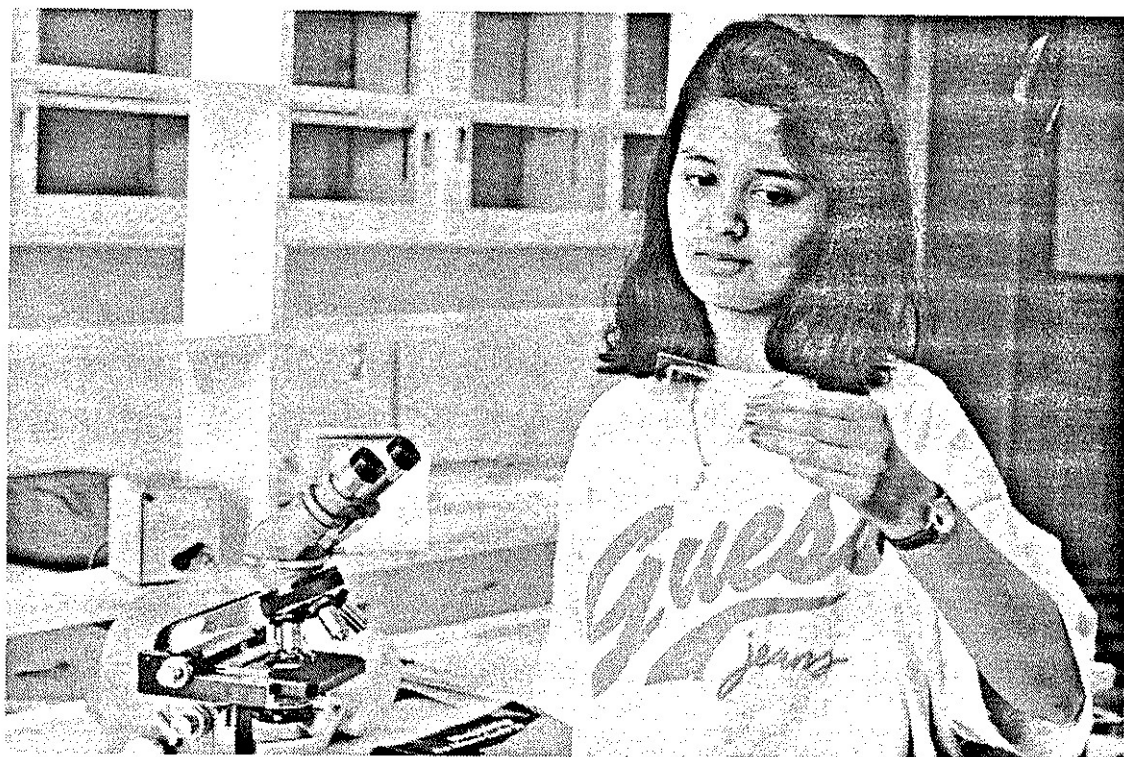
I worked with Heather McClure under the supervision of June Dabbagh, Dr. Sperber and Dr. Machin in the Department of Oral Biology. My work involved the study of Embryology using 3-D computer imaging. Abnormal embryos which had been spontaneously aborted were reconstructed using the computer. After the specimen had been sectioned and slides had been prepared by our technician, Colleen Murdoch, our job was to take and develop the slides into black and white photographs. The organs were then traced and digitized into the computer. Once all of the organs had been digitized, they were attached to one another and a 3-D image of the embryo was portrayed. These images help us to understand the placement of the body parts within the face so we can study and learn about the abnormalities that resulted in the spontaneous abortion. We can also learn more about the normal which will help us better understand the abnormal.

Being an out of town student and having to live alone for the first time was a great experience which helped me develop my self-confidence and sense of responsibility. Working with our supervisor June, made me realize that a career in science involved a lot of hard work and determination. I also realized that research involved patience and perseverance which did get tedious and repetitive at times, but produced excellent results.

I really enjoyed my summer here at the U of A. I met a lot of interesting people and made many new friends. The campus tour certainly helped me to learn my way around campus which will surely help me next year when I come to the U of A. All of the group

sessions were a lot of fun and were very interesting. I hope this program continues so other people will be able to have the same experience and I hope WISEST continues to sponsor out of town students like myself. I am glad I decided to participate and will be sure to tell other people in Fort McMurray about it. It's been a great summer!

by Monica Kumar





Participating in WISEST was a new experience that showed me many things. By being exposed to work in a lab, I not only got a better idea of the type of career I wanted in my future, but also a lot of knowledge that could be useful in future student years.

This summer I worked a lab in the Pharmacy/Dentistry building in the Department of Oral Biology under June Dabbagh, Dr. Sperber and Dr. Machin's supervision. We (Monica Kumar and myself) dealt with the reconstruction of human embryos. The process involved embryos that were naturally aborted due to an abnormality within them. These embryos were then cross-sectioned, put on slides and stained by our technician, Colleen Murdoch. Monica and I then took enlarged photographs of these slides. From the pictures, we made tracings onto transparency paper of the various organs within the head area of the embryo. These tracings were then used to digitize the organs into the computer. The digitizations were formed into 3-D images which could then be researched, studied, and used in reports by June.

Overall, this summer proved to be very helpful in showing me the different possibilities for future careers in science. Through meeting and talking to others in the program, I learned of other areas which interest me. Besides learning about future careers, this summer at the U of A has helped to prepare me for the years to come because I got to know my way around the campus, thus making my first year at university less confusing.

I had a great time this summer, and I hope this program will continue for many years to come!

by Heather McClure

The WISEST experience in PATHOLOGY

By: Lisa Boorse

Wow! I can't believe how fast these past six weeks have gone by this summer. Being a part of the WISEST program not only once, but twice has been a very rewarding experience. The opportunities to explore science through this program are really tremendous. This summer I had the chance to discover what Pathology (the study of disease) is about. Since I was situated in the U of A hospital's Department of Laboratory Medicine, my job gave me the unique opportunity to become familiar with the hospital environment as well. My career interests in the health sciences have been further enhanced by this experience. In any case, I would like to thank Dr. Machin, Dr. Bamforth, Mike Innes (co-worker), and everyone at WISEST for their support towards a rewarding and unforgettable summer.

