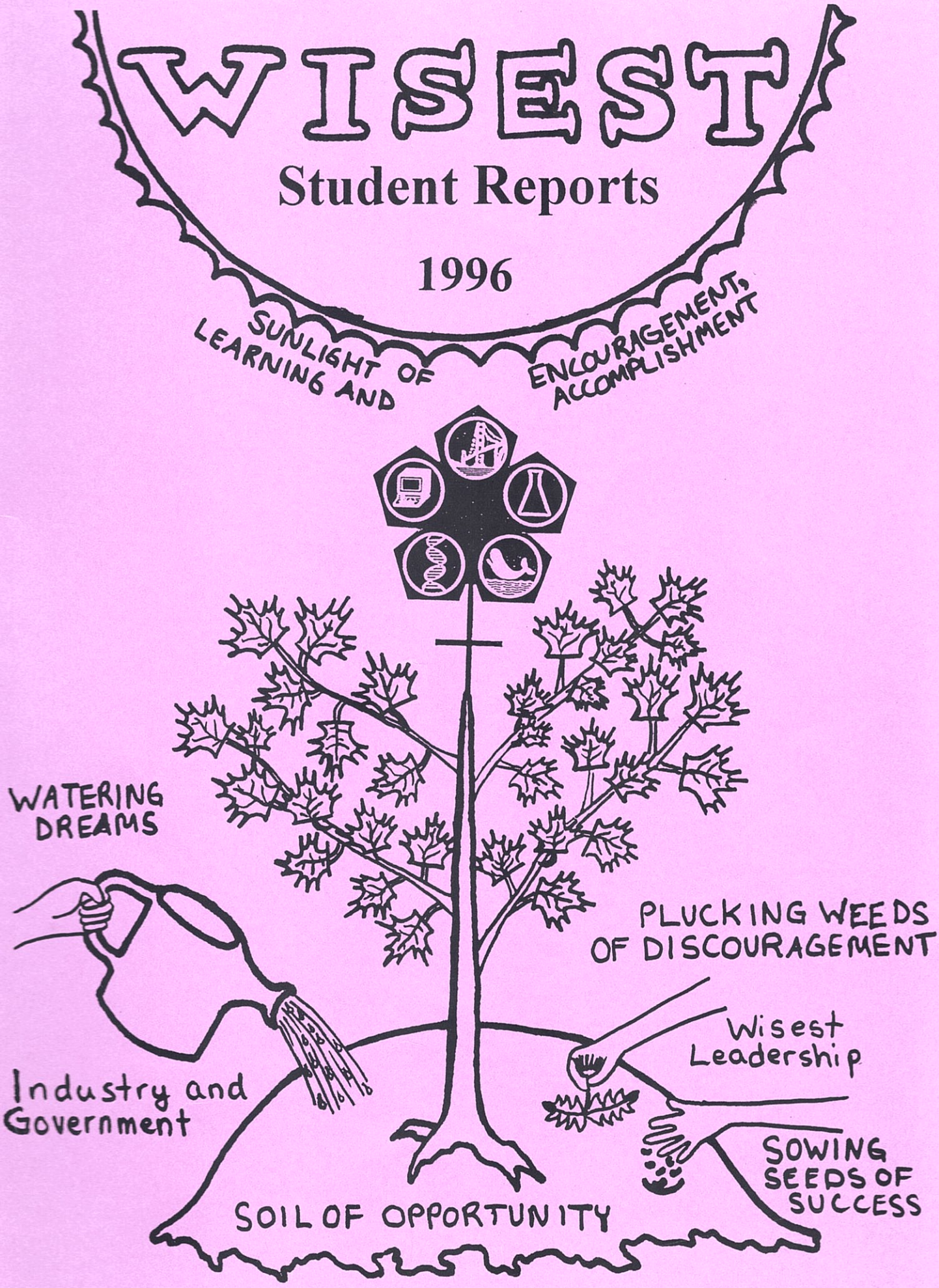
WISEST

Student Reports

1996



WISEST, Women in Scholarship, Engineering, Science and Technology.

Many thanks

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WISEST

Summer Research Program
1996
Student Reports

"It was a great program which will help me in the future. I've learned lots, have a better idea of what research and science are about and what is in my future."

"Upon entering the program, I was indecisive in my career choice for my future. Now I have a good idea what I want to be...WISEST is truly an inspiring and innovative program."

Dr. Margaret-Ann Armour, Dr. Dorothy Tovell, Renate Pfeifer, Grace Ennis

The Summer Research Program is one of the initiatives of WISEST: Women in Scholarship, Engineering, Science and Technology. WISEST was the brain child of the late J. Gordin Kaplan, the first Vice-President (Research) at the University of Alberta. The group was formed as a Task Force in 1982 and is now a standing committee of the Vice-President (Research).

It has a mandate 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. The current membership is thirty scientists, engineers, scholars, educators and students from the University of Alberta, the Alberta Government, the school boards and the private sector.

In the summer program, which began in 1984, students from grade 11 spend six weeks during July and August working as members of research groups at the University of Alberta. The girls work in Science, Engineering, Agriculture, Forestry and Medicine with boys working in Human Ecology and Nursing. From their responses to questionnaires at the end of the program, we know that the young people who participate find the experience broadens their knowledge of fields of research about which they had little awareness. Thus, it influences the choice of courses which they will take at the university and of careers which they may pursue.

Teachers and school counsellors are very supportive of the WISEST Summer Research Program; in making information available to their students, encouraging them to apply for positions, and in completing many teacher reference forms. We at WISEST recognize that the success of the program is very much dependent on the teachers' help in publicizing the program. We encourage all teachers to share this booklet with grade 11 students in their schools to help ensure continued participation.

This program would not be possible without the supervisors and their technicians, undergraduates and graduate students, and research associates. Their commitment of time in training, supervising and encouraging the students is invaluable. We are very pleased to add our thanks to those expressed by the students in their reports.

The program would also not be possible without financial contributions of our many supporters. In 1996, funding was received from AGT, the Alberta Heritage Foundation for Medical Research, Chieftain, Dow Chemical, the Edmonton Glenora Rotary Club, the McNeil Medal Fund, the Margaret-Ann Armour Fund for Rural WISEST Students, the Summer Career Placements Program of Human Resources Development Canada, the STEP (Summer Temporary Employment Program) of Alberta Advanced Education and Career Development, Syncrude Canada (Edmonton Research Centre), the Vice-President of Research at the University of Alberta, and Weyerhaeuser Canada Ltd.

It was a busy six weeks for the students as they worked in their labs and took part in the Wednesday afternoon sessions and various optional social activities. This year's Wednesday afternoon sessions included a campus tour, an informal discussion with people who have chosen non-traditional careers, a tour of the Syncrude Canada, Edmonton Research Centre facilities, a visit to another lab at the University of Alberta, and presentations by the students of their work. For the final Wednesday afternoon session, the students attended a luncheon with their supervisors as a way of acknowledging their supervisors' time and efforts. We would like to thank the numerous people whose participation made these sessions such good opportunities for learning.

A special effort was made to include students from outside the city of Edmonton in the WISEST program. Not only did the students work at the university, but they also got to experience city life. The "Big Sister", Renate Pfeifer, was there to offer support, direction and even entertainment to the young women from out of town who were living on campus at Lister Hall.

In addition, several social events were planned to give the students an opportunity to get to know one another better. These included: dinner at "Earl's" before attending a Shakespearean play in the Hawrelak Park Amphitheater, an evening at the Edmonton Space Science Centre, an Open House old-fashioned tea for parents, friends and corporate sponsors, and a picnic following the tour of Syncrude Canada, Edmonton Research Centre. Every Tuesday at noon, students were encouraged to bring their bag lunches for an informal gathering at the Students' Union Building.

As extra learning opportunities, sessions were given in "How to present a scientific report" and a tour of the SLOWPOKE Nuclear Reactor was arranged for the students. The WISEST team for the 1996 program was composed of five members: Dr. Margaret-Ann Armour, Dr. Dorothy Tovell, Victoria Wishart, Grace Ennis and Renate Pfeifer. Margaret-Ann Armour (Vice-Chair WISEST) and Dorothy Tovell (WISEST Co-ordinator) were available to provide wisdom, insight and advice when needed to Victoria, Grace and Renate as they administered the program.

Each year a booklet, such as this, about the WISEST Summer Research Program is made available to students, teachers, supervisors, sponsors and other people who express and interest in learning about the Summer Research Program. To this booklet the students have contributed their final reports which describe their work in the research labs, pictures, and summaries of the various activities which were sponsored by WISEST during the program. These personal observations are the heart of the booklet as they illustrate the quality of the research and the variety of the projects that the students undertook. In response to the "Cover Design Contest", many creative entries were submitted and we are pleased to announce that Tarah Berger was the artist chosen to have her design on the front of the booklet for 1996.

We have very much enjoyed getting to know at least some of the young women who will be our future scientist and engineers and the young men who worked in the non-traditional fields of Nursing and Human Ecology. We were happy to have all of you in the program, and strongly encourage you to tell your friends and schoolmates all about your experiences. We wish you the very best as you pursue your education and work towards fulfilling careers.

Grace Ennis (Administrator)
Renate Pfeifer (Administrator and Big Sister)
Victoria Wishart (Administrator)

Gordin Kaplan - founder of the WISEST

Dr. Jacob Gordin Kaplan -- internationally known biochemist, lecturer and researcher in Canada, United States and Europe, the first Vice-President (Research) of the University of Alberta, the key organizer of the UNDO (University Nuclear Disarmament Organization) and the University Research Prizes, Chairman of Ottawa University's Department of Biology (1975 - 1985), Chairman of the Canadian Federation of Biological Societies (1975 - 76), President of the 11th International Congress of Biochemistry (Toronto, 1979), an organizer of the first science lobby to take place in the House of Commons (1976), the Chairman of the Ottawa Committee to End the War in Vietnam, the founder of WISEST (Women in Scholarship, Engineering, Science and Technology)...the list of his accomplishments seems endless.

Dr. Kaplan was born in New York city in 1922, received his B.A. degree from City College of NewYork (1943) and his MA and PhD degrees from Columbia University (1948 and 1950). In 1955 Dr. Kaplan moved to Halifax, Nova Scotia and later, in 1981, he came to work at the University of Alberta. His main role here was as a missionary for research at the university and in Alberta -- to create in this province, a climate of intense intellectual, scientific and artistic activity. (1) His strong belief in the need of research and its application brought him recognition as a spokesman on science policy and research funding: "Canada's survival as an industrial nation depends on having world-class university research and transferring results to the private sector". (2) Dr. Kaplan conducted a lobbying campaign for the research funding: "Since it is a long-term investment in the future of our country". (3) As a result of his lobbying federal government increased its spending on research funding. "Having a big mouth did it -- I don't like keeping my opinions to myself." (4) Dr. Kaplan's perseverance is best illustrated with an example from his private life. While living in Halifax he was struck with polio -- his right hand never fully recovered. Still, Dr. Kaplan continued to play violin with the bowing technique he developed to overcome the obstacle. Dr. Kaplan's own contributions in Biochemical research are the studies of certain enzymes in yeast and of the lymphocyte activation.

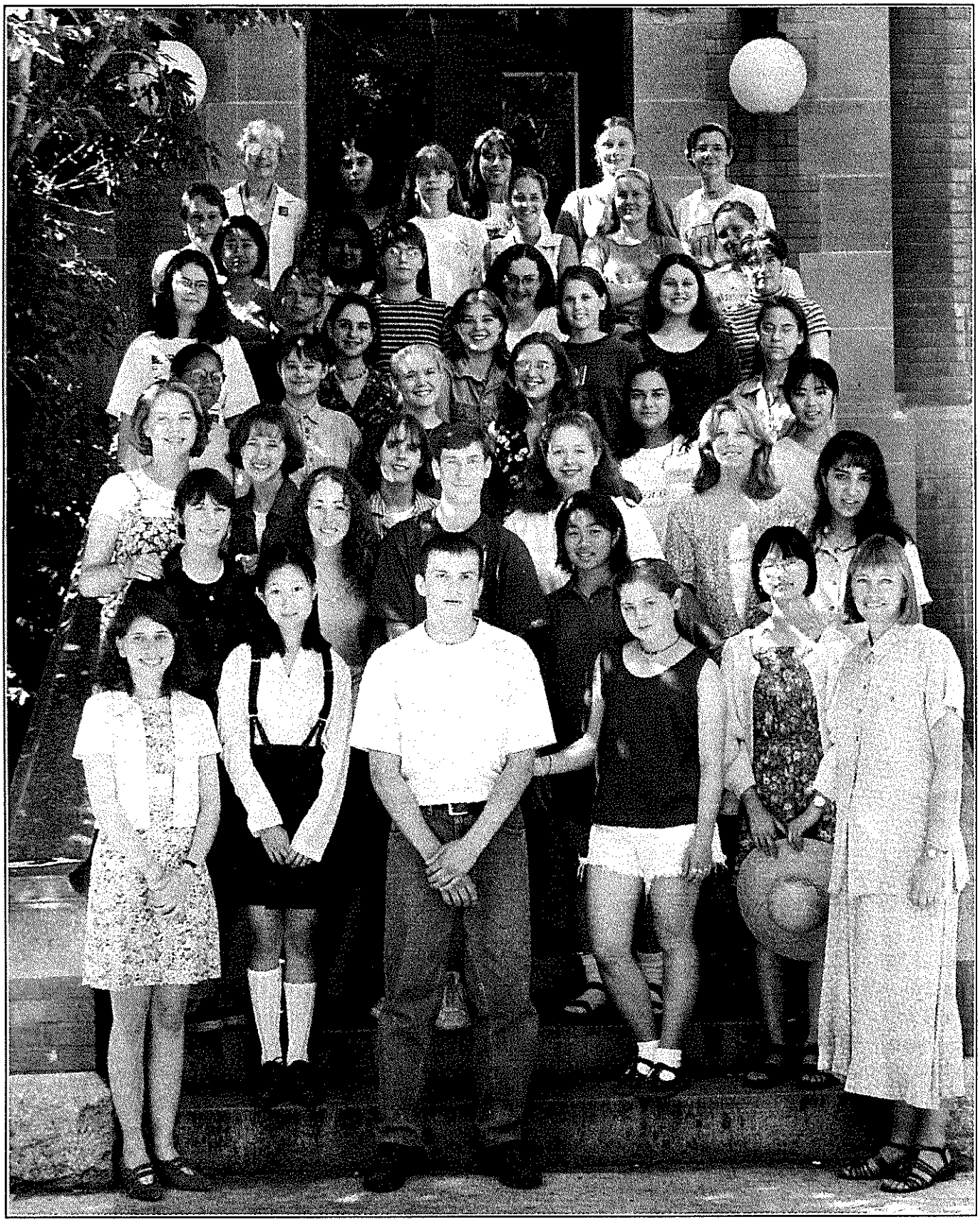
In early 1982, while attending the seminar on microprocessors, Dr Kaplan noted there was only one woman among the 150 people present. This triggered the creation of the new group to promote participation of women in the non-traditional careers -- Women in Scholarship, Engineering, Science and Technology (WISEST). The primary job of this group, said Dr. Kaplan, is to try to understand why women are under-represented in the hard sciences and engineering, and then do something about it. The group found that at the University of Alberta only 5.1 percent of full-time employees in science and 1.9 percent in engineering, are women.

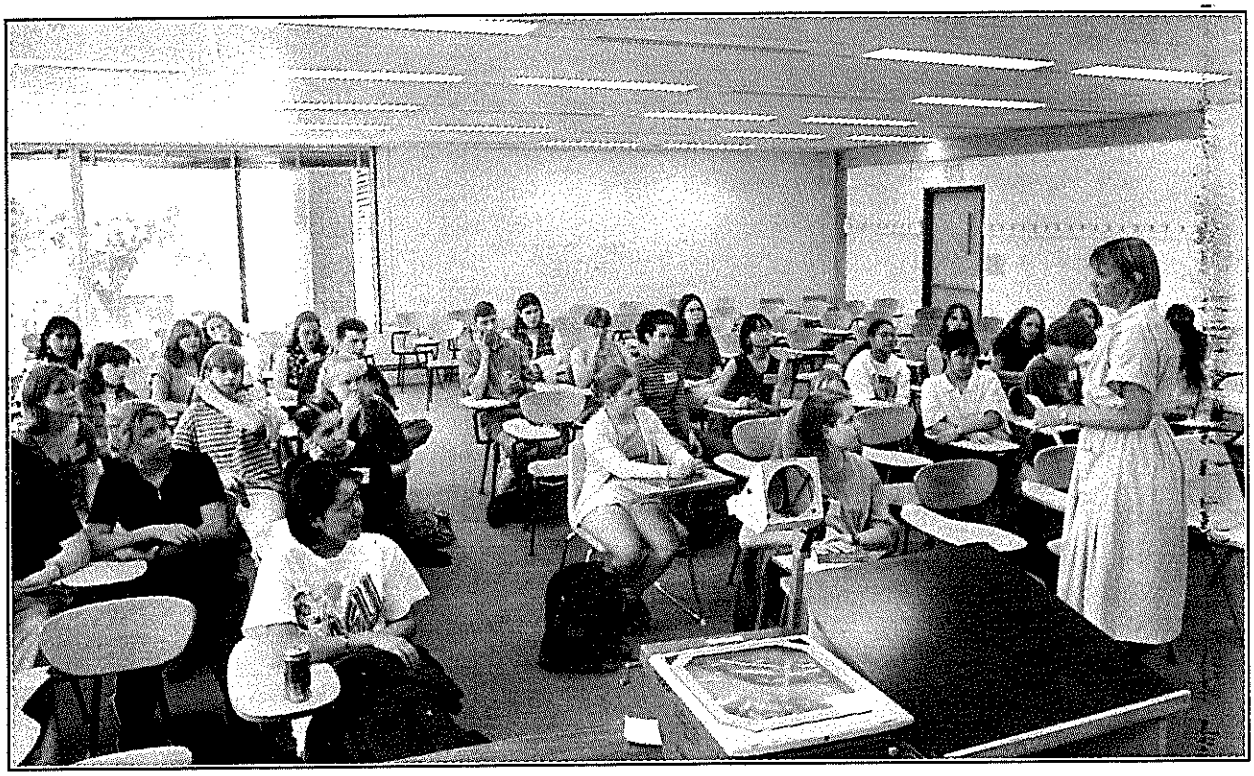
On July 6, 1988, Dr. Kaplan died due to stomach cancer. With his death the world lost not only the outstanding scientist, activist and leader but also a man with thoughts and ideas that were ahead of his time. His dreams, though, continue to live on. One of them, WISEST Summer Research Program, expanded from 10 students in 1983, at the time of its creation, to 40 students in 1996. WISEST continues to encourage promotion of scientific education of women and holds conferences that give junior and high school students opportunity to meet women in non-traditional careers. As a result, more women are choosing science or engineering as a career.

(1) Dr. Kaplan quoted in Edmonton Journal, July 7, 1988
(2) Dr. Kaplan quoted in Faculty of Medicine Bulletin (U of A), spring 1987
(3) Quote from Dr. Kaplan's letter to B Mulroney; Edmonton Journal, November 6, 1985
(4) Quote from Faculty of Medicine Bulletin (U of A), spring, 1987

Tatiana Soviak

The WISEST Class of 1996





The Terror of the Opening Session

Nervous, anxious, excited. These are just a few words to describe our July 3rd opening session. Walking in to a room filled with forty people you do not know and trying to find a place to sit is a very stressful thing. But we all pulled through and I do not think anyone fainted. Grace, Renate, Margaret-Ann and Dorothy loosened us up a little by telling us about how WISEST started, how we were picked and what the agenda was for the rest of the summer. By this time everyone had already exchanged a few words with the persons next to him or her and jaws were beginning to become unclenched (just kidding!). Actually, it wasn't that bad at all and by lunch we were already making friends.

In the afternoon we had a safety seminar given by Margaret-Ann and Dorothy. We were all kind of feeling tired after lunch and the morning's activities when all of a sudden the fire alarm went off. I know that my adrenaline was pumping like crazy, but it woke us up and we all started to pay more attention to the seminar.

By the time the safety talk ended, many of the supervisors were already on their way to the building. This part was exciting, yet awful, because you had to wait -- and what if your supervisor did not show up? I think everyone met with their supervisor and then we were off to see our workplace and find out what we were really doing. I was nervous now, but it was over so fast that I hardly had time to digest it all. The day was a great start to an even better summer.

Jennifer Anderson

The Wonderful Campus Tour

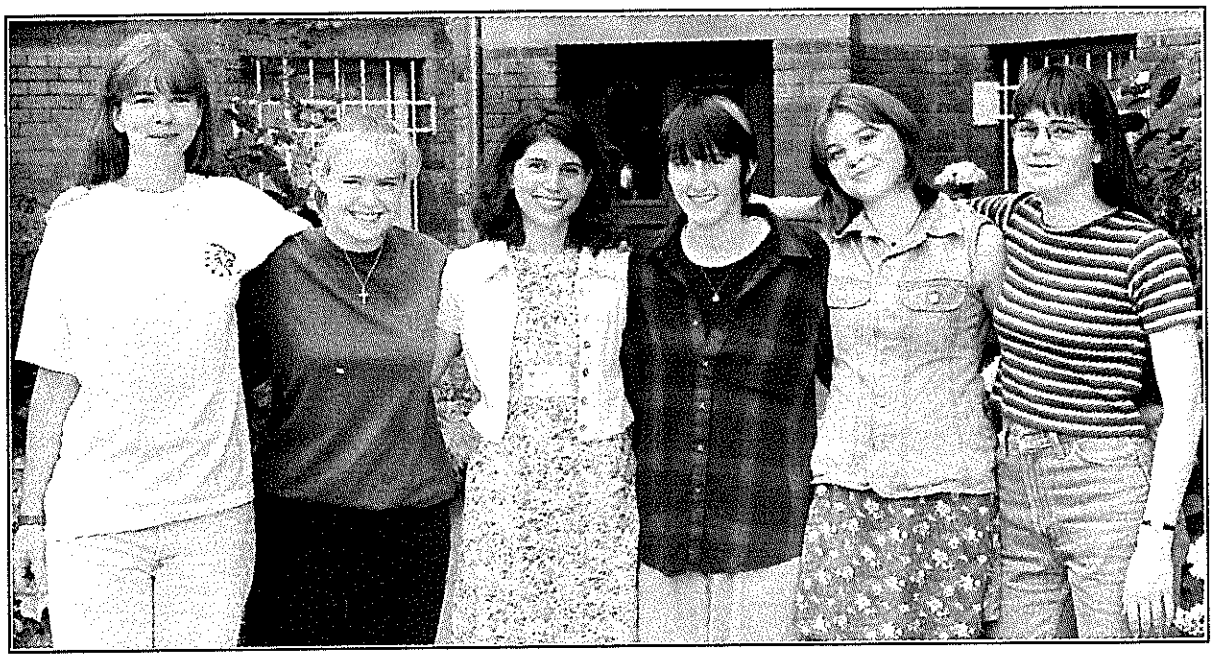
3:00 pm, Wednesday, July 10, 1996

After working for 3/4 of the day, you wouldn't think walking on the huge university campus is a wise thing to do, would you?

However, every one of us did enjoy the campus tour! Although we were so tired, our desire to explore the university had erased all the complaints. Starting at the Peace Dove beside the SUB, we walked to the Heritage Medical Research Centre, the Dentistry and Pharmacy Building, the CAB, the Chemistry Building...etc. Some of us were surprised to find out that a few of the classrooms can contain as many as 300 students.

I'm glad that it was a pretty nice day. And we had several experienced university ambassadors who answered every question with patience. Even if we didn't ask, they would tell us stuff that we might need to know for this six weeks. For example, how to use the library photocopy card and the walk-me telephone service. Thanks to WISEST for organizing this wonderful tour. We were proud that we knew the campus better than our friends at school. I think it's actually the wisest thing to come to the WISEST campus tour!

Isabella Lau

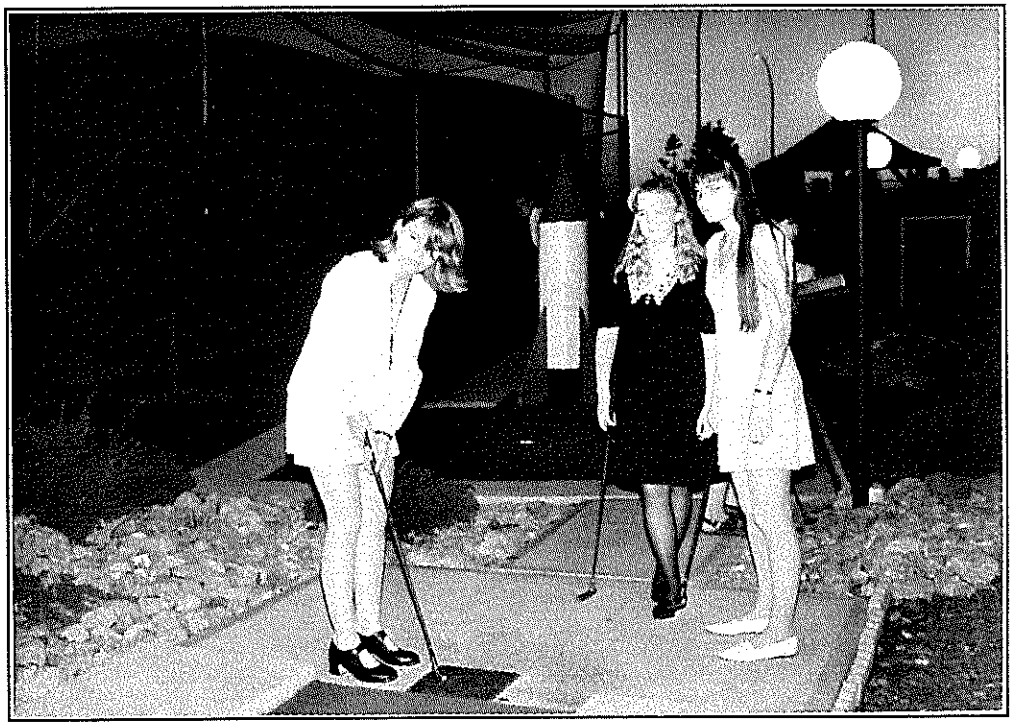


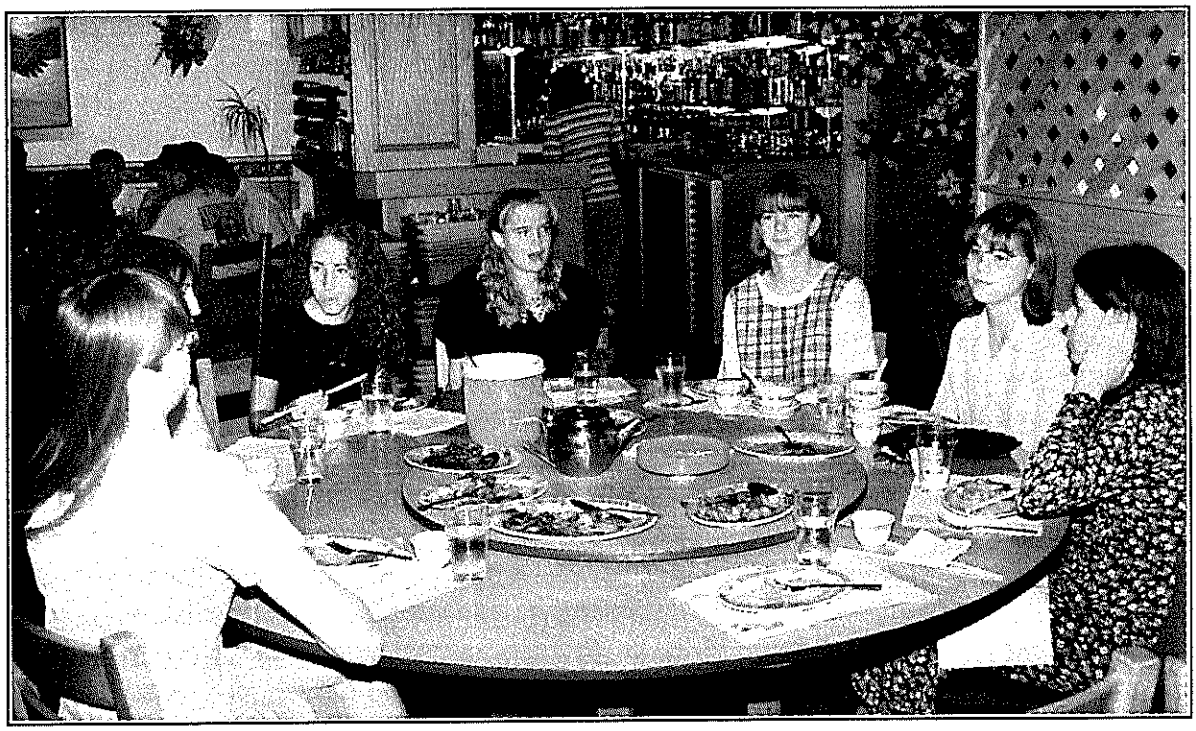
Life in Lister

For six weeks of the WISEST program, four other girls and I have stayed at the prestigious Lister Hall. Under the ever watchful eye of Renate, who serves the double role of big sister and administrator, we have all managed to have fun. Having a hallway mostly to ourselves and as it is now dubbed (to our flagrant dismay) the teen hall. I would have thought University students could be more creative, but hey it's summer. Between monopolizing the TV and being grossed out with, to our surprise, the best washroom in the building, we have had tons of activities. Movies, pizza night, Karen's birthday, world water park, taste of Edmonton in the rain. I could go on but there isn't much more. Most of us have had a fun time desecrating Mickey Mouse on the white boards, just for Melissa. Especially Melanie since she is the meanest person any of us have met. We all have one word to describe the food @$/%&*&%!!! and that's on a good day. Now I cannot write this article without mentioning our arch nemesis, loser royale, the smirking, annoying, jerk down the hall. Not one of us has passed a day without his foreboding stagnant presence. If none of you know who I mean, I know at least four other girls reading this article have an idea and a word or two for him. Not the entire six weeks was spent complaining because Renate was around to whine a little. Just joking. Renate actually brought a ray of golden sunshine into our lives every day by gracing us with the sanctity of her presence. Oh yeah and her boyfriend Chris who fixed our doors. It was more fun than you ll ever have at home with four other girls and one washroom!!!

We have all shared our projects with each other, telling about our ten hour days or our three hour days of filling pipette trays. Everyone has attained a fear for the thirty year-old elevators in the once-condemned Henday Hall. We've done a lot together (not that much) and have become friends. I know I had a great time and I hope everyone else did, too.

Tanya Foubert





My Summer Home

Staying at Meanook Biological Research Station is very different from working at the University and sleeping in your own bed every night. I spent so much time at Meanook that it was my second home. Each person at Meanook has his/her own room in nearby trailers. Everyone makes their own breakfast and lunch, while the cook makes supper. There is plenty of time for fun and games after the working day is done. A favourite pastime of Meanook residents is ultimate Frisbee.

Ultimate is a no-contact football-type game played with a Frisbee. For those who like to work out, the town of Athabasca offers a swimming pool, a free weight room and a system of nature trails is available at Athabasca University. For those who prefer to stay at home, a spirited board game is always a popular choice. Meanook was a great place to call home.

Kirsten vander Meer

Life at Meanook

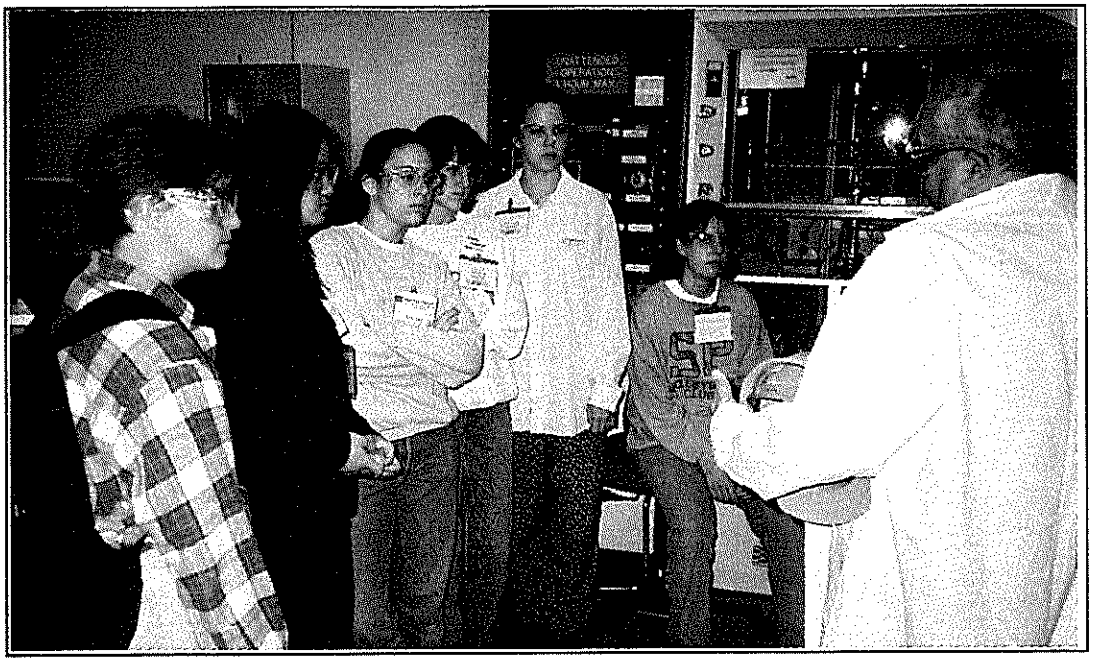
Working at the Meanook Biological Station is a lot like working in any other lab: you get up, work your hours and go home. The big difference is that home is a little room in a trailer at the other end of the compound about the size of two city blocks.

Obviously, there are a few disadvantages to this situation. For instance, there is very little point to calling in sick if you want a day off (to do so I would have to walk over to the lab where I work to use the phone). Then there is the fact that I spend five or ten days here at a time, which means I get very little time with my friends and family in the city.

But this is more than made up for by the people here. Being in such close quarters all the time means there is some lack of privacy (sound travels very well through the trailer walls). But to avoid problems everyone makes a great effort to get along. There are only two rules to live by: respect other people's space and don't plug up the toilets (for under-age residents like myself, there is one more: don't raid the beer fridge). They are pretty simple rules and that is why everyone follows them.

All in all, living at Meanook has been a really great experience. It even has a bonus over other labs: the food. What other lab will cook gourmet dinners every night? All I can say to the people here is thanks for a great time.