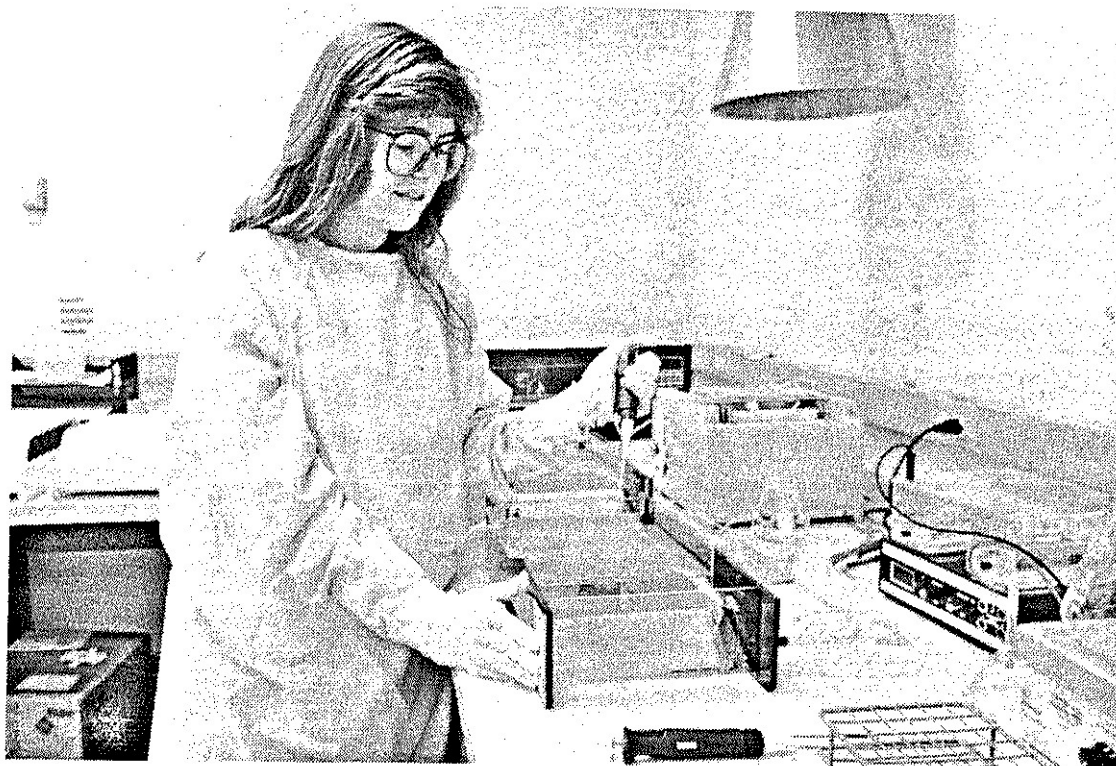
The weekly WISEST group sessions are quite interesting. Our trip out to Meanook and Baptiste Lake was a great addition to the program. A highlight of the summer was my pharmacy research lab visitation where I gained a lot of insights about this occupation. Meeting a number of new people in WISEST and sharing our job experiences and concerns was a lot of fun as well.

The research that I was involved with this summer used DNA samples from human female identical twin babies. We are testing out a hypothesized theory that female twins can be created from a non-random x-chromosome inactivation during the early growth of the fetus. The process of DNA fingerprinting is used. First DNA extracts are done on blood tissues of the twins to be studied. Restriction enzymes are then used to analyze the x-chromosomal patterns of the samples and eventually provide essential data. An agarose gel then sorts the fragments to size by the process of electrophoresis. The stained bands are then visible under UV light. Strands of the DNA are transferred to a membrane in the next step, by the technique of Southern Blotting. A radiolabelled probe then binds to matching DNA sequences, which can then be seen as visible bands on an x-ray film placed in contact with the membrane. As this project is in its beginning stages, problems

arose with use of our specific probe, but some recent progress has been made after consultation with the U of C.

Despite a frustrating first few days, I quickly became familiar with the research's routine and I feel that I have learned a great deal. Thanks to this job I have gained a wide range of experiences such as the technique of pipetting, the extraction of DNA samples, the preparation of various solutions, the packaging of blood samples for transfer out of the lab, the re-sorting of past hospital records, the performing of some lab tests, and so on. I feel that these skills may become useful during my university studies.

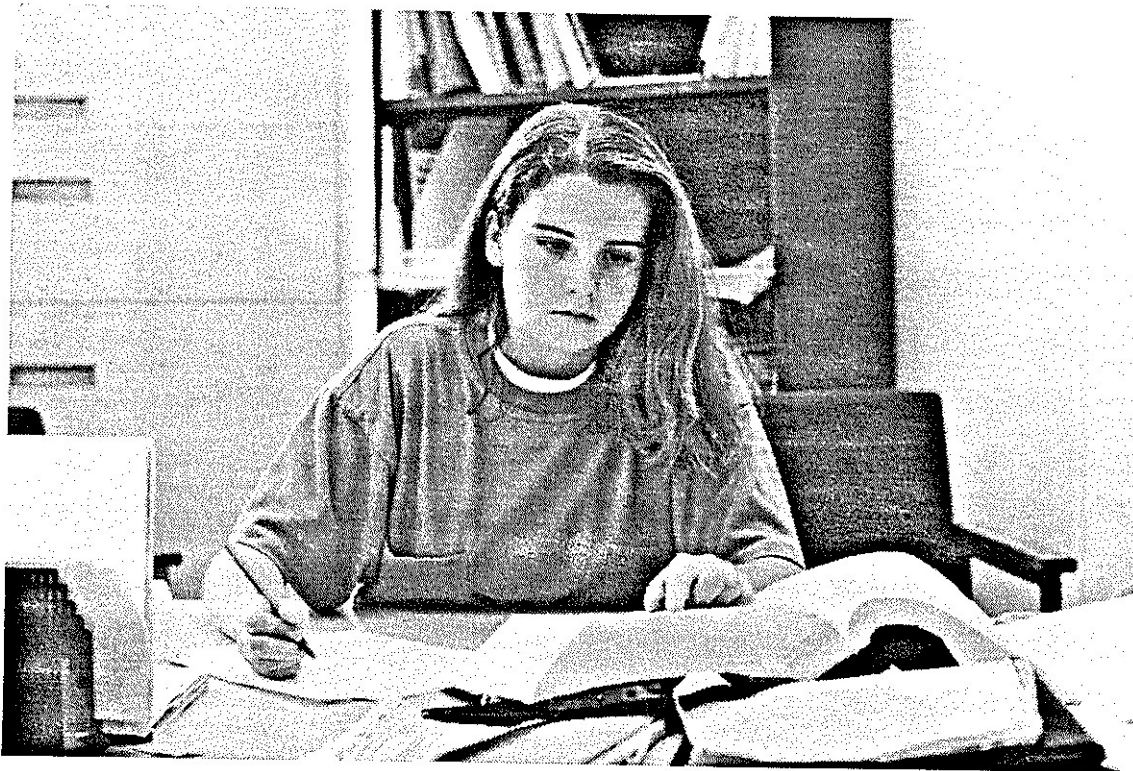
From all my exposure to this program, I remain a strong supporter of WISEST. I definitely recommend this opportunity to all those with an interest in science at the U of A. As I begin my education at the university, I have more confidence and firsthand information of what this place has to offer.