Heather Smith



On Syncrude

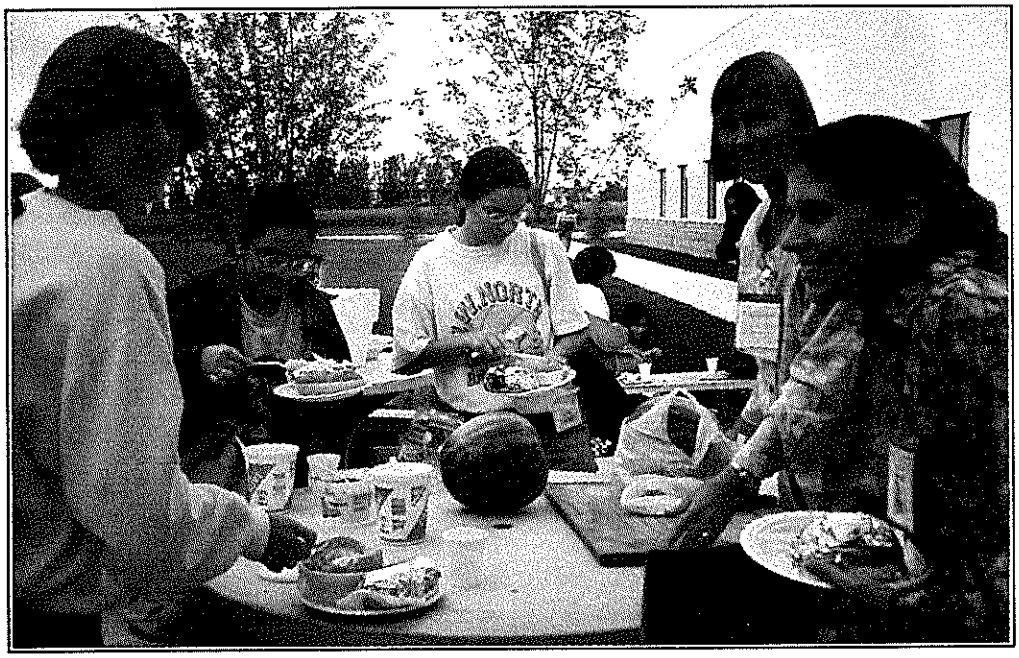
About sixty years from now, those of us who worked in WISEST 1996 will be nostalgic and probably toothless, and we'll realize, upon trying to tell our grandchildren about one of the largest oil refineries in Canada, that we'll remember only one thing about the company: M & M's. In actual fact, Syncrude was more than just a symbol of colorfully coated chocolate candy. Heck, our visit lasted in excess of five hours. Well, everyone went, so I'm not sure exactly what I could say about our visit but in case chronic memory loss has already set in, I'll try my best to outline Syncrude as I saw it:

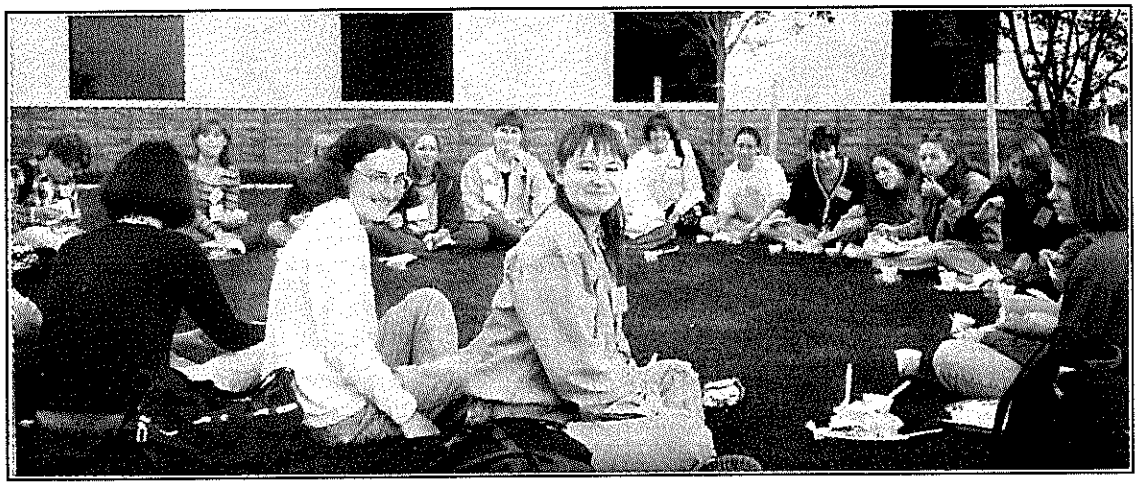
a) Bus trip. As I watched the name tag box make its way from one end of the bus to another, I honestly though we'd break into song. You know, the traditional bus tunes such as *"The Wheels on the Bus"*, or *"Yellow Submarine"*, or *"Baby Elephant Walk"*. Unfortunately/fortunately (I'm not sure which), we didn't. I guess we were all too hungry or something. Easily solved.

b) Lunch. The food was quite good (especially the desserts) and there was a LOT of it. Sandwiches to fit every diet; white bread, brown bread, vegetarian, roast beef, ham etc. But I guess that's not really the important part of our tour...(some would differ).

c) Tour. The group of which I was part followed Mr. Bob Hall around the Syncrude facilities. Their labs actually have equipment! And the labs are SO clean! I don't suppose Syncrude was hit too hard by Ralph Klein's cuts. I'm pretty much convinced that they gave everybody at the labs the day off, too. There weren't very many people there at all, at least not as many as I was expecting. We visited everything from the chemical analysis laboratories to the scanning electron microscope and to a very loud hard hat area where I couldn't hear very much of what Mr. Hall was telling us. Along the way, we met a couple of friendly people who explained the projects on which they were working. Syncrude's research not only involves improving the refining process to obtain optimum quantity and quality of oil from their sources but also concentrates, to my surprise (I thought they paid smaller research facilities to do this for them) on improving the quality and durability of their equipment, which involves much more than simply making the equipment as hard as possible.

d) Hands on ... I will forever be wondering what percentage of Alberta oil sands are made of





M & M's. Besides sorting candy, though, we also tested cold and hot water methods of oil extraction. The session that I found most valuable, however, was the chemical analysis of coffee, walnuts and oil sands using only a light source and a computer. By measuring how much light is reflected, the computer can identify the sample's elemental composition. This, of course, is used to find the chemical composition of tar sands without interrupting processing. Very sharp technology they've got here...

e) Oh right, the film. I left this as the last item for Grace to cut out if she found it inappropriate. But hey, I'm just being honest. Anyway, call me a cynic but I thought the movie that Syncrude showed us was the biggest piece of corporate propaganda that I've seen in a long time. They claim that they will leave the environment in better shape than it was when they began extraction. Did they consider the fact that they're FLUSHING CANADA WITH AIR POLLUTION AND ACID RAIN? That's somewhat analogous to a tobacco company claiming to fund cancer research. Well, what did we expect? I guess we owed them something after they fed us and gave us all sorts of groovy stationery. I, unfortunately, missed the picnic, so, of course, I can't leave any more fond memories of that particular day after five o clock.

Iva Cheung

Science at Syncrude

Alberta struck black gold in the 1800's. Already unique in climate and in geology, it was no surprise that, even in the case of oil, the province proved again to be atypical: non-conventional oil deposits in the form of tar and sands is a mixture of sand, clay, water and bitumen, a heavy oil with a high sulphur content. Due to the fact that the bitumen stubbornly surrounds each grain of sand, profitable extraction of this oil is very difficult and, until a few decades ago, remained next to impossible. It is here that the wonders of applied science can be seen.

So, how does one extract bitumen? Researchers discovered that between the bitumen and the arenaceous sand particle, there lies a thin film of water whose hydrogen bonds bind the oil to the sand. Hydrogen bonds are weak bonds, easily cleaved by mechanical and thermal energy. This property is dictated by the simplest laws of chemistry and physics and it is exactly a combination of these forms of energy that the sophisticated machinery in Fort McMurray use to extract bitumen. And what about maximizing extractions? Scientists today strive to improve yields and save Syncrude energy - the aim is to have the bitumen extracted at 20 instead of 70 degrees Celsius. Since every rock is different, every combination of bitumen and sand is different, so how does one know which technique of extraction will provide optimal yields? By literally shining a light on tar sands on a conveyor belt, one can measure the wavelength of the reflected rays and determine the percent composition of bitumen, sand, clay etc. of each sample in a matter of seconds. Experiments continue to better interpret the computer-generated plots of wavelength versus volume and henceforth aptly process the tar sands. Machinery introduces another obstacle. Which metals can best survive the harsh winters of northern Alberta? Which alloys erode most easily? By creating conditions similar to those at Mildred Lake in the laboratory and examining defective parts with electron microscopes, Syncrude's metallurgy laboratory works towards avoiding the technical errors of the past and developing new instrumentation for the future. Finally, the bitumen is sufficiently refined and a synthetic crude oil named "Syncrude Sweet Blend" is produced. For the scientists at Syncrude, the objective to lower operating costs is coupled with efforts to minimize environmental damage. This is a formidable goal and we students at WISEST trust that Syncrude will make every attempt to aid not only Alberta's economy but also her ecology.

Tina Dasgupta

Young Successful Independent Girls at Shakespeare in the Park

A small group of WISEST students braved the looming dark clouds to attend *The Taming of the Shrew*. Luckily they watched the play from a large tent at Hawrelak Park while shivering uncontrollably from the cold.

Hot chocolate and popcorn was served during a brief intermission between scenes of romance, swooning and screams that a banshee would shudder at. For those not familiar with taming a shrew, it is quite simple. First you must find a shrew, a woman who no man dares to approach in fear of her nails, wails and quick tongue. She will never marry because no man is brave enough therefore she shall spend the rest of her life without a purpose, alone and unwed. To tame this devil, spawn of Satan, one (being a man of course) must teach her how lucky she is to have a husband and that she owes her life and soul to him for taking her in, providing for her, feeding her and keeping a roof over her head. Shrews come with large dowries because their parents will pay anything to be rid of them.

The moral of the story, children, is to be grateful for any man willing to take in your large dowry and, if you're lucky, you. !@$#*&@$*%!!! I think not. We must consider the time in which the play was written and understand what customs were observed in Italy at that time. The one thing we must not do is accept the moral of the story for we all know where that can be shoved. Overall the play was superb, excellent, three thumbs up. The actors were impeccable in their portrayal of Shakespeare's characters but thou must listen carefully for the language is garbled at times. Tremendously funny, this modern day adaptation had motor bikes, cars and clowns. Everyone enjoyed the play thoroughly and I laughed so hard my sides hurt.

Tanya Foubert

Shakespeare in the Park

To go, or not to go? That was the question...

The evening of July 18 did not offer a promising start. Most of the WISEST students who were planning to attend Shakespeare in the Park met at Campus Earls ahead of time. As the rain poured down outside, we ate and visited together, debating the walk to Hawrelak Park.

Fortunately, the weather decided to cooperate with us and we agreed to make the trip. It was William Shakespeare's *The Taming of the Shrew*, as performed by the ever-fantastic Free Will Players. We watched and laughed as Petruchio (Julien Arnold) attempted to woo Kate (Elizabeth McLaughlin), the woman deemed too "shrewish" to ever be married, while several other suitors competed for the love of Kate's fair sister, Bianca (Rebecca Starr). The play was filled with entrances on motorbikes and wacky cars, plenty of humor and a whole lot of fun! And, of course we can't forget "Fabio," the accordion player!

The moral of the story - as the feisty "shrew" becomes a loyal and obedient wife - was not the WISEST of sorts but (regardless of that) it was great fun for all who attended.

Ebony Chapman

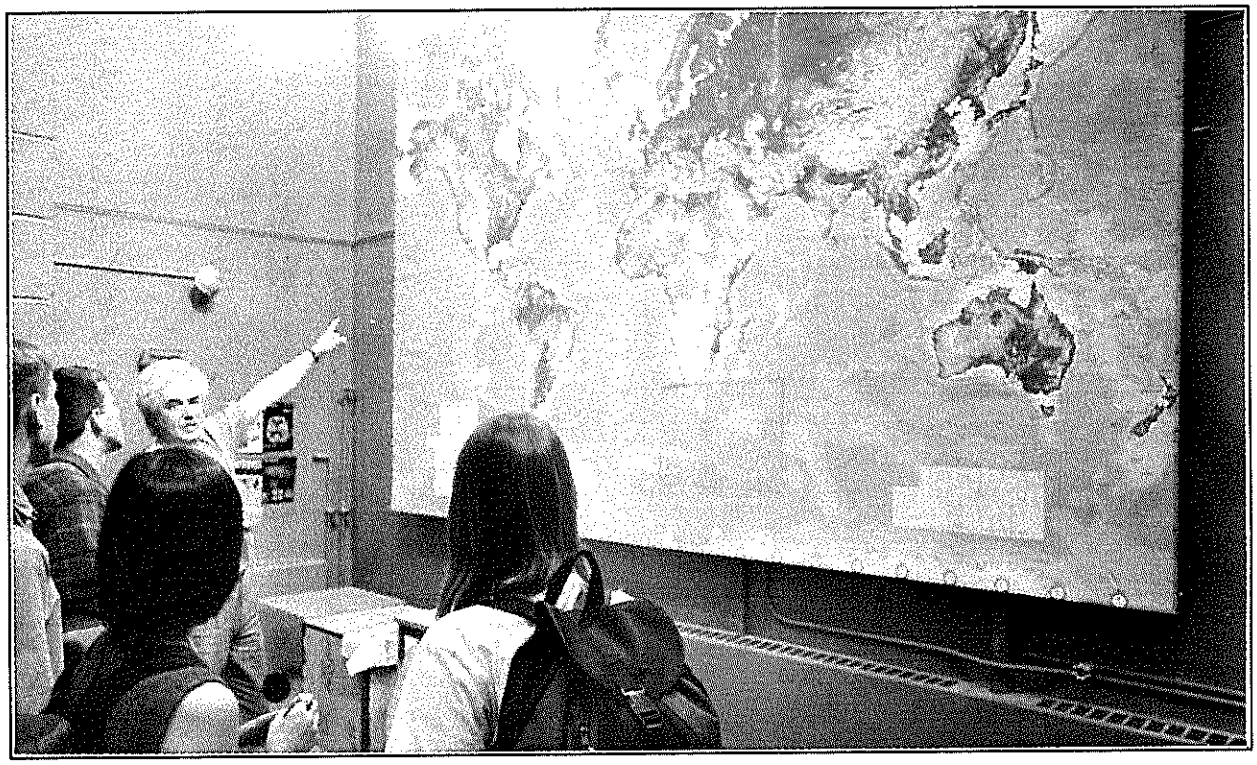
Small Group Discussions

"After I graduated from high school, I didn't know what I wanted to do. I've taken courses that I didn't like and I wasted all my scholarships since I failed it...", said a female guest speaker, who is also a mechanical engineer. Many students have role models. In fact, during the small group discussion, some of the advice or experience of the guest speakers was really beneficial for us - next year, we might need to face the same situation.

Our speakers were mainly female. They were people in non-traditional careers. They talked about how they got involved in their career and the obstacles that they had been through. It was like a sharing of experience. In my group, there was a speaker who told us that her boss would shake hands with everyone in the office except her, just because she was the only female there. Some other stories are really depressing, but I will always remember that one of the speakers said, "I am among all the educated people and if you let me down because I'm female and have chosen this career, I don't care. You are the immature one..."

The discussion finished at 4:30 p.m. and some of us stayed until 5:00 p.m. asking our guest speakers questions. They were very willing to answer us and gave us comments. It was a valuable Wednesday afternoon. And some of the speakers became my role models.

Isabella Lau



On the Centre for Subatomic Research

I have come to the conclusion that cool British accents are a necessity to every laboratory. At least one person in each lab must have a British accent. My supervisor, Dr. Gordon, SLOWPOKE's Dr. Duke and now, the Centre for Subatomic Research's Dr. Pinfold are evidence to support my theory. Subatomic physics have always been a passion of mine but this experience was novel, as I have never actually been in a subatomics lab.

I was surprised to find many mechanical and electronic parts of accelerators and detectors in the lab. At the U of A subatomic facility, I expected many more computers and/or theoretical physicists tapping their pencils in deep thought. I guess I didn't expect Edmonton, virtually unknown in the world of subatomic research, or so I had deduced from my reading, to be an active participant in the construction of actual detectors. It was really a pleasant surprise to find that the U of A is actually helping in the creation of a detector overseas. If I am not mistaken, the portion of the detector built in Edmonton is made entirely of copper. There was still a piece of it, I think, in a separate room but it was being painted and we couldn't see it. The most exciting part of the tour was going upstairs, where they keep portions of old accelerators and detectors. The building is actually much larger than it looks; it has several narrow passages leading to unknown places. The interesting thing about the Centre for Subatomic Research, however, is that those working there are planning to make it a museum, using the old detectors as displays. There were already a couple of displays set up during our visit, including a rather large map of the world with small color-coded lights indicating where, in different parts of the world, the major detectors and atom smashers are located.

It is perhaps a most fortunate thing that Europeans seem to prioritize subatomics, more so than do the (North) Americans. Case in point: the US government cancelled their multi-billion dollar superconducting supercollider project, whereas the Europeans are continuing with their plan to build a similar accelerator. Anyway, as I was saying, it is fortunate that very few (comparatively speaking) accelerators are located in North America. That means that the subatomic physicists get to travel! And, according to Dr. Pinfold, to very trendy places (such as Geneva), all expenses paid — or most, anyway. Hey, physics AND travel, all at no cost? Who would want anything more?

Well, the visit was certainly worthwhile, and if any of my other articles were printed, you will have discovered that I'm rather difficult to please. I thought Dr. Pinfold was very articulate and hospitality friendly. It was amazing to see how, as we examine smaller and smaller particles, down to quarks and leptons, we can discover more about the bigger entities of our theoretical understanding: the universe and beyond.

Iva Cheung

The Endless Facts at Meteorology

On Wednesday, July 31, the WISEST group split up for the afternoon to visit various labs of their choice. I had the opportunity to visit the university's meteorological research station. First, I was taken on to the roof of the Tory Building and was shown some of the instruments there, along with receiving a spectacular view of Edmonton. Back in the building, I was shown books containing weather records and maps of every day since 1899. These records are used by people researching everything from previous weather patterns to forest fires almost a century ago.
In my guide's office, I was shown a computer that could download the most current forecasts and radar maps from around the Edmonton area. With the touch of a few keys, I could find the latest conditions for any major site in North America. These conditions were displayed in a complicated code which, thankfully, my guide deciphered for me. This was especially interesting, as I had seen this code before but I had never known how to interpret it.

I was then shown a computer that could operate a database program which could display the weather conditions on any date in the past few decades. I investigated the weather on the day I was born and sought out a few other significant dates as well.

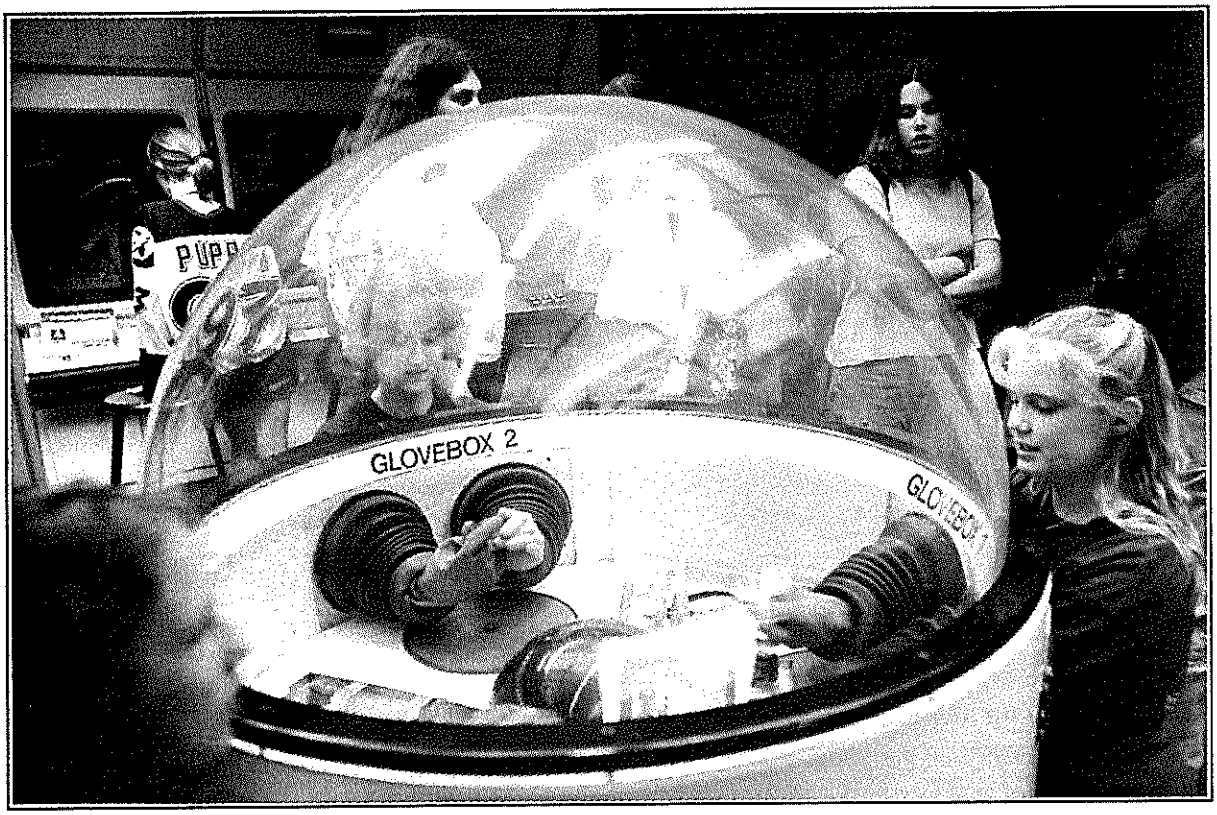
What overwhelmed me was the amount of information that was available in mere seconds. The section turned out to be much more oriented towards research rather than laboratory work. Altogether, I discovered the meteorological area to be a little-known treasure of endless information.

Christina Hansen

Visit to the Morgue

There were many visits to different labs for all WISEST girls but none more unmistakable than the visit to the Medical Examiner's Office. There was a brief unrealistic yet helpful movie at the very beginning of our tour. It explained the processes taken when there is an unexplained death. We learned that as well as people who die from an unexplained death, people who die ten days after hospitalization or surgery, accidental death (like car accidents) and crib death get an autopsy. There were many questions from the students and Renate, who took us to the building and back. It takes a lot of will power to be a forensic pathologist or a medical examiner. This is essential to walk out the front door and forget everything that happened during your work day because sometimes it gets nasty. There runs an efficient coordinated system inside the medical examiner's office and it's not just looking at dead people. There are many aspects of death that must be taken care of and this involves drivers, secretaries, specialists, lab technicians and the family. Interesting objects viewed were dead bodies, brain buckets, bugs from different stages of decomposition, the skull saw and a bladder stone the size of a baseball. No one passed out at the sight of blood or threw up, proving yet again the well known fact that girls are stronger than guys.

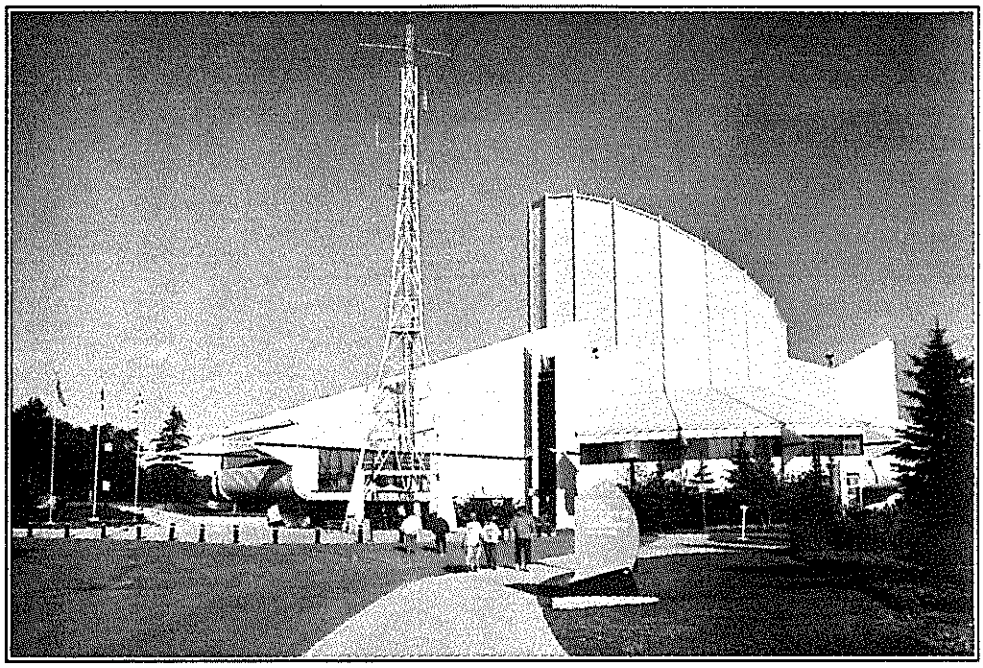
Tanya Foubert



Storms and Stars at the Space Science Centre

On Wednesday, August 7, the WISEST group had the opportunity to visit the Edmonton Space Science Centre. After being briefed in a conference room, a guide took us on a tour of the centre. Afterwards, we were treated to a showing of the Imax film *Stormchasers*. The film included dramatic footage of planes flying into hurricanes, the flooding and destruction caused by the high winds and waves, as well as shots of storm fronts and tornadoes. Various scientists were also shown and interviewed, such as the pilots and researchers that flew into the storms, forecasters at the National Hurricane Centre in Miami, Florida, and the stormchasers themselves. In addition to the footage, interesting facts were given about the development of the storms and their destructive capabilities. The audience was also given an idea of the uncertainty that can come with chasing and tracking storms due to a certain degree of unpredictability that is always present.
After the Imax presentation, some of the group went to view the exhibits of the centre. However, most of the group decided to take in the Laser Country Gold show. Country hits were accompanied by a myriad of laser-created images moving across the domed screen.
Most of the group left after the two shows (as work followed the next day) but a few stayed to take in more of the exhibits and get a chance to look at Jupiter in the Observatory. The exhibits, tour, great shows and friendly guide all contributed to a memorable experience for the WISEST group.

Christina Hansen




Navy
Data

Visit to the Slowpoke Nuclear Reactor

About fifteen of the WISEST members took the opportunity to go on a tour of the University of Alberta's nuclear reactor on July 19. First, we were shown how a computer records the levels of radioactivity from samples placed in front of a detector. Our guide demonstrated the machine's capabilities by placing different radioactive samples in front of the detector and showing us how to read the computer's display. He also explained to us how the Geiger counter worked and demonstrated its usefulness with various samples.

After being warned that seeing the reactor itself might be anticlimactic, we were taken downstairs. In front of a control panel was a large area of slabs of orange concrete. Our guide explained to us that the actual reactor, about the size of a garbage can, was located down below the concrete. He summarized for us how the reactor works and explained that it has sub-critical mass (in other words, another Chernobyl accident wouldn't occur at this reactor).

We were then taken downstairs, where he demonstrated the reactor's usefulness by putting a silver sample into a tube and shooting it into the reactor using air pressure. After one minute, it returned to the lab. He placed it in front of the detector and explained how the numbers that the computer displayed confirmed the contents of the sample.

The visit to the reactor was very interesting in that we learned some of the physics behind the work, as well as the practical uses of the reactor, such as identifying a myriad of samples. The tour was quite valuable in that it gave us a sense of what actually goes on inside a laboratory that deals with a nuclear reactor.

Christina Hansen

On SLOWPOKE

The first thing that came to mind when I went to see SLOWPOKE was. What the hell's a nuclear reactor doing in the Dentistry/Pharmacy building? Some theories that surfaced while we were all waiting for the tour included:

(1) The reactor was built during the war and was located in the Dentist/Pharmacy building as a strategic measure to prevent its discovery by the enemy.

(2) It made use of radioactive isotopes discarded by the pharmacy faculty after they used them in the manufacture of certain drugs.

(3) The nuclear physics department didn't have any room to build a nuclear reactor in their building.

(4) The radiation created mutants that the pharmacy faculty used for pharmaceutical testing.

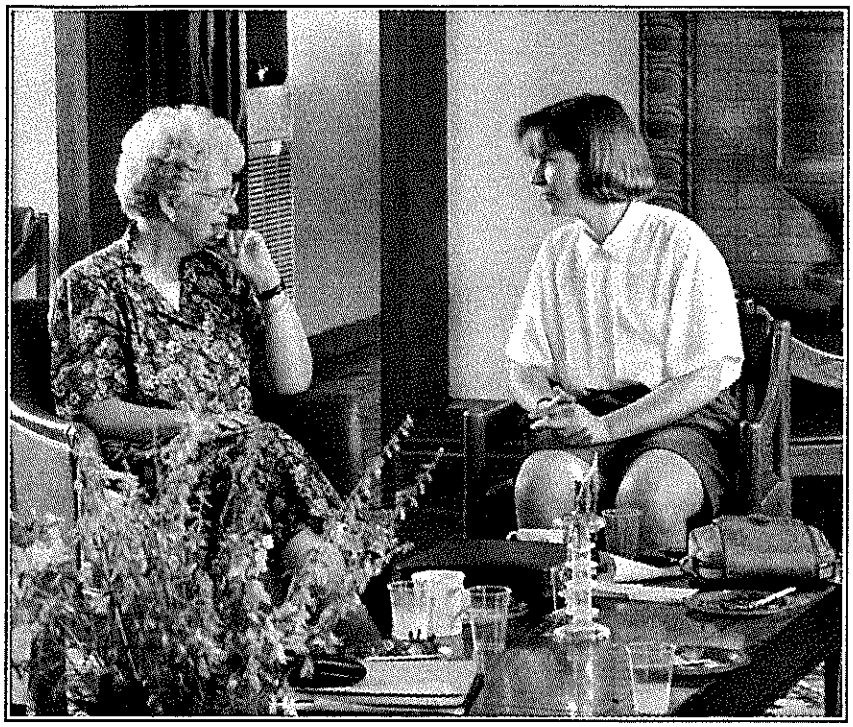
Too bad it was none of the above. It would have been interesting to see six-legged rats running around wearing W.W. II combat gear. In fact, as our tour guide, Dr. John Duke, explained, the nuclear reactor is used to create radioactive isotopes of common elements in the human body, which are introduced into a human and traced as labels to pinpoint the paths that the elements usually take to perform their functions. Logical, eh? Well, I don't know. I'm still convinced the whole Dentistry/ Pharmacy building is simply a facade disguising the many secretive non-dentistry/non-pharmacy experiments that go on there; part of an elaborate government conspiracy, of course!

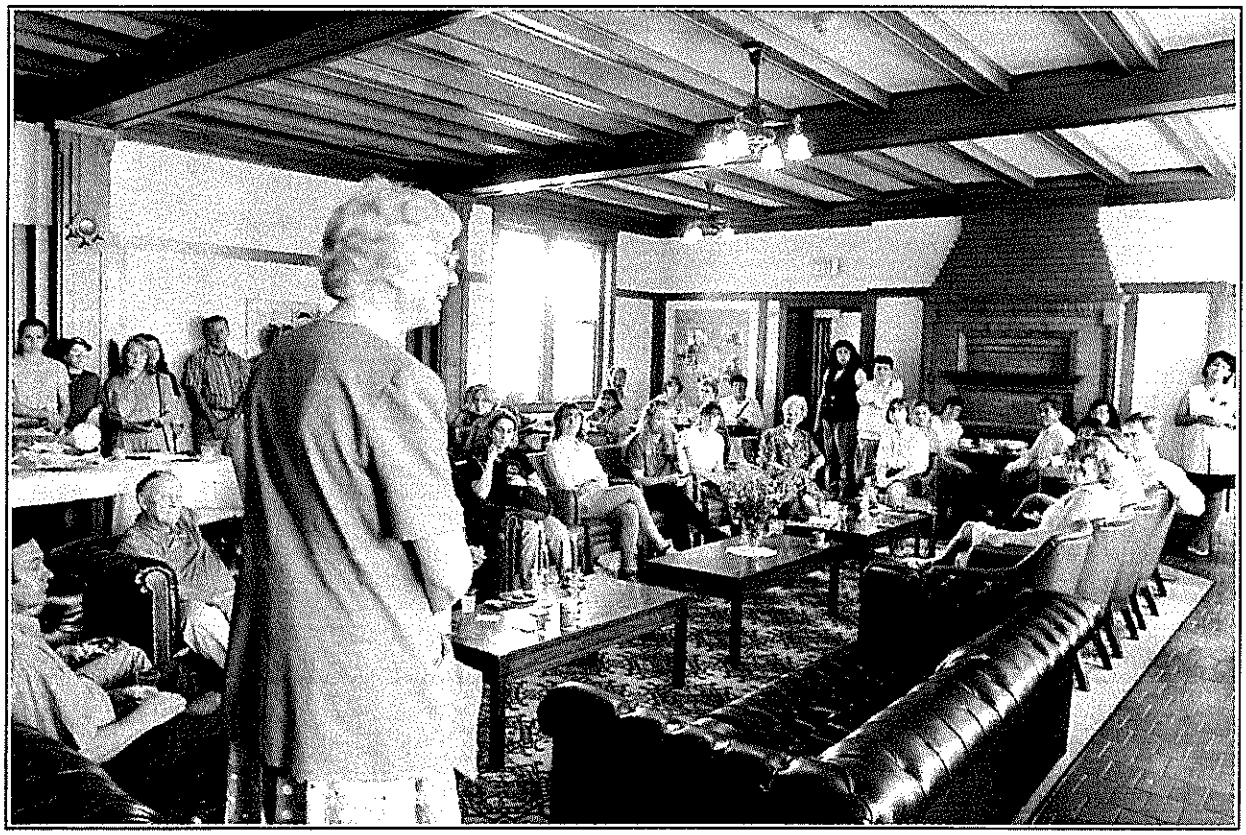
Seriously, though, SLOWPOKE is a slightly orthographically incorrect acronym for Safe LOW Power Kritical (my spell-check s going to hate me for this) Experiment. The reactor itself is located several metres underground and is about the size of a garbage can. The reactor employs the fission properties of uranium samples; adding neutrons to the stable element to form a radioactive isotope. In the lab there is also a Geiger counter, as well as a computer used to analyze the radioactive samples. As I understand it, the samples release gamma rays that are picked up by a chunk of germanium, which converts the energy into electrical impulses, which are fed into the computer, which in turn scans its database and identifies the isotope. Pretty neat, eh? Well, the samples, once the radioactivity has decayed away, are perfectly intact, making the reactor ideal for non-destructive elemental analysis.

I thought Dr. Duke was very articulate and patient when it came to explaining the system to an ignoramus such as myself. However, I'm not too sure I would want his job. It seems kind of lonely to spend days alone in a lab so isolated it has its own doorbell. I hate to quote an old saying but I see no more appropriate time: SLOWPOKE's a great place to visit but I sure wouldn't want to live there.