WISEST SUMMER RESEARCH PROGRAM

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HOLLY PAGET



WISEST SUMMER RESEARCH PROGRAM
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Participating in the WISEST Summer Research Program 1992, has been both beneficial and enlightening. As one who is pursuing a career in Pharmacy or Pharmacology, working in the Faculty of Pharmacy has brought forth many rewards. As six weeks was not sufficient time to conduct an experiment and obtain accurate results, I did not get to experience first hand the world of research, but I did do various jobs throughout the faculty which enabled me to view what is involved in becoming a Pharmacist. Perhaps the one thing which opened my eyes the most was the extensive inventory of drugs I completed for the Sterile Products Lab. I had no idea until then of the amount and variety of drugs available to the human being. This inventory was conducted in three different stock rooms and took me one month to complete and enter on the computer. As my supervisor Sharon Mitchell said, it was a very narrow view of Pharmaceutical Science but indeed it provided me with an insight into the field. Aside from the inventory, I also prepared lab materials for the students to use in the fall. In this respect I learnt that not all methods are truly "scientific". As part of the Sterile Products course, the students are required to learn how to handle cancer chemotherapy drugs. Cytotoxic drugs, most commonly cancer chemotherapeutic agents present a hazard to personnel that prepare and administer them. Direct contact with or inhalation can cause dermatitis, dizziness, nausea and headaches. In addition, studies suggest that repeated exposure to even small amounts of cytotoxic drugs may be carcinogenic (cancer-causing). To avoid placing the students in this high risk situation, the drugs used in class are simply simulated ones. Surprisingly enough, kool-aid crystals are used in place of the actual drug. For example, Doxorubicin HCl, which is used in the treatment of solid tumors including breast and ovarian cancer is made up of cherry kool-aid crystals. Another drug of high potential toxicity is Methotrexate, which when simulated consists of yellow/orange TANG crystals. Methotrexate is used as a component of various cancer chemotherapeutic regimens and also to treat severe psoriasis. The drug has many adverse effects such as nausea, abdominal distress, decreased resistance to infection and deaths have been reported after its use. In the treatment of leukemia, a drug Cyclophosphamide is administered. The simulated version consists of baking powder. It is a highly toxic drug as well and must be used only under constant supervision by physicians experienced in therapy with it. Accompanying its use are the side effects of anorexia, nausea and vomiting. Lastly, diluted grape kool-aid crystals are used for Mitoxantrone, an anti-cancer drug as well. When considering the use of these drugs for chemotherapy, clinicians must evaluate the need and potential value of the drug against the risks or toxic effects. In addition, I had the opportunity to use a machine called an autoclave which boils the liquid to a high temperature (242 degrees F or 121 degrees C), removes impurities, causes it to coagulate and results in a sterile product. This was involved in making the simulated Mitoxantrone. The procedure I followed for preparing these simulated drugs was a simple one. I measured the approximate amount of crystals needed, transferred them into the appropriate vial, sealed them and put labels on.

Besides doing various tasks around the faculty, I was fortunate enough to visit the University of Alberta Hospital (Walter C. Mackenzie Health Sciences Centre) to attend rounds, which is an informal gathering where doctors present unique patient cases while other doctors and health care professionals give their input or opinion on the subject matter. I found these presentations very interesting and informative and I felt privileged to be attending. Lastly, I assisted with various office duties in the Faculty of Pharmacy's main administrative office. My experiences working here have made me a more independent person; which will be an advantage to me in future endeavours. Even though I did not partake in a research project, I feel I still gained valuable knowledge and insight into the world of Pharmacy.

An Opportunity of A Lifetime

By Shao Lee

During the WISEST Summer Research Program 1992, I had the great honour to work for Dr. Terry Allen in the Department of Pharmacology. Under the supervision of Chris Hansen and Ajay Agrawal, I performed several experiments to find one way in which drugs can be effectively delivered to cancer cells.

Scientists established that liposomes can carry drugs in their interiors since they are composed of phospholipids whose hydrophilic and hydrophobic ends combine to form a hollow sphere. This configuration enables the liposomes to carry drugs like water in a balloon. One major problem, however, was that the liposomes could not reach the cancer cells, because they were foreign particles and were being rapidly removed by the body's immune system.

The first step in my experiment consisted of making liposomes containing PEG (polyethylene glycol) which increases their circulation half-lives, and enables the liposomes to avoid detection by the immune system. The lipids were dried under vacuum by a stream of nitrogen gas into dried lipid films and placed in the desiccator for 4 to 5 hours. After, I rehydrated, heated, vortexed, and extruded the liposomes ten times through two stacked 0.1 μ m filters in order to reduce the size of the liposomes.

The second step was to attach the sheep IgG (antibodies, which are protein) to the liposomes using covalent and non-covalent methods. In the covalent method, the IgG was thiolated with SPDP and trace amounts of radioactive 125 I-IgG were added. Unreacted SPDP was removed by gel filtration. Gel filtration permits larger, conjugated molecules to come out of the gel column first, and leaves the smaller, unreacted molecules in the gel for a longer period of time. I reduced the thiolated IgG with DTT and unreacted DTT was removed by gel filtration. A Bio-Rad Assay was done to determine the amount of protein in the solution. The thiolated IgG was coupled with hydrogenated soy phosphatidylcholine:cholesterol:(N-[4-(p-maleimidophenyl)-butyryl]-phosphatidylethanolamine) (HSPC:CH:MPB-PE) liposomes which had molecular weights of PEG (5000, 1900, 750, 120) attached to them. The higher the number, the longer the PEG fibres are. The control was liposomes without PEG. The conjugated liposomes were incubated for 2 hours to overnight and run over gel columns in order to remove the free IgG molecules.