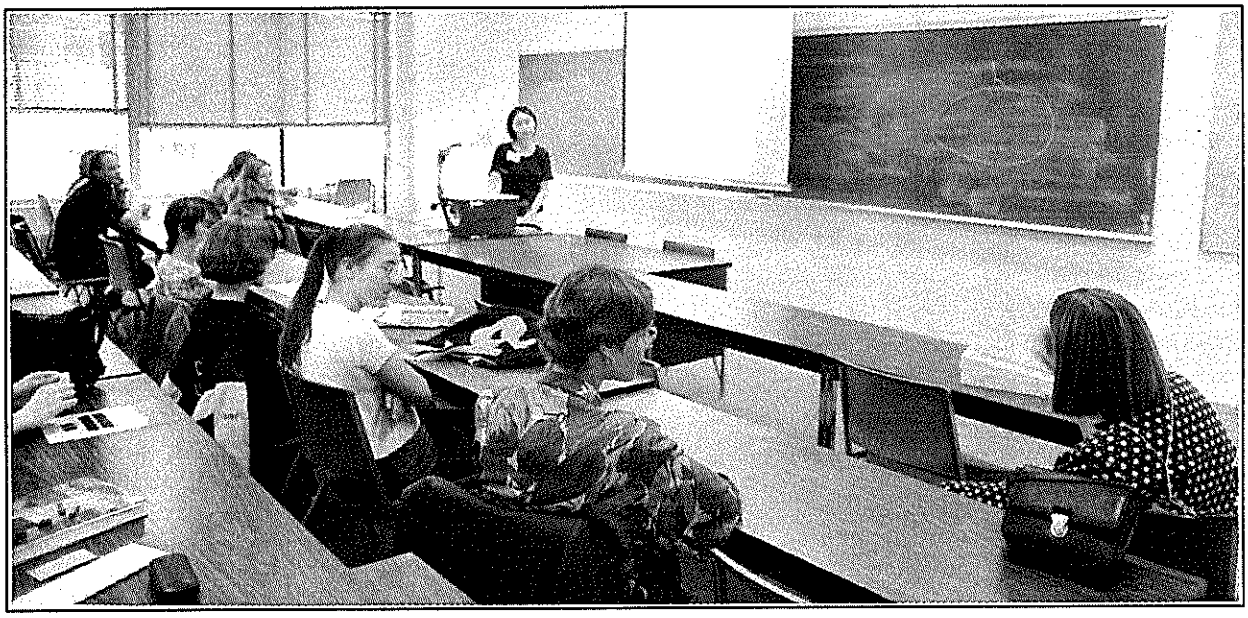
Iva Cheung

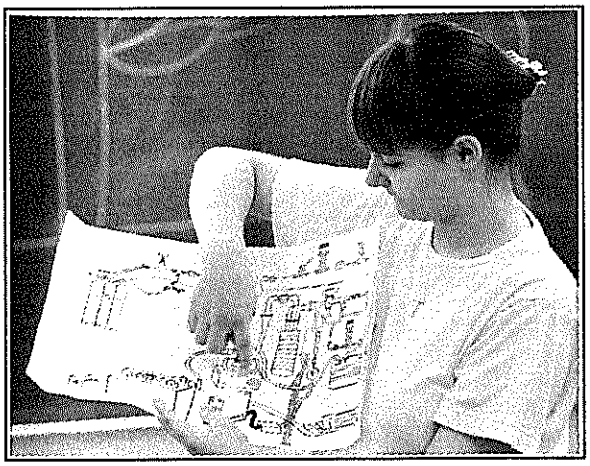
Tea and Social

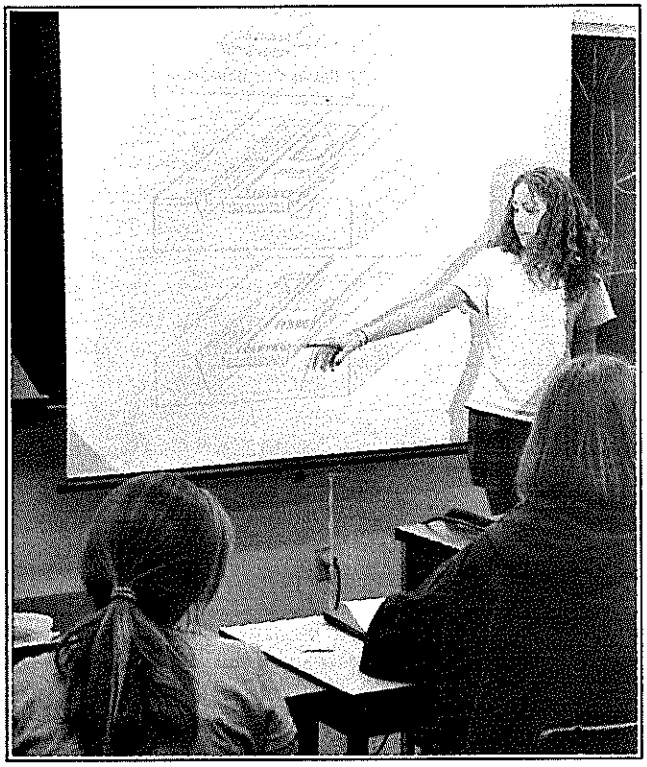




Oral Presentations







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STUDENT REPORTS

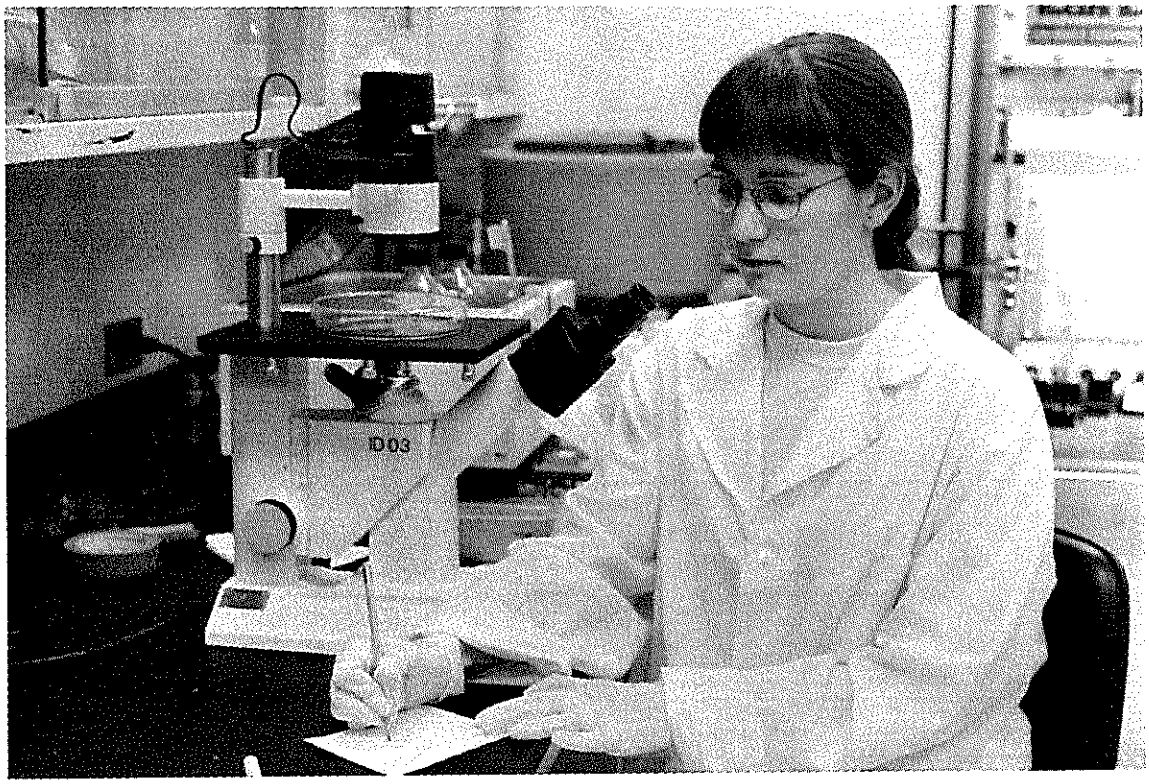
THE WONDERFUL WORLD OF CELLS

The WISEST Summer Research program has quickly come to an end, leaving behind a summer of learning, fun-filled experiences, friendships, and life at Lister Hall. It has opened the door for many new opportunities, with experiences that we can carry into the future.

This summer I had the opportunity to work with Dr. Manijeh Pasdar, Li Zhi, Tatiana Iouk, and Karen Wong. The overall goal of my project was to observe the differences between cancer cells and normal cells. Normal cells have strong cell to cell adhesion, where cancer cells have weak cell to cell adhesion properties. During the course of the six weeks, I worked with two mouse tumor cell lines, S180 and S180L. S180 cells are mouse sarcoma cells and S180L cells are the same cells, but have an engineered cell adhesion molecule expressed in them. Expression of this cell adhesion molecule changes the morphology of the S180 cells from tumor-like to normal. In the S180 cell line I observed weak cell to cell adhesion properties, but the S180L cells showed strong cell to cell adhesion, due to the introduction of an adhesion molecule. These observations were made by looking at the different proteins in the cells that were related to the adhesive structures which bind cells together.

In order to obtain these results, a lot of time and care went into growing these cells. (I should know, since these cell lines were fairly new and I learned everything that you should not do!) I had to check them daily and monitor their progress. Every two days I had to wash the cells and change their media (food). To prepare the cells so that they can be observed under a fluorescence microscope, I had to grow them as a single layer on coverslips. The cells grown on coverslips were then processed for indirect immunofluoresence. This technique uses antibodies which bind to the specific proteins of our interest. The antibody-protein complex can then be detected with a second antibody. The second antibody binds to the first antibody on one site, and is attached to a fluorescent marker (usually red or green) at a different site. After completing these reactions, the coverslips are mounted on slides and viewed under a fluorescence microscope. The proteins bound to the fluorescent markers appear red or green, and are brighter than the rest of the cell and the contrasting black background. We now can determine where the different proteins are located in the different cell lines.

I learned from my experiments that some cancer cells do not bind tightly to each other and therefore can detach easily. This phenomenon is the foundation for the development of metastasis (spreading of tumors from one organ to the other). These detached cells now are free to travel to other parts of the body via blood or lymph. That is how breast cancer can spread to the kidneys or pancreas. Therefore, researching and learning about these adhesion molecules is very important.



The WISEST Summer Research program was not all about work. We got together every Wednesday afternoon for group activities. Everything from safety awareness sessions to the Space Science Center, from meeting with other women in non-traditional fields to touring the Syncrude Research Center. These activities exposed us to new knowledge and were a nice break from our busy work schedules.

Living at Lister Hall proved to be an interesting experience. I could not have imagined staying with anyone else after meeting Melanie, Sayler, Karen and Tanya. Despite our bad luck with the bathroom and kitchen facilities, missing newspapers, and the people in Henday, we were able to have a great time. Renate helped us out and kept us busy with various activities. I really enjoyed our trips to the World Waterpark, Taste of Edmonton, Street Performers, and Fort Edmonton Park. How could I forget going to the WORKS displays with Tanya, Klondike Days with Melanie, and the Henday Bar-B-Que with Sayler. When we were around the fifth floor we prefected the skills of sitting around and talking, gaining control of the television, and complaining about dirty dishes. What will we do when we return home?

I had a great time working in the wonderful world of cells and I will truly miss it. Thank you to WISEST for the honor of being a part of such a great program.

Melissa Kachan

Summer of Experience

When Victoria told me that I was accepted to the WISEST Summer Research Program, I felt like the luckiest person in the world. In fact, it is the first job I've ever done in my life. Therefore, besides the excitement, I was a little bit nervous that I might not be able to manage it.

However, my first day here – the orientation – had already proved to me that there is nothing for me to worry about. Although I did not know any of the other 39 girls, I felt that we all share a common interest – a will to learn, to explore, and to experience. I'm glad that everyone is so friendly. And Margaret-Ann, Grace, Renate, and Dorothy are all very encouraging. I knew that I'll have a wonderful six-week adventures.

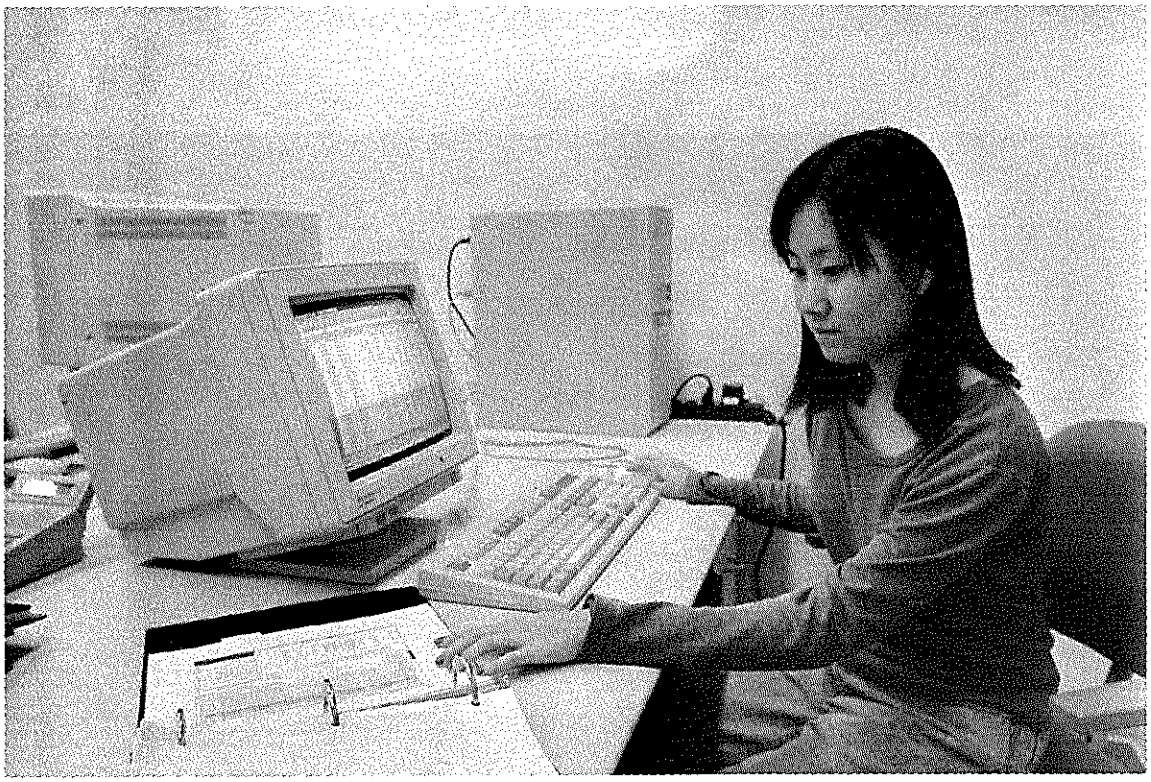
Under the supervision of Dr. Katherine Kavanagh, and Kathy Jones, I am working at the Department of Medicine, Division of Cardiology. (Here, I would first like to thank the WISEST coordinator who placed me in my first choice. I'm really interested in Cardiology!) My project is focused on atrial fibrillation, the most common cardiac arrhythmia (abnormal heart rhythm). I do research like how to recognize atrial fibrillation based on the observation of the electrocardiograms, or ECGs, and what is happening to the atria during the irregular baseline.

In a normal heart, the SA node in the right atrium works as a pacemaker, which stimulates every electrical impulse, causing the depolarization of the atria. Through the AV node and the bundle branches, the impulse is then conducted to the ventricles. On an ECG tracing, different peaks represent different depolarizations. The P wave is the contraction of the atria. The QRS complex waves represent the electrical activity of ventricular contraction. There is a pause after the QRS complex, then a T wave appears. It is the repolarization of the ventricles so they may be stimulated again. On the ECG of a normal heart, the P, QRS, and T waves appear regularly, with constant time intervals between each peaks.

However, in atrial fibrillation, the SA node is not stimulating any impulse. In fact, atrial fibrillation is caused by the firing of many atrial foci, thereby causing ineffectual, chaotic atria activity and irregularly irregular ventricular response. Inside the atria, the circus movement is not traveling in a regular pathway. Instead, many different excitation waves can be seen to travel over the surface of the atria. The atrial rate exceeds 350 beats per minute. The ventricular rate is slower because the AV node is able to block some of the impulses. What it does is that it has a longer refractory period, approximately 1/200 minute. So not over 200 impulses per minute usually can be transmitted into the ventricles. Therefore, when the atria contract as rapidly as 350 beats per minute, only one of every two impulses passes into the ventricles, thus the atrial rate is two times of the ventricular rate. Since the atria are not depolarizing in an effective way, but are fibrillating, on the ECG, atrial fibrillation is characterized by no discernible P waves and grossly chaotic undulations of the baseline.

Atrial fibrillation occurs in 15% of patients with arrhythmia and the number increases when aged. It is menacing because patient with atrial fibrillation experiences chest pain if his ventricles response too rapidly. Occasionally, blood clots may form in the atria. This may cause blockage of oxygen intake and may lead to stoke or paralysis.

This is briefly what I've found out for six weeks. I can still remember how frightened I was when Dr. Kavanagh first told me that my research is on atrial



fibrillation. I didn't even know what it is! But now, I feel very comfortable talking about it and even explain it to my friends.

In fact, the research is only part of my WISEST experience. I've learnt a lot from other WISEST activities as well. For example, the tour of campus got me to know my way inside the U of A better. I think it is very helpful for us – pre-grade twelve students who are going to apply for university and always wonder how the campus is like. At least I can identify several buildings inside campus right now. My favorite Wednesday afternoon session is the tour of Syncrude. I saw a lot of interesting stuff. Researchers at Syncrude are very nice, they answered every questions that we asked, and they also hosted a wonderful lunch for us. On the other Wednesday sessions: meeting people in non-traditional careers, and the visit to another research lab, I listened to (or looked at) how Science influences other people's lives. Some of the speakers were already my role models.

In conclusion, I'm really glad that I was involved in this WISEST summer research project. This summer has instilled in me the confidence to continue to pursue a career in Cardiology. I've learnt many valuable skills (ex. communication, computer, and writing reports ect.), and I received lots of comments and advice during this six weeks. I know they are going to be so useful throughout the rest of my life.

Last but not least, I would like to thank everyone in the WISEST, for giving me such an unforgettable summer. I'm going to miss all of you so badly. Also, a lot of thanks and love to Dr. Kavanagh and Kathy, who have taught me so patiently and kindly, and who have always been so caring and understanding. I cannot manage the whole research without all of you. And friends forever with Angie, my summer buddy! Again, thank you very much WISEST!

Isabella Lau

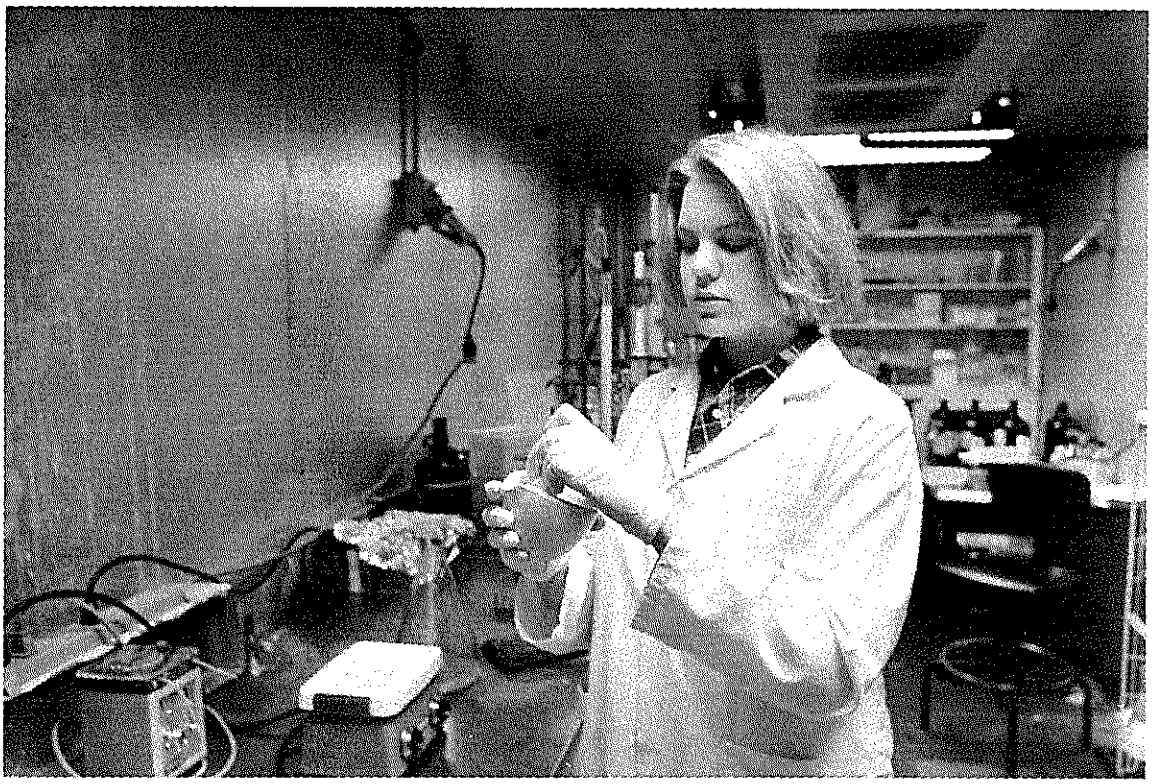
My WISEST Summer Experience

by Amanda Pauls

This summer I had a once in a lifetime experience. I had the privilege of working in the Department of Biological Sciences under Dr. Edwin Cossins. I was involved in basic research of a specific enzyme chain needed for folate metabolism. The experiment I was working on was trying to find the involvement of one specific protein in this enzyme chain. My role in this experiment was to work with a kind of fungus called neurospora because it is easy to work with and it grows very quickly. I would make different chemical alterations to the environment of this fungus and observe the effects these alterations would have on the specific protein as well as the protein content of the fungus. For example, I attempted this experiment using different concentrations of glycine and serine to see how these two chemicals would affect the protein in the neurospora. The use of these chemicals seemed to enhance the protein content of the fungus. Later, the technician in my lab, Carole Kirk, will use these results to run a Western Blot analysis to determine the effects of my alterations on the specific protein.

I have had a wealth of lab experience these past six weeks. I have learned complex scientific processes such as, electrophoresis, Western Blot analyses, protein assays, sterile technique, lyophilization (freeze-drying) and centrification. Having the opportunity to apply these processes will give me an extreme advantage in my lab work at university. Another valuable experience I had this summer was working with the people in my lab. Sherwin Chan and Murray Beurlein taught me how to work with people in an employment setting and still have a lot of fun. Carole Kirk is the lab technician she was very patient and a very good teacher. I really liked working with them for these six weeks.

My experience in the WISEST Summer Research Program was better than I could have ever imagined. I was extremely impressed with how well Renate Pfeifer



and Grace Ennis organized our different activities and tried their best to give us the best experience possible. The Wednesday afternoon sessions were very informative and helpful in our understanding of the university and science. The Open House, Taming of the Shrew at Hawrelak Park and trip to the Space Science Centre were very enjoyable. I've met friends in the WISEST Summer Research Program that I believe will keep in touch with after the program ends.

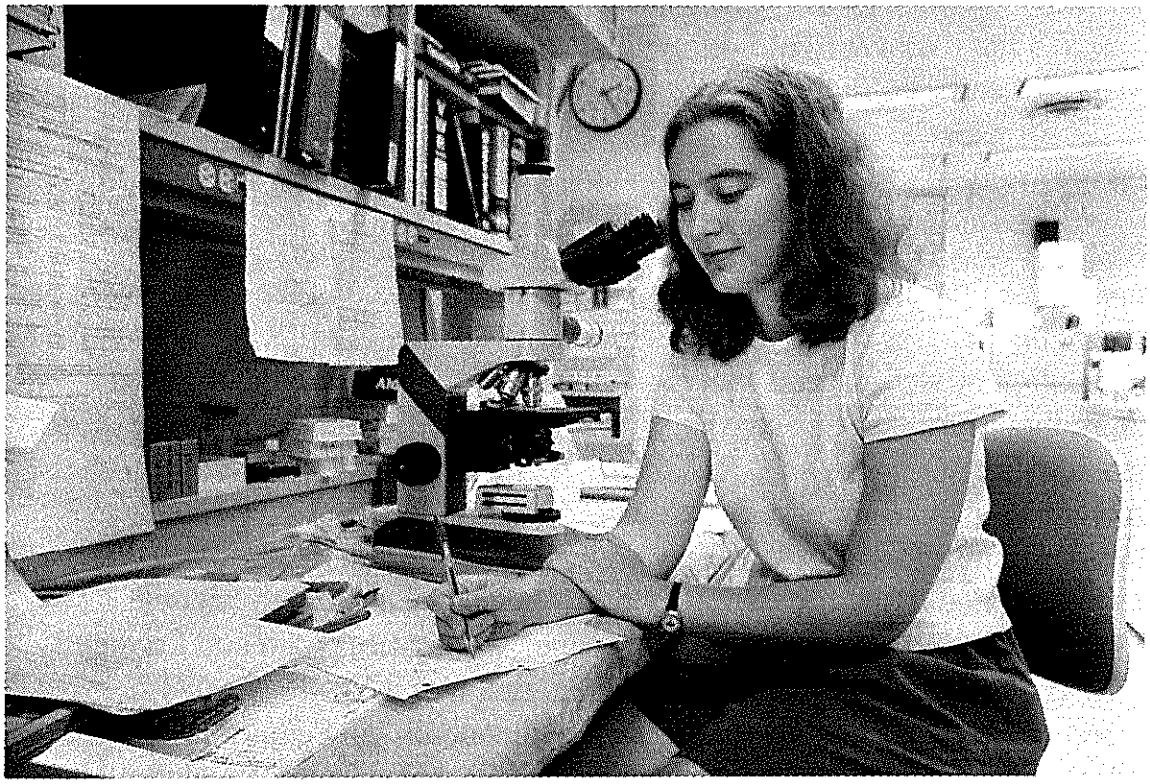
I doubt that I will pursue a career in Biological Sciences. However, I have gained valuable experience performing lab processes that will consequently aid me in any scientific career I choose. I also had a fun summer working with interesting people. I'm very thankful to the WISEST Program for giving me this wonderful opportunity.

My Summer at WISEST

by Melanie Kardel

This summer I spent six weeks working in Dr. Alexandra Lucas' lab in the Department of Medicine, Division of Cardiology. The thing I noticed most during my first couple of weeks was just how many things were going on all at once in the lab. Our main goal was to test a drug, SERP, to see if it could be useful in inhibiting atherosclerosis and restenosis. Some projects focussed on how the drug worked and some on proving that it did work. The project that I was involved with tested the effect of SERP in rabbits and pigs. The animals received angioplasties to purposely damage the inner walls of their arteries and initiate an immune response that would cause the arteries to become blocked off, as in restenosis. Some would receive treatments of the drug and some would not. I was fortunate enough to observe several of these surgeries. In fact, one of the most exciting experiences I had this summer was when I got to go down to the surgical suites and actually help out in one of the pig surgeries. I got to make the incision and help to insert catheters and infuse the drug. I even got to wear the green surgical outfit just like the doctors on TV. Amazingly enough, I didn't even faint. Although I did come pretty close a couple of times, once when I discovered that pig's blood really can squirt pretty far and once when I found that surgical masks are extremely difficult to breathe in.

A large portion of my summer was spent looking at slides of aortas from some rabbits that had been tested earlier on. What I mostly did was to look for atherosclerotic plaques and measure their size. These measurements were used to compare the saline (control) group and the SERP group, to see how well the drug worked. The rest of my time was spent learning about all the other projects in the lab. It was extremely interesting to hear everyone talk about their project; to hear their enthusiasm and to learn how the project was related to all of the others. During the six weeks of the program, I saw everything. From the lab and its equipment, to the tremendous effort required to move the lab and its equipment to, for example, London, Ontario (a long process that was not yet complete when I left), from surgery to review papers, from projects dealing with entire animals to those focussing on one type of cell, it was great to see it all.



But WISEST is a lot more than just lab work. It also gave me an opportunity to meet people and to have a lot of fun outside of the lab. So here is what else I learned:

1) Syncrude is a very neat place that gives you Smarties and has funky yellow hard hats. (It was also a great chance to compare an industrial research lab to one at the university.)

2) Renate is very easily convinced to do strange things like kiss the gargoyles on the set of Shakespeare in the Park.

3) A session in "How to create your oral presentation in an hour or less" could possibly be a very useful one.

4) People who have actually had the opportunity to stay at Lister Hall would not be good people to hire to advertise the food there, at least judging from the stories I've heard.

5) It will ALWAYS rain when you have a picnic planned for the entire group. (And then you end up in SUB with two tables full of food. . .)

And the list goes on, but to try and list all of the things that I have learned this summer would be pretty much impossible.

Thanks for a great summer everyone!
Melanie Kardel

My WISEST Experience

My WISEST experience is a memorable one. My involvement in this program provided many benefits. It gave me the opportunity to become familiar with the University and its programs. I worked in the Department of Computing Science under the supervision of Rob Lake, and my task involved the creation of web pages. More specifically, I edited a couple of maps before they were placed onto the World Wide Web. One was a downtown map, and the other was an L.R.T. map. At first, I was intimidated to start the project. Initially, I knew very little about computers and the Internet. However, my supervisor was very patient. He took the time to teach me the basics I needed to get me started. For my project, I needed to become familiar with UNIX, HTML, and Netscape. Ebony Chapman and I worked together periodically, and one of the highlights was a Virtual Reality demonstration. We played Virtual Reality handball, and explored underwater and dinosaur graphics. Throughout the program, I feel that I have developed valuable computer skills which will become useful for my future.

Benefits of the WISEST program included the Wednesday afternoon sessions. The sessions enabled me to become more familiar with the University. Campus and lab tours were provided for the program members. I was very much interested in finding out more information about the other faculties, and the tours were very helpful. In another session, we had the opportunity to meet people in non-traditional careers and ask them questions. I found this very valuable, because they were able to answer my questions about various careers. Another interesting session was the visit to the Syncrude Research Centre. It was an impressive, first-class facility. The people there were very hospitable. We were able to tour their labs, and also carry out some experiments. Most importantly, the Wednesday afternoon sessions contributed to my goals and decisions regarding my future at the University.

WISEST also provided some interesting activities outside our work hours. Renate organized the Tuesday bag lunches where we could spend lunchtime with the other program members. One lunch hour was spent touring the SLOWPOKE Reactor Facility. It was interesting to witness the type of experiments that go on at the facility. We also ate at Earl's before going to Taming of the Shrew at Hawrelak Park. Although there was a thunderstorm warning, the evening turned out okay. Another unforgettable evening was the time we went to the Space and Science Centre. We were

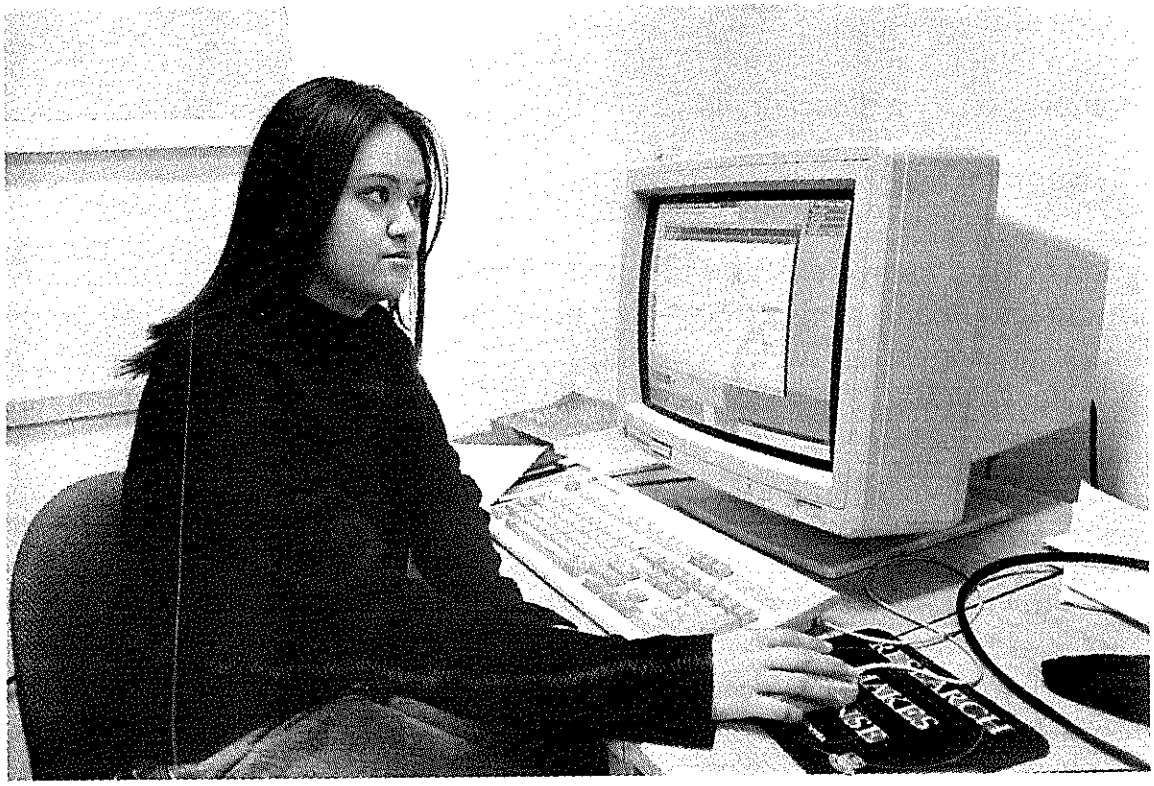
able to tour the exhibits, and watch an IMAX film (Stormchasers) and a laser show. Thank-you Renate for your time and effort.☺

I would like to thank Rob Lake, Carol Smith, Lloyd White, Paul Ferry, John Buchanan, and the rest of the Department of Computing Science for all their help. The people in my lab were easy to get along with. Thanks for helping me out whenever I "broke" something.

Coming into the program, I knew very little about what I wanted to do in my future. WISEST gave me the benefit of providing me the opportunity to explore my options. The program motivated me to make some goals regarding my education. Throughout the program, I discovered which options interest me and which ones I would like to pursue.

It's hard to believe the six weeks have gone by so quickly. I can remember coming on the first day not knowing anyone, but I leave with a handful of friendships and memories.

Charlotte Po
Department of Computing Science



My WISEST Cyber-Summer

It wasn't exactly a sandy beach in Hawaii, but I did do a little bit of "surfing" this summer...

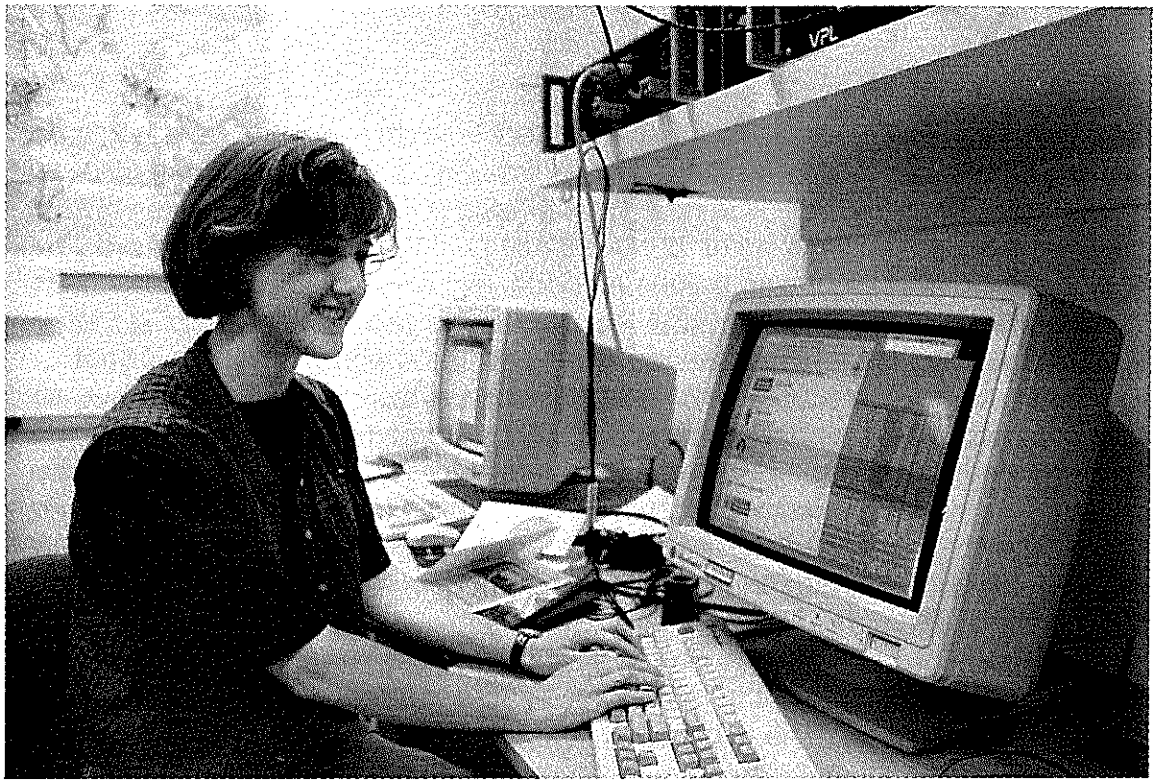
I worked in the Department of Computing Science under the supervision of Carol Smith. In my first week, I was greeted with manuals and references to tutorials on the World Wide Web. I spent time learning about UNIX, the Internet, and HTML (hypertext markup language). My work involved modifying and producing web pages, as well as creating and editing some graphics for use on these pages. As practice using HTML, my first project was to create a humble home page all about myself. My main project involved making maps of various floors of the Computing Science department, so that when you click on a room it will show you whose office it is - or what lab it is - and what equipment is located in that room. These maps will be used on the World Wide Web and will be useful to people in Computing Science.

I worked together with Charlotte Po periodically, editing and "experimenting" with graphics. One of the highlights of my time in Computing Science was a Virtual Reality demonstration. Not many people get to play handball, catch fish with their bare hands, and get trampled on by a dinosaur, all in one day!

Of course, WISEST wasn't just a summer job...

The program offered many benefits and opportunities, such as becoming familiar with the University campus and its programs, touring other labs, participating in small group discussions with people who have chosen non-traditional careers, and discovering just how broad science really is! Special tours of the SLOWPOKE Nuclear Reactor and the Syncrude Research Centre were informative and impressive. It was interesting to see what goes on at these places and the types of experiments they carry out. The people at Syncrude were more than hospitable, providing us lunch and allowing us to tour the facility and carry out a few experiments. The picnic afterward was one of many great opportunities to visit with other students and was very enjoyable despite the rain.

We had a lot of great times outside of work... Bag lunches on Tuesdays allowed us more time to make new friends and learn about their projects. The open house and tea was a wonderful chance to share our experiences with others. Shakespeare in the park and Fort Edmonton with the Lister girls, the list goes on... The Space Science Center was excellent, some of us just couldn't get enough of it, so we went back two days later to see the U2 laser show and check out Saturn!