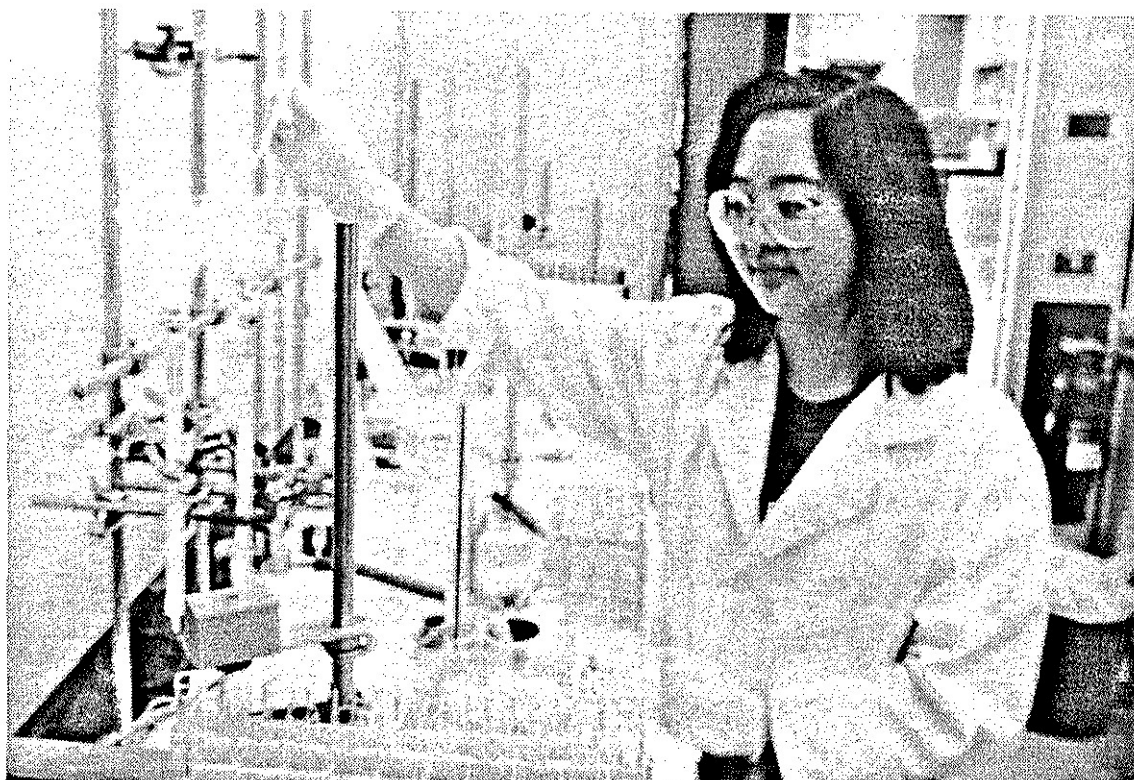
In the non-covalent method, hydrogenated soy phosphatidylcholine:cholesterol:biotinylated phosphatidylethanolamine (HSPC:CH:Bio-PE) liposomes with and without PEG(1900) were incubated with either avidin or streptavidin for 30 minutes. The unbound avidin or streptavidin was removed by gel filtration. The liposomes were then coupled with biotinylated IgG- 125 I-IgG and incubated for 30 minutes. The

free IgG molecules were also removed by gel filtration.

Finally, I completed phosphate assays and CPM counts with a gamma counter to find out the amount of protein conjugated to the liposomes (protein:lipid ratio). I discovered that there was generally more protein attached to the liposomes without PEG, and as the length of the PEG fibres increased, the amount of protein associated to the liposomes decreased. The long PEG fibres created a steric barrier and prevented the attachment of the antibodies. My results were given to Ajay and he performed experiments to measure the ability of the antibodies to be recognized by their antigens.

This experience was very beneficial in confirming my ideas about the type of career I plan to pursue in university. I am glad that I was involved in such a challenging program. I learned many techniques and the different functions of various equipment. I became more aware of the type of research that is going on at the university. My work was often tedious since I had to repeat my experiments several times in order to achieve reproducible results, however, my results will be used in the publication of a scientific paper. More importantly, I have the satisfaction of knowing that my role in this research project will eventually help to discover an effective drug delivery system to combat cancer.

I would like to thank WISEST and Dr. Allen's lab for providing me with this opportunity to gain more insight into this field, and making my job a most memorable and enjoyable experience.



Alida Apon
 WISEST Program
 August 11, 1992

WISEST has been a very educational experience for me. I feel very privileged that I was chosen to be part of it. I have been able to experience what work in a lab is like. It is nothing like labs in school or the work that high school students get. I really enjoyed the work in the space lab ever so much more than other part time work I've had before.

This summer I learned much more about physics, specifically space physics. I learned that the earth's magnetic field is changed by the sun's solar wind, which is made up of ionized particles. This causes the earth's magnetic field to shape into what looks like a comet, although we can't see the magnetic field. When the solar wind changes, currents are induced into electric power grids, which does cause problems at times. Some of the sun's ionized particles become trapped in the earth's magnetic field. As they come into the earth's atmosphere, they collide with the particles that make up our atmosphere (eg. oxygen, nitrogen). The collision causes an electron of the element to move up into a higher energy level. Some time later the atmospheric particle returns to its original energy state, releasing energy as visible light. We can see this happening in the Aurora Borealis.

EMR Canada tries to predict what the geomagnetic field of the earth will be on a given day. I quantitatively assessed their predictions using data from September 17, 1987 - August 3, 1992. I found that if they predicted that it would be quiet (80nT and under) it was either an accurate prediction or an overestimate. But above 80nT it was a scatter of points reflecting both underestimates and overestimates. EMR are accurate about 24.2% of the time within their predicted range. They report the actual values sometime later, and these were compared to the predicted values. The actual values are above the predicted range 29.4% of the time and below the predicted range 46.4% of the time.

The actual values reported by EMR are daily averages. I had to find out how large the magnetic field disturbance (B_{max}) actually got. I randomly chose five months of data and looked at the magnetograms on the microfiche from each day, from four stations: Churchill, Poste de la Baleine, Yellowknife, and Baker Lake. I included Baker Lake because it is at a higher latitude near the interface between the auroral zone and polar cap. From the magnetograms, I recorded the B_{max} and the time when it occurred. I also recorded the maximum rate of change of the magnetic field, and the time at which that occurred. With those data I made some graphs.