I would like to thank Carol Smith, Jim Easton, Lloyd White, John Buchanan, Paul Ferry, Rob Lake and **everyone** in the Department of Computing Science for all of their time and patience. Thank you for answering all of my questions, helping me out, and making me feel welcome. I have learned so much from you and it is greatly appreciated!

Thank you to all of the WISEST coordinators for all of your time and effort to make this a most exciting and enjoyable summer!

Before I came to WISEST I did not know very much about computers, and even less about the Internet. Through WISEST, I have learned so much... Not only valuable computing skills for the future, but about science in general, University life in Edmonton, and myself. I think one of the greatest things about this program is that we, as students, have the opportunity to get to know ourselves better, to better understand who we are and what we're interested in. I will always be thankful for the friendships and memories I take with me as I leave, and I know that the knowledge and experience this summer has given me will be beneficial whatever path I choose to take.

Ebony Chapman

Keep in touch, K?!
Ebony Chapman :)
Wetaskiwin, AB

Renewing Our Resources

The Department of Renewable Resources is a faculty at the U of A that most people do not know exists, let alone what it deals with. The Department primarily deals with the problems of land reclamation that was once clear-cut, a mine or some other site that has seen environmental damage due to man. reclamation is the use of plants and animals to restore the natural habitat of an area that is significantly damaged. Within Renewable Resources there are several different areas of research; soil physics\management, water management, and contribution and establishment of plant species in reclamation are just a few of them.

Soil physics concentrates on how acceptable certain soils in certain conditions are to plant growth in terms of available water capacity, compaction and many other factors. The experiment that I helped on was with soil compaction and how water content and soil type affect it. Sandy, silt and clay loam were mixed with varying amounts of water and then compacted to different densities. Their ability to allow roots to grow freely in them was tested with an instrument called a penetrometer, this device measures the pressure required by roots to penetrate the soil and consequently how much nutrients the soil will provide. Compaction is a major problem in reclamation because higher densities do not allow for abundant plant growth. large machinery used in industry and animal traffic have a profound impact on soil compaction making it difficult to inexpensively and efficiently reclaim land.

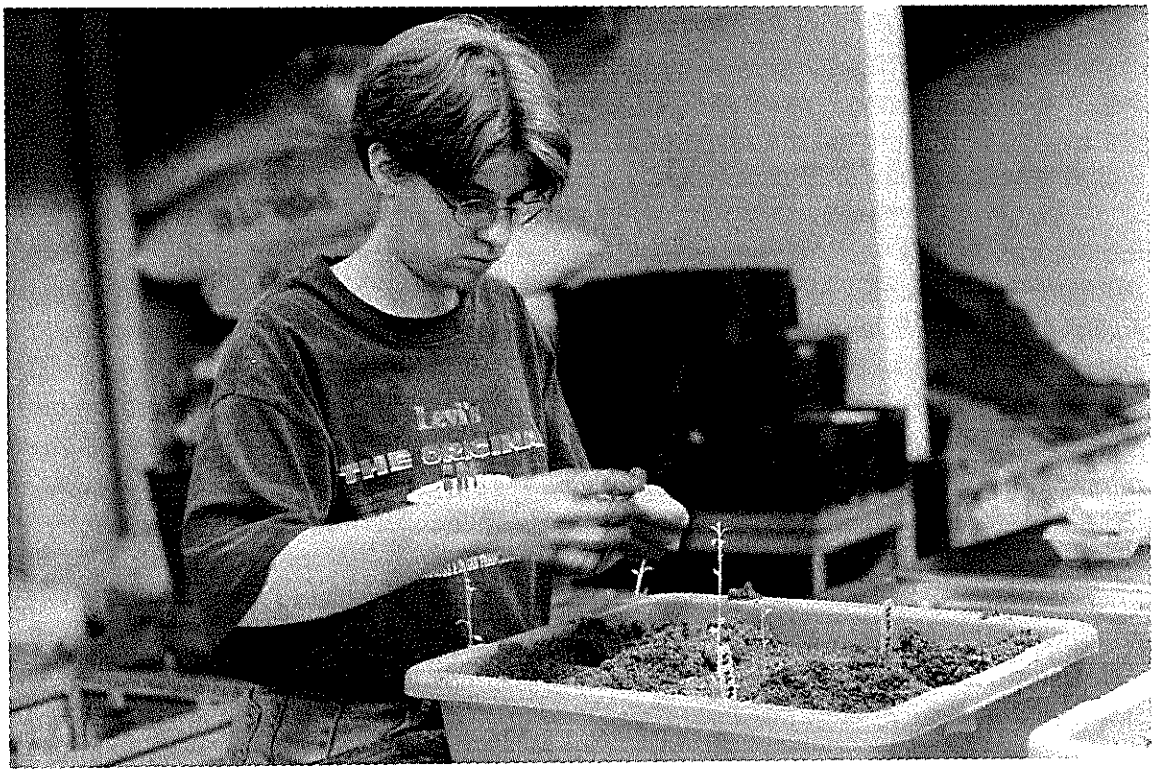
Water management deals with problems such as run-off from fields carrying away soil and fertilizers, the effect of moisture content on plant growth and the effect varying amounts of rain on plant development. hydroprobing was the project that I was assigned to. once every two weeks a team of four people measures soil moisture content in Lacombe with an instrument called a hydroprobe. These probes have radioactive cores that are sent down testing tubes into the ground. The cores send out electrons into the soil, water reflects these electrons back to the probe. The Probe counts the number of returning electrons and displays the number giving an indication of soil moisture content. Naturally soil moisture has an effect on plant development, so finding the range that most plants will grow with in specific areas is of great value to people looking to increase plant productivity.

The biggest experiment I participated in this summer was for a forestry company in Saskatchewan called Mistik Management. They are interested in using aspen trees to make products like paper, their problem is that there is not a great enough volume of aspen trees in western Canada to ensure a reasonable profit. To determine what may be causing the rapid decline of the aspen our project examines the roots of trees in four different site conditions; no decline, light decline, heavy decline and control (mixed wood). The roots are planted in sterilized sandy soil and left to grow or sucker for two months. Small samples of the roots are also tested for carbohydrate contents to see if that may

be a problem. After two months that roots are harvested and all the little shoots or suckers are measured to determine their suckering capacity. The roots and suckers are then dried and weighed to see if size and weight have an effect on how the trees grow. If a solution can be found in joint with other projects being sponsored by Mistik Canada may soon be seeing new forestry products on the shelf.

Most of the work this summer has been tedious, difficult and seeming useless in some cases, but in the long run it is really rewarding to see results that you have collected being used by someone to further environmental awareness or to help society. It was not the most fun I have ever had in a summer, but the people I worked with and the experience I gained with the WISEST program and the Department of Renewable Resources made everything worthwhile.

Corinne Blattler



The WISEST and the NICEST

Image analysis of diamond-like carbon coatings deposited by laser-produced plasmas. The title is grueling, and could probably scare almost anybody away. However I did say that I enjoyed a challenge, and WISEST delivered one. When I received my acceptance letter, I had to spend some time looking up the words in the project title in order to have some idea as to what I would be doing for six weeks of my summer. It was far from sunbathing in Hawaii, but I was able to get a little bit of a tan because the laser I was working with produced UV light.

The experiment that I was involved in consisted of firing a laser into a vacuum chamber where it hit a carbon target. Because light contains energy, the graphite target was heated and electrons were stripped from it. The graphite that has had the electrons stripped from it is called a plasma because it contains a charge. We then guided the plasma to a small silicon wafer that it coated.

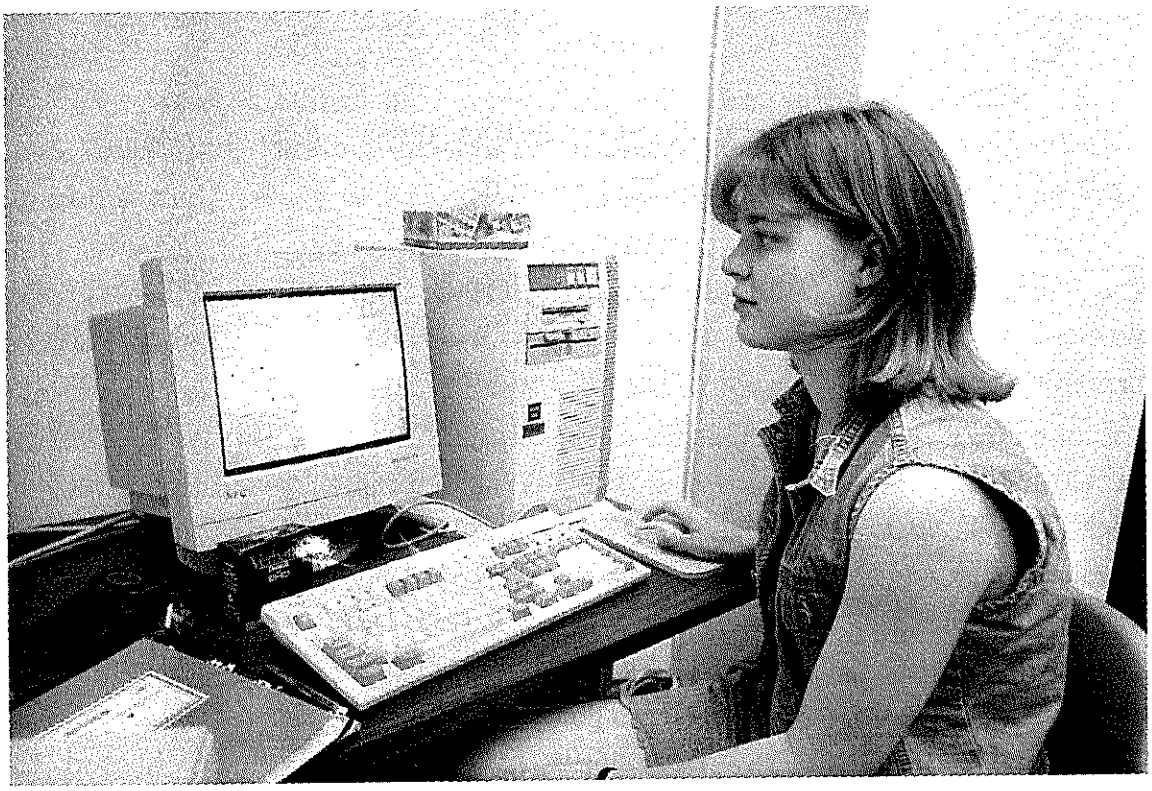
The coating on the silicon wafer has all of the properties of a diamond but it is made quickly from carbon, hence the name diamond-like carbon coating. Since diamond is very hard and much stronger than carbon, there are many practical uses for this diamond-like carbon coating. The main one is in the oil field. Currently, drill bits are made out of diamond A diamond-like carbon coating could allow for another material to be coated and still contain the same strength, but at a smaller expense.

It sounds very simple, however, as I quickly learned this summer nothing in science can be this easy. So, of course, we had a problem that needed solving. When the laser light hits the carbon target, it has a similar effect to a meteorite hitting the earth--chunks of the carbon (in this case) are sprayed up. These carbon pieces get embedded within the diamond coating, and reduce its effectiveness. A magnetic field was used in order to guide the charged plasma particles away from the neutrally charged debris particles. Unfortunately, the debris particles would ricotee down the tube, and reach the silicon wafer. Various tubing set-ups, which posed as magnetic field set-ups, were tried in order to eliminate the debris.

We magnified the silicon wafers with the Scanning Electron Microscope (SEM). My job consisted of taking the enlarged pictures that we received from the SEM and analysing them by using a computer program designed by my supervisor, Dr. Vick. Through the computer program, I was able to see how many debris particles there were, and the size of each particle. We then took the results to decide which tubing structure was able to eliminate the most debris. Although progress is rarely seen in research, in my six weeks in the Department of Electrical Engineering, I was able to see some. We were actually able to eliminate most of the debris particles with one of our tubing designs.

The work in research can often be quite tedious. In my first few weeks in the Department of Electrical Engineering the most excitement that I received was saying "Firing 3-2-1" as I fired the laser. (Yay!) I found that if I thought about the theory behind my work, and the ultimate goal of what I was doing, it made the job a whole lot more interesting.

Since I come from the big ol' town of Mayerthorpe, I had to move to the city, and was lucky enough to live in Lister Hall, which definitely added to my WISEST



experience. I got to meet and really get to know some great people during my stay. There is Tanya, whom I woke up daily at 7:00 in order to get my milk from her fridge to put on my Alpha-Bits, Karen, who lit up each work day by leaving her room for a shower, just as I left for work. (The relaxing life of some people.) After growling at her every morning for three weeks, she learned to wait until I left for work before she even decided to get out of bed. I would like to thank Renate, our "Big Sister" for planning group outings to make our stay entertaining and fun. Thanks for being there to talk to and make jokes to about all the obnoxious people I met and hats I seen in and around the university. I must also thank Renate's boyfriend Chris for guiding us around the city on our first few days here, as well as fixing my mail key. Melissa--I'm sorry about Mickey. I just heard that he was pushed from fifth floor Henday. I must also thank you again for saying that I was nicer than Melanie. And of course Melanie--I'll never forget your feeble attempts at trying to be nicer than me.

Sayler Marr

THANK-YOU'S...
...I would like to thank everybody in my lab group for taking the time to explain to me what was going on in the project, and just talking about university and what is available there for me.
...I would also like to say a thank-you to all of the WISEST coordinators, Grace and Renate for arranging the Wednesday activities and various other activities that gave us a chance to mingle with the other WISEST students; and to Dorothy and Margaret-Ann for their entertaining and inspiring stories. It has been a wonderful opportunity and experience for me. Thank-you again.
... And of course, a great big thank-you to my Lister Hall pals for making a long six weeks away from home seem short.

MY WISEST MEMOIRS

- Melanie Willsey

My WISEST summer is over already, and having survived six weeks in the big city and become accustomed to the world of bacteria cultures and DNA, I am genuinely sad that it's all over.

I have been working in Medical Microbiology and Immunology in Dr. John Elliott's lab, doing diabetes research. I have been helping Lisa Purdy with her project in which she is using mice with some human cells to try to isolate the peptide in insulin that is believed to cause diabetes. The way that insulin-dependent diabetes works is that the immune system attacks and kills insulin-producing cells, and insulin is necessary for cells to absorb glucose.

We are still in the first steps of the project, but I helped test the mice to make sure that they had the human cells, and I also worked with a gene called β galactosidase which will be used as a control in the experiment later on. I used bacteria to make a lot of β gal, and I experimented with different methods of cutting DNA rings with enzymes and stuff like that.

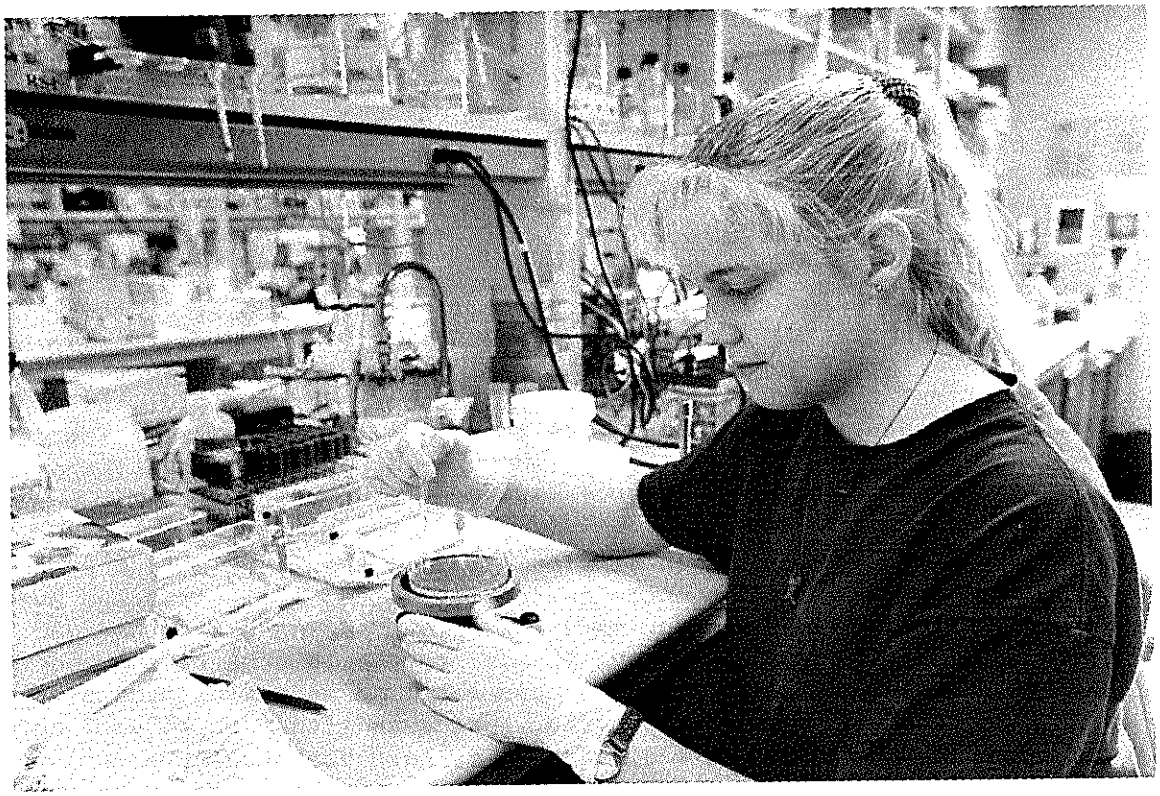
Eventually, if the peptide is isolated, it will be able to be used to test people that have a high risk of developing diabetes. The peptide could be injected under the skin (much like a TB test) and if swelling were to occur, the individual could have diabetes and more testing could be done. An efficient screening process like this is important because it is estimated that half of the people that are diabetic have not yet been diagnosed.

It's been really exciting to be part of this project and the people in my lab have been great to work with. I've learned more this summer than I ever thought my brain could handle, but I've had a lot of fun doing it.

My whole WISEST experience has been just super! The Wednesday afternoon sessions, and group activities went really well and it was fun meeting everyone and hearing all their stories. Everything from the fire extinguisher going off in our safety lesson, to the M&M experiment (way to go Syncrude!) was great, and thanks to all the WISEST organizers for all their hard work.