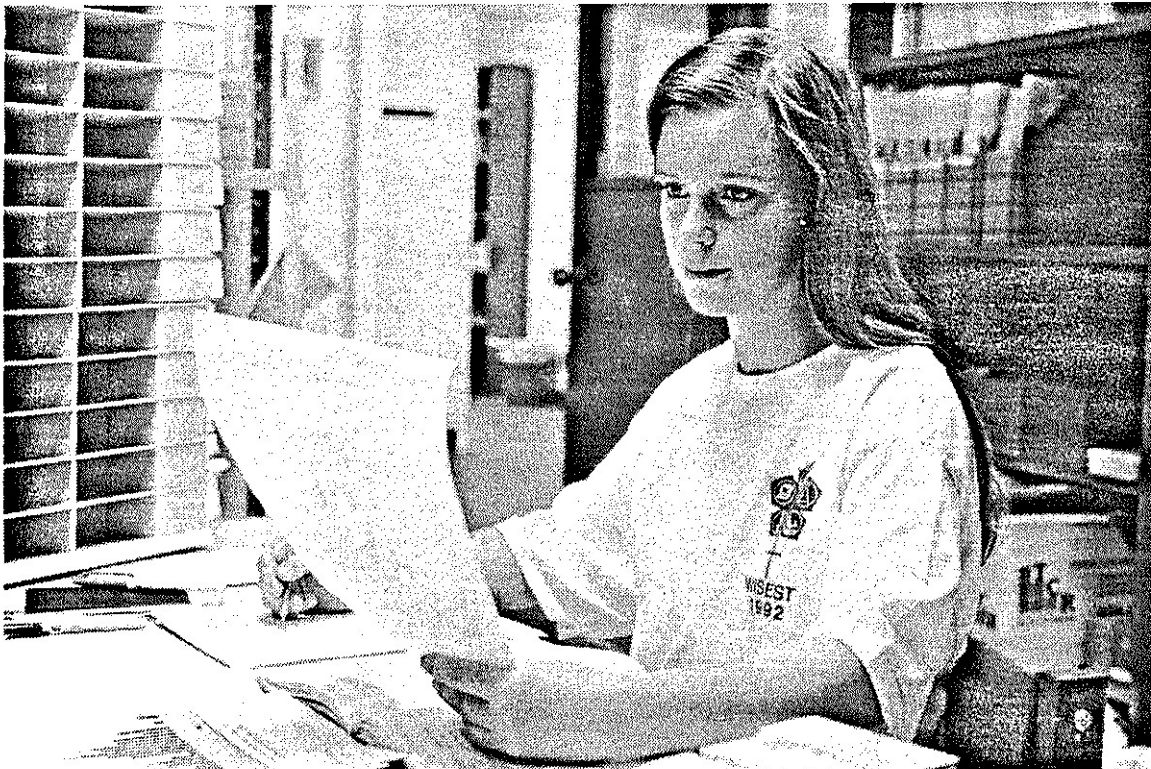
The first graph dealt with the quantity of values of the maximum rate of change of the magnetic field within nT/s ranges. Most values lay between 0.0 and 1.0nT/s. The next graph illustrated when the maximum rate of change of the magnetic

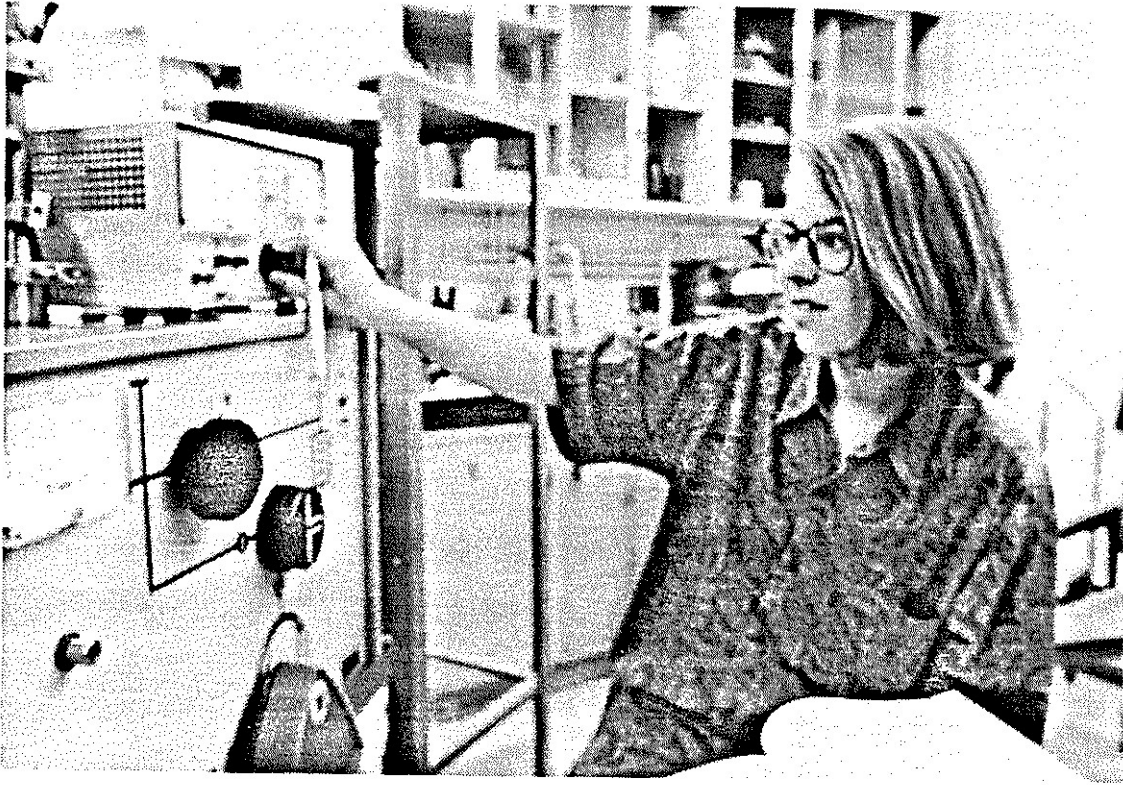
field occurred. It slightly varied from station to station. I also made a similar graph for the Bmax. Each of the stations had two peaks, one around midnight and one around dawn. I also made a graph comparing the daily average disturbance reported by EMR with Bmax. The slope, on average was .32x. That means that on average the maximum magnetic field disturbance is typically three times as large as the daily average disturbance.

For Bmax I had only used positive disturbances for most of the study. Using the station Churchill, I looked at the five months of data using either positive or negative Bmax. I made the same graphs as before and compared them to the ones where I used positive Bmax only. There was more activity detected in the evening hours than before and the slope of the daily average disturbance reported by EMR vs Bmax was 17% smaller.

After I found all this information I started to put it together into a report. A report certainly makes your findings seem so much more important.

I enjoyed my time in the space lab and I am glad that the environment that I was working in was comfortable and inviting. I know this experience has made a big impact on my life.





Kyla Koehn

WISEST Report

With my bus pass clutched firmly in hand I, Kyla Koehn, entered a room in the Biological Sciences Building to find before me a sea of unfamiliar faces. But . . . I made it, I had finally made it to university . . . for the summer at least!

From my initial meeting, I joined Dr. Beamish, my supervisor, Eric, a graduate student, and Donna, a former WISEST student in the area of Low Temperature Physics. Low Temperature Physics is just that, physics studied in extremely low temperatures. A version of a refrigerator, nothing like what one would find in a home, is used to collect data from samples about their properties as they are frozen as low as 0.10° Kelvin and then how their properties change as they are warmed up again. The material I made for my project is one of the materials that will be studied in this manner. During the first four weeks on the job, while waiting for some chemicals needed for my project, I had the opportunity to learn the fine arts of soldering pipes, leak checking equipment, drilling, hacksawing, and fire-polishing. With these skills I put together a panel on which I mounted the valves and gauges needed to make areogel - my project. Once the chemicals came, Donna and I set to work mixing the chemicals and completing a long, somewhat tedious, drying process involving high temperatures and high pressure to get our final product. Our project's purpose was simply to see if making quality areogel here at the U of A was possible, as it has not been previously attempted here. Areogel, being glass made up of approximately 5% solid and 95% microscopic holes, has got a lot of potential as its many uses are only beginning to be realized.

My experience in the WISEST program has proved not only educational but also enjoyable. I've had the opportunity to familiarize myself with the campus, some of its buildings, and how university works in general. I have been able to better see the relevancy of what I am learning in high school in terms of science and I have also enjoyed meeting all the people! I had the chance to meet not only the people I worked with but also other WISEST students. The people I worked with also went farther than just Dr. Beamish, Eric, and Donna, I also met Don, the lab technician, and Loran, a student just getting ready to defend his thesis, and so many others. I also noticed, in the coffee room, more than anywhere else just how small the ratio of women to men really is and more fully understood the importance of this program!

Department of Soil Science

Robyn Brown

This summer I worked in the Department of Soil Science Dr. Anne Naeth and numerous others. I learned a lot about team work and how important it is to successful projects. During my time with Dr. Naeth, I did not have my own project. Instead, I worked with the other summer students, doing whatever was required of me. The majority of my time was spent in the field at Wabumun, working on land reclamation of the coal mines out there. One of my jobs was reading ground moisture using a 501 radiation probe. It weighed about 30 pounds and was very awkward to carry. I have the bruises on my legs to prove it! While on the mine sites, safety required us to wear safety helmets, steel-toed boots, jeans or long pants, and long sleeved shirts. It got very hot sometimes!

The major project this summer was called the CO₂ project. As an ongoing project, I won't be able to see the final results of the project (which is too bad). The purpose is to see how much carbon is below and above the soil. First, we clipped 1/4 m² areas of vegetation on and off the mine sites. Then we gathered the "litter" (dead leaves, decaying material, etc.) in 1/10 m² areas. Next, we sorted the "standing litter" (litter left in live vegetation) out of the live vegetation. Then, we weighed and subsampled the vegetation, litter, and standing litter. Next came coarse grinding and fine grinding. After we

collected the vegetation, we took soil samples down to a metre deep. They will be tested for carbon as well. The part I won't get to see is the burning of the fine ground vegetation to determine the amount of carbon in the area. The results will be used to determine if trees, shrubs, grasses, or crops are the best use for the reclaimed land and which cycles the most carbon.

My experience in the WISEST program has been a fabulous one. Soil science was a field that I did not know much about and it turned out to be very interesting. This field does not seem to be very male dominated but it just may have been that I didn't see much of it with the people I worked with. My co-workers were very accepting and they made me feel right at home and at ease with them. I felt like I was one of them. I hope that more people discover what WISEST is all about and how it can benefit them like it benefited me.



THE AMISK LAKE PROJECT

This past summer I worked at Meanook Biological Research station which is located near Athabasca, approximately a one and one half hour drive from Edmonton. There are a number of projects currently operating at Meanook involving lake liming, birds and lake oxygenation. I was involved in the Amisk Lake project, which is supervised by Dr. Ellie Prepas.

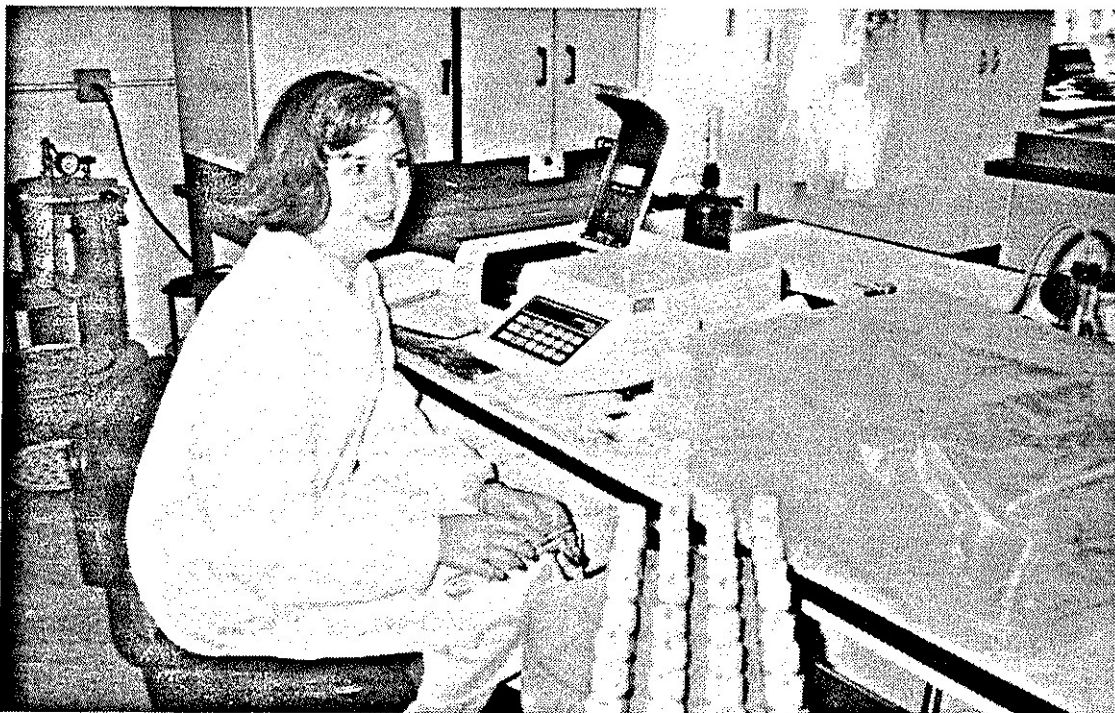
Amisk Lake is a deep water lake which consists of two basins and is prone to algal blooms. When the algae dies it sinks to the bottom where it is decomposed. This decomposition process requires oxygen and therefore leaves the water overlaying the sediments of the lake anoxic (without oxygen). This anoxic water allows phosphorus to be released from the sediments which rises to the surface and provides nutrients for the algae. The oxygen poor water at the bottom of the lake decreases the habitat for fish and certain bottom dwellers. In addition the algae at the surface prevents light from passing into the deeper waters and thereby decreases productivity in the lower depths of the lake.

In an attempt to improve water quality oxygen is being injected into the north basin of Amisk Lake. The process involves an on shore oxygen tank from which the oxygen is carried under water by a hose to diffusers located on the lake bottom. This is intended to increase dissolved oxygen in the lake which will improve water quality as well as reduce phosphorus release from the sediments which should help prevent algal blooms.

Research is currently being done on the effect of oxygenation on the various organisms. As well the chemistry of the lake

is being studied. This portion of the project, in which I participated, involves the weekly sampling of water at different depths and locations in addition to taking temperature and light readings taken every meter at each of the same locations. These samples were then treated for various specific analysis and were then analyzed for dissolved oxygen, phosphorus, silica, Ph, alkalinity and chlorophyll. Afterwards the data was inputted into a computer for calculations. I found the project extremely interesting and I enjoyed being at Meanook. The people there were all very helpful and I thank them for a great summer.

HEATHER GUNTER



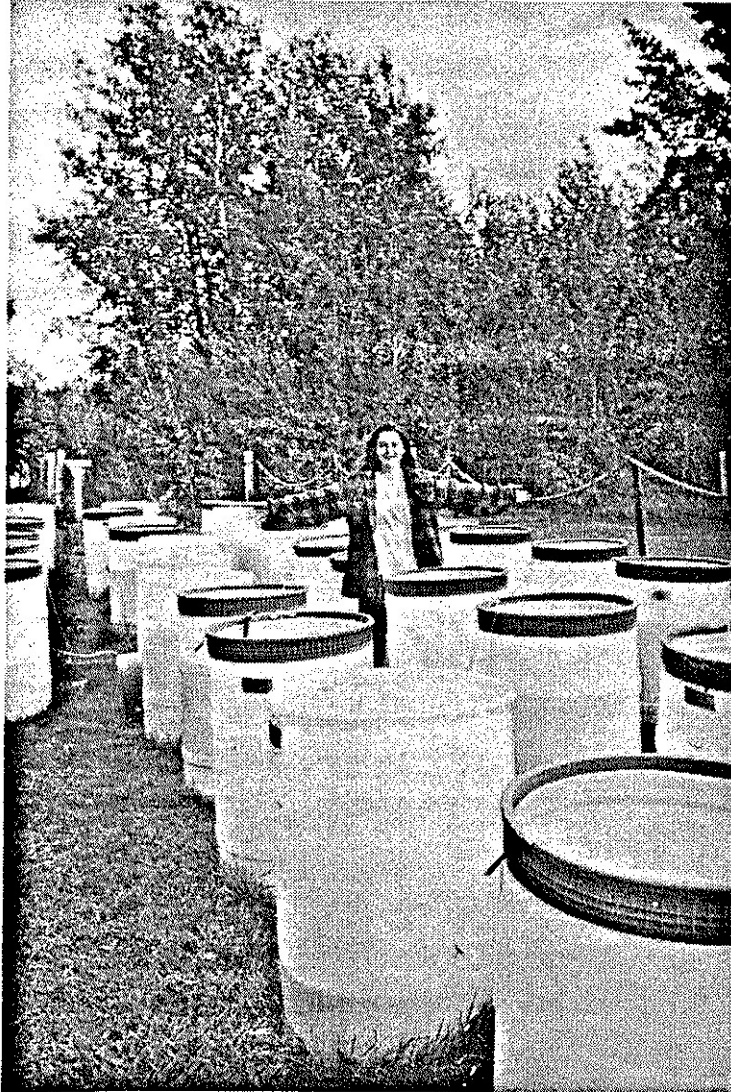
This summer thanks to the WISEST program I was able to work at the Meanook Biological Research Station located just outside the town of Athabasca, at the very center of Alberta. I got to stay right at the station since it's out of town.

I assisted Christine Scaber who was researching the effects of lime on macrophytes. This experiment involved 45 barrels filled with water, plants and sediment from nearby lakes which were then dosed gradually with lime. I arrived after it had all been set up so I was only involved in the treatment process.

My actual job consisted of doing many different tasks such as monitoring the pH levels of the barrels, measuring and weighing plants and working in the lab. It was a nice combination of outdoor and lab work.

I was very fortunate to be able to help with other research projects as well. I helped set up nest boxes in the woods with the 'bird people'. I also assisted in sampling benthos for both the lake liming and the lake oxygenation projects. Both of these projects are attempts at reclaiming naturally eutrophic lakes.

I really enjoyed having a job at the station because it allowed me to experience working in the field. (and a opportunity to get away from my parents for the entire summer) Not only did I learn about science but how to live with the people with whom you are working. This summer at MBRS has definately been a positive experience and I'm even applying to come back next year!



Keri Zwicker

FINAL REPORT

My name is Rebecca Phan and my project involves Genetics although I am in the department of Zoology. I am working with Dr. Warren Gallin who is my supervisor. The goal of my project is to find the promoter for the L-Cam gene. L-Cam is a protein that holds cells together in chicken. My supervisor has isolated a region which he thinks contain the promoter for the L-Cam gene.

To test this hypothesis, we take the region which we think controls the expression of the L-Cam gene and attach it to a gene, B-galactosidase (Bgal). The region and the Bgal gene are then inserted into cells that make L-Cam. The cells that have been transfected with the promoter-Bgal DNA are allowed to grow. When they have been grown a dye is added to them. If the cells turn blue, then the Bgal gene has been expressed. Therefore the gene has been turned, so we will know that the region is a promoter.

I have isolated the potential promoter DNA and have tried to attach it to the Bgal gene. Unfortunately, the chemical used during the insertion has been defective in some way. Therefore, that chemical must be remade and the experiment must be repeated.

I have thoroughly enjoyed my six weeks in WISEST, once I got used to work in the lab. During my first week at WISEST I followed Anita, a second year university student who is working on her own project, and watched what she does so that I will be able to do it by myself later on. My first and second week were frustrating because I was not fully familiar with where things are and I made many mistakes. But, after my second week I begin to like what I do and I looked forward to it everyday. I learned what certain equipments do and how to work them, the sterile methods of doing things, many new vocabulary, how to grow bacteria, and countless other things.

This experience has greatly helped to define my interests and given me the opportunity to find out what research is all about. I have found out that I like working independently, and the flexible work hours of a career in research. I now have an idea what researchers mean when they say what a great feeling they have when they have discovered something no one has ever known before. When I went through a long procedure to make this solution by myself for the first time I felt what the researchers must have

felt, although my achievement was small compared to theirs. My only regret is that there wasn't enough time for me to complete my project and find out if it was successful.

I would like to take this opportunity to thank all the people where I work who has made me feel so welcome for my six weeks in WISEST like Anita and Tim. But particularly, my supervisor, Dr. Warren Gallin, for greatly helping me on my report, and for his time and patience.

I feel very fortunate that I have the opportunity to be in WISEST and I have enjoyed my experience.



Rebecca Phan

We have spent the past six weeks in the department of Zoology, specifically in the area of Limnology, working on a lake restoration project. There are several different projects currently underway in this lab but we were primarily involved in the liming of lakes. Lime is added to lakes in order to decrease the algae. The lime reacts with the phosphorous, one of the nutrients algae need to survive, and as the lime sinks to the bottom so does the phosphorous. As a result, the algae population, which grows primarily near the surface of the lake where the sun's rays penetrate, decreases. In order to assess the effect the lime has on the lake, samples are collected from the various lakes and then analyzed. The analyses in which we were involved were the analysis for pH, alkalinity, chlorophyll, color, turbidity, conductance, silica, and phosphorous. These same tests are also conducted on samples from lakes and dugouts that have not been limed in order to determine their water quality.

Acid bath is the initiation process into the Limnology Lab. Hundreds of beakers and bottles have to be placed in the acid bath overnight in order to clean them. They then have to be rinsed seven times with distilled and deionized water. They are placed in the oven overnight to dry. We spent our first day in the lab doing acid bath while imagining another six weeks of doing this. Luckily, like everyone else in the lab, we only had to take our turn at acid bath for the remainder of the six weeks.

Tests for pH and alkalinity are done on the water sample, a job that takes patience and perseverance. The pH of a sample is a measure of its hydrogen ion activity. Alkalinity is the measure of

the amount of negative ions (bicarbonate, carbonates, and hydroxides). These components shift the pH to the alkaline side of neutrality.

The chlorophyll test calculates the amount of phytoplankton biomass in the water. The chlorophyll testing is done in a separate lab for lighting reasons and it is a process that usually takes about two days - a day to prepare the samples and a day to read them on the Spectrophotometer(Spec).

Color is a visual test done after the samples are centrifuged by comparing the color to the appropriate standardized color disc. Color can also be tested by absorption on the Spec for samples that are very light in color.

Turbidity is a measure of the amount of light passing through a substance. It is dependent on the amount of particulate matter suspended in the water. Conductivity is a measure of the water's capacity to conduct an electric current.

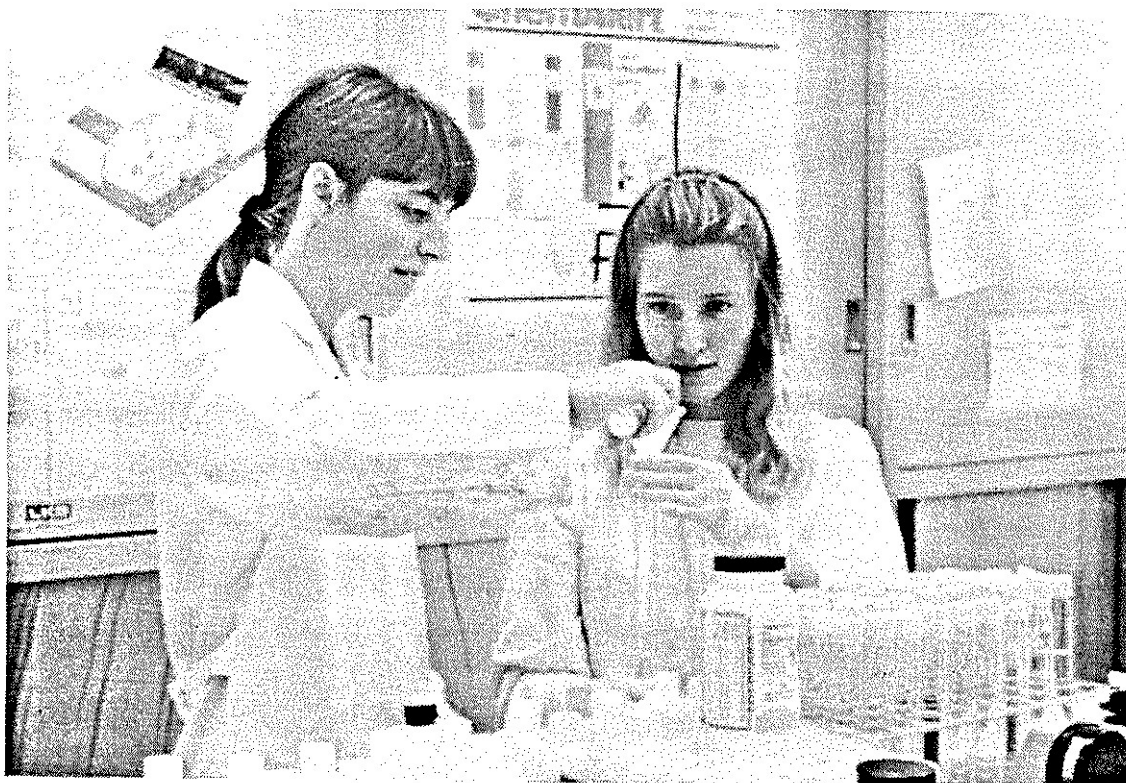
The silica level of each water sample is measured because the diatoms in the water are made of silica. The diatoms are an important nutrient for the phytoplankton and the fish in the water.

Phosphorous levels are measured because it is very important for algal growth and it is through liming that phosphorous levels are altered. Samples are prepared for both Total Phosphorous(TP) and Total Dissolved Phosphorous(TDP). The samples undergo a color reaction and then are read on the Spec.

The collecting of the water samples and the analysis of the samples in the lab is a lengthy process. The data is finally entered on the computer and graphed to demonstrate the changes

taking place in the lake or dugout.

Our work seemed repetitious but everything we did was routine, essential lab work, similar to everyone working in the lab. We enjoyed working in this lab for the summer and look forward to future careers in science.



Elizabeth Allegretto and Jennifer Makowsky



Katerina Carastathis, 1992 summer student
Olivia Tsai, 1991 summer student
Dr. Dennis Tanner, 1991 & 1992 supervisor