I've been staying at Lister Hall for the summer, which is a bonus, but I've definitely learned to appreciate free food, clean bathrooms and having a vehicle. I think that the Lister crew would agree though, that the grand Timbit binge, Karen's "surprise" party, "the Avenue Pizza incident" and the whiteboard insult wars made it a huge old crazy time.

So before I sign off I would like to especially thank Renate (you're a great big sister), Chris (our Mr.Fix-It) , Melissa (you think you know me so well-ha!), Tanya (with the hair of many colours) , Karen (-the carnivorous tortoise), and Sayler (you will always be meaner than me!). Thanks for all the hearty laughs, guys. It's been great!



Rosa Spencer

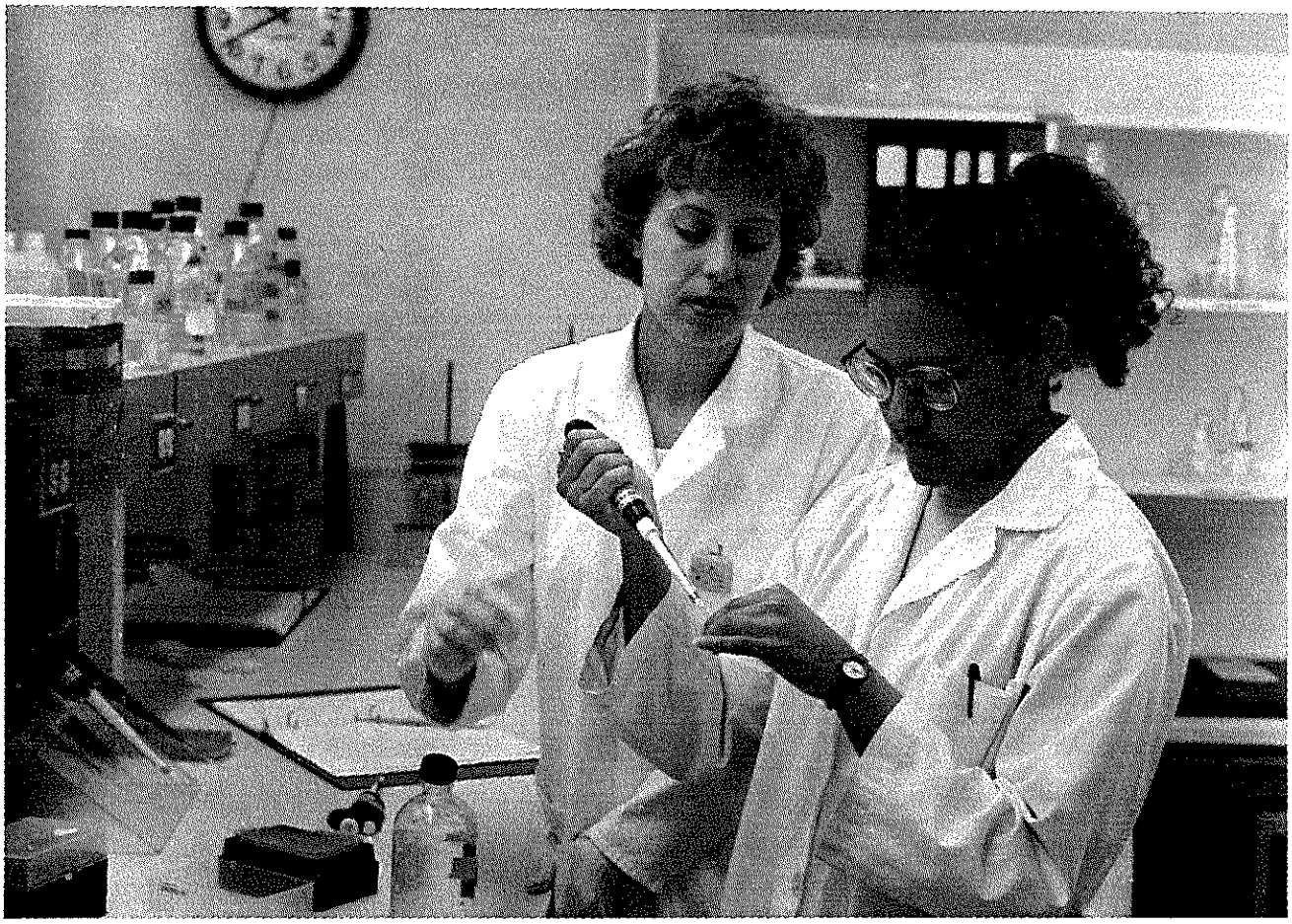
Microbiology, Dr. Owttrim's Lab., Biological Sciences Building

My Experience As A Microbiologist And WISEST Student

The WISEST Summer Research Program is an excellent opportunity for any student with an interest in science to expand his or her knowledge of the field. You are certain to learn something of value and interest no matter what area you are placed into. My experience of both the WISEST program and the Microbiology lab was not only interesting but also fun. I met a lot of new people in the WISEST program and also in my department which allowed me to talk to other people about what I was doing in the lab and how to go about fixing any problems that I encountered. Making new friends and meeting new people also made it easier to adjust to working in a laboratory environment and finding my way around the University of Alberta. I could always count on a familiar face to help me out.

I had originally wanted to work in the area of Genetics but since working in Microbiology I have learned that the two fields are very closely related. Working in Microbiology was very interesting. I learned a lot of new things about DNA, cloning DNA, DNA sequencing and electrophoresis as well as various other techniques used when working with DNA. Much of the work that I did during the six week program involved working with graduate students in the lab and sometimes even the professor himself. I would assist the graduate students with their projects - setting up experiments, preparing solutions, doing experiments and generally learning a great deal about the field of Microbiology. At first I was a bit overwhelmed by all the new information that I was being exposed to. I wasn't sure if I would learn to adjust to this new environment but the other students in my lab were very helpful and explained anything that I wasn't sure about. After those first few days I felt confident enough that I could follow the protocols myself and from then on I was able to work fairly independently.

Even though everyone was working in a different areas of the U of A I wasn't totally isolated because there were WISEST group sessions every Wednesday afternoon. The group sessions allowed me to meet other students in the program as well as make friends with some of the people in my building. The Wednesday afternoon sessions were also some of the more interesting parts of the program. One such afternoon we were able to talk to a panel of women who had made careers for themselves in science and another time we toured the Syncrude Edmonton Research Center - both were very interesting and informative. I really enjoyed the WISEST sessions as they gave me an opportunity to learn about fields other than the one that I was working in. I found that aspect of the program the most interesting because you could then see how all the different areas of research were linked to one another. I was able to get a much broader picture of the science field from these experiences.



The WISEST Summer Research Program is certainly one of the best summer job opportunities a student is likely to have. No matter what you are doing you are certain to make new friends, meet new people, and above all have a valuable and interesting experience.

I would like to thank the students, and of course Dr. Owttrim, for all their time and patience in explaining things to me for without them I couldn't have had the wonderful experience that I had this summer. Thank-you to:

Wendy Magee
Sonya Kujat
Susan Astleford
Ian Lee
Esther Yu
and Dr. Owttrim

My Summer Experience

Before July started, the word WISEST meant a summer job, but now that term means whole lot more to me: friends, learning, experience. WISEST is more than a summer job, it is a great opportunity to learn about a specific field, but you are also exposed to other peoples' projects. And at no other summer job I know of do you get to go to the Space and Science Center, have a picnic at Syncrude, and meet a great group of people from all around the province.

My project was with Dr. Gerald Stemke, working in the field of Microbiology at the Biological Sciences building. I did not have my own project, instead I worked with Dr. Stemke. Being in the field of microbiology, we worked with microorganisms -- specifically a strain of *E. coli* called *Mycoplasma hyopneumoniae*. *M. hyopneumoniae* causes pneumonia in pigs and costs farmers millions of dollars every year. The project's final goal is to find a vaccine for the disease by changing the organism's DNA.

I was involved in retrieving the plasmid and then trying to combine it with different cells. A plasmid is a strand of DNA made up of about 5 - 15 kilobases (DNA building blocks). If we can successfully combine the plasmid with the other cell's DNA, then hopefully a vaccine can start being created. I did numerous tasks (yes, I had to wash dishes and fill tip boxes, too), such as picking colonies of cells from petrie dishes, running the gel electrophoresis machine, and doing digests and ligations.

I will explain each of these tasks a little further, even though I know that you all know what they are. Gel electrophoresis is when you put DNA samples, plus dye and buffer, in wells in a special gel. The gel is then covered with buffer, and then an electric current is run through the gel, separating the pieces of DNA and RNA. A picture of the gel is then taking using ultraviolet light (thanks to Walter for pointing out to me that UV light does not go through plastic) and some dangerously mutagenic solution. Digests are when you break up the DNA using enzymes and ligation is where you glue it all back together. I also did 'normal' lab work like mixing solutions, pouring plates, and sterilizing media.

This project had been started just before I arrived, so results are few, but I sure learned a lot. Many of these procedures I had read about in my Biology 30 textbook and I thought that it was all so high-tech and really complicated, and then I end up spending my summer messing with DNA. I had little background knowledge when I went the first day, but my Bio. 30 class helped a LOT. In this job I was learning right up to my final week and that's one thing I really like about it. "Research is repetitive" is a very truthful slogan, for I have been doing the same experiments since my first day there.

This experience helped me make a few decisions about my career, for one thing I do not like research very much -- working with people is more for me. I will definitely stick with something in the sciences or medicine, but the possibilities are infinite. The group discussions that we had with people from non-traditional fields were very interesting, and it helped me realize that there are positions out there for women. Being on campus was another great thing about this job, for I love the atmosphere in the university and I really can not wait to go the U of A (I am sure my opinion will change after 4 or 5 years of being there).

To all people past, present, and future who have worked to make this program an excellent opportunity for everyone; to Dr. Stemke, Walter, and Sheetal for teaching me how to do it all; and to all other WISEST students (especially to those who I held regular washroom meetings with), thanks a lot for making this summer an unforgettable experience.

Jennifer Anderson

A Nervous Experience

Aargh! Where did the time go? I am in complete disbelief that i've already spent close to six weeks working in the neurosciences lab with Dr. Tessa Gordon. And i am in shock that there's no more left. This summer has been all but fabulous (and i'm not just saying that because i know Dr. Gordon will be reading this!).

The start was kind of shaky; i had no idea what i would be doing in the lab and thus didn't know what exactly to expect. Luckily, there were several people there to help me out of the pit of total ignorance and to make me feel that i had actually been of some use over the summer. Some of my tasks in the lab included: blocking nerves (the process of repeatedly rinsing nerves with several chemicals and embedding nerves into polymer blocks to prevent neural deterioration due to osmotic pressure, etc.), cutting blocks (i used an absolutely amazing machine called the "ultra-microtone", which sliced blocks as thin as two μm), preparing slides, staining slides, observing the slides under the microscope, printing pictures of the nerve sections, and analysing the pictures. I was quite surprised, actually, that i was allowed to do as much as i did. I mean, i expected that, being a high school student, i would be stuck doing odd repetitive jobs. I am grateful that it was otherwise.

The main question being tackled by all of the members in the lab is: what occurs when a nerve is cut? By observing nerve regeneration after nerves are cut in rats, one is eventually able to conclude which growth environment is the most ideal for regeneration, for example, or how long may a nerve be left to degenerate before regeneration is impossible. The answers to such questions may ultimately assist in rehabilitation efforts for victims of neural injury and maximise nerve regeneration. The three projects with which i worked, prolonged axotomy, prolonged denervation and FFD (fresh-fresh-denervated), all dealt with nerves that had been cut and that had been left to degenerate for a specific amount of time before regeneration was allowed to take place. Prolonged axotomy involved leaving the part of the nerve closest to the cell body (located in the spinal chord) to regenerate, then finally suturing the old nerve to a freshly cut distal stump (i.e. the portion of the nerve farthest to the spinal chord). In prolonged denervation, the portion of the nerve farthest to the spinal chord was left to degenerate for a period of time, and then was sutured onto a freshly cut cell body. FFD involved the suturing of a fresh cell body to a fresh graft, which in turn was sutured onto an old denervated stump.

I was responsible for cutting sections from each nerve of each experiment, and printing pictures of the microscope slide sections. I then observed specific characteristics in the pictures, including axonal size, shape, density, myelination, connective tissue build-up and axonal variability, among others. I compared all of the pictures from all three experiments and compiled a list of observations. Though some of the observed characteristics were found to be somewhat insignificant or unrelated to the length of time that the nerve was left to degenerate, others proved to have very striking patterns as the length of time increased. From my meagre data, it could be generalised that the nerves that underwent prolonged axotomy appeared to regenerate better than those in the prolonged denervation experiment, which in turn were better regenerated than the FFD's, strongly indicating that a nerve's growth environment is more significant a factor than the overall strength of the cell body.

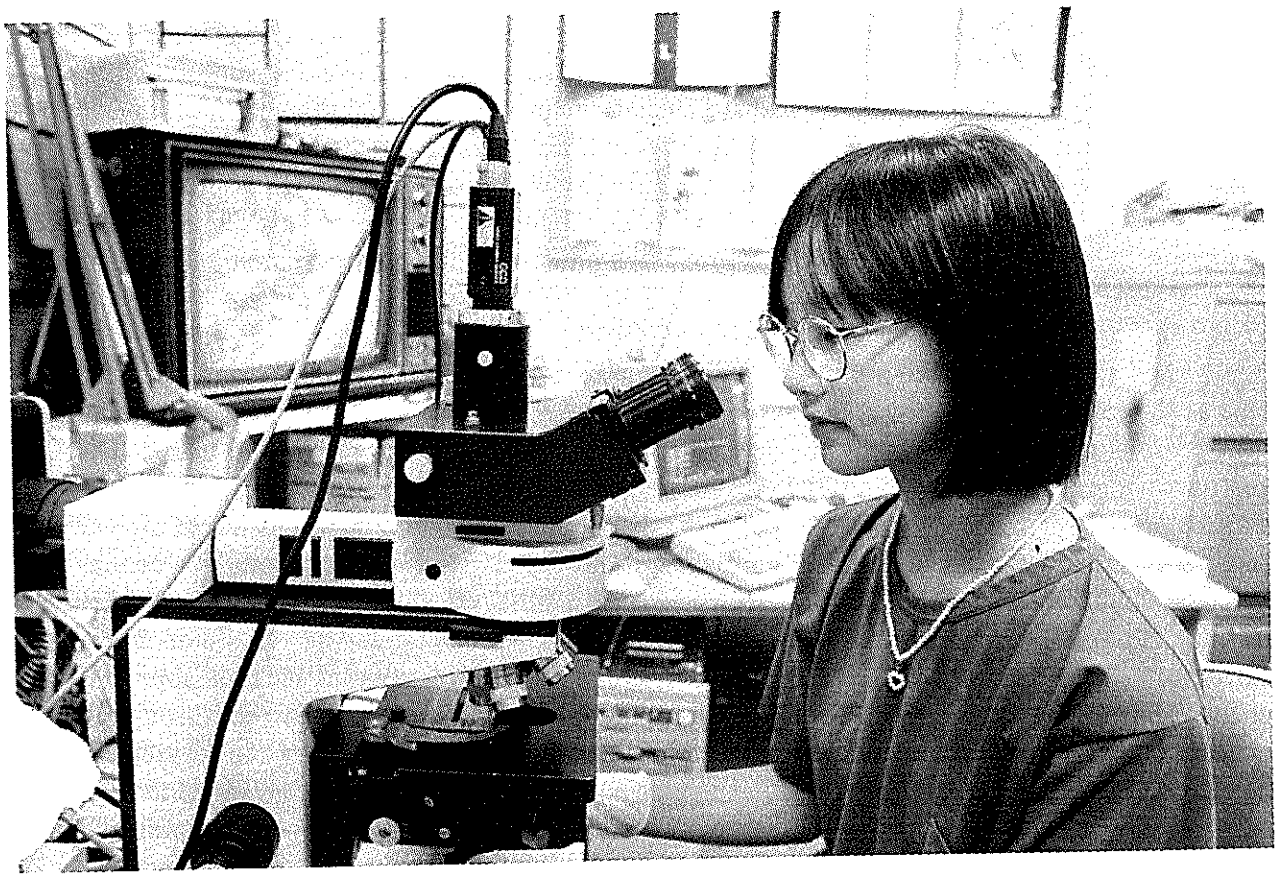
Characteristics that were found to change with the length of time degeneration took place included axonal size, size variability, axonal shape variability, axonal density variability, fascicle size and shape (the fascicle being a bundle of axons enclosed by connective tissue), and connective tissue accumulation. The significance of this is merely that when these experiments are performed once again, Dr. Gordon will know to pay special attention to those particular characteristics. Other experiments being performed in the lab include testing the specificity of regeneration (seeing if motor neurons regenerate into the motor branch of a nerve, and likewise the sensory neurons into the sensory branch of a nerve), and observing the paths that nerves travel upon reinnervation of a muscle.

Well, it certainly was eye-opening to be immersed in a lab environment. The lab is much more relaxed than i'd expected it to be: no dress code, no strict work hours. It is also much more of a social environment than i had earlier thought. At times when i was not occupied with my own project, i had the opportunity of watching others work. I watched as surgery was performed on rats and mice. I watched as the cryostat was operated...and, i also saw the grotesque process of fixing rat tissues. The experience has been very worthwhile, as expected. I have learned more in six weeks working than i ever could by reading a text book. I certainly know much more about nerves than i did on my first day. Not only have i improved my microscope skills, but i have also had the opportunity to get acquainted with a number of computer programs. Hopefully, some of the skills that i've picked up in the lab will be useful to me in the future. I am quite confident that they will.

And so, thank you Dr. Gordon, Cathy, Neil, Kitty, Sijun, Ted, Dan, Elliott, Gary, Kanna, and Kirsten. You have made my summer of '96 absolutely unforgettable!

Iva Cheung :-p
Department of Neuroscience
Dr. Tessa Gordon

*English is the only language which capitalises its first person singular pronoun. I have decided in humility not to do so in this report. After having learned as much as i have over the summer, i have realised that there is far more to be discovered, and "i" being only an ignorant and insignificant speck in our vast world of brilliance, do not deserve to be capitalised. :-p!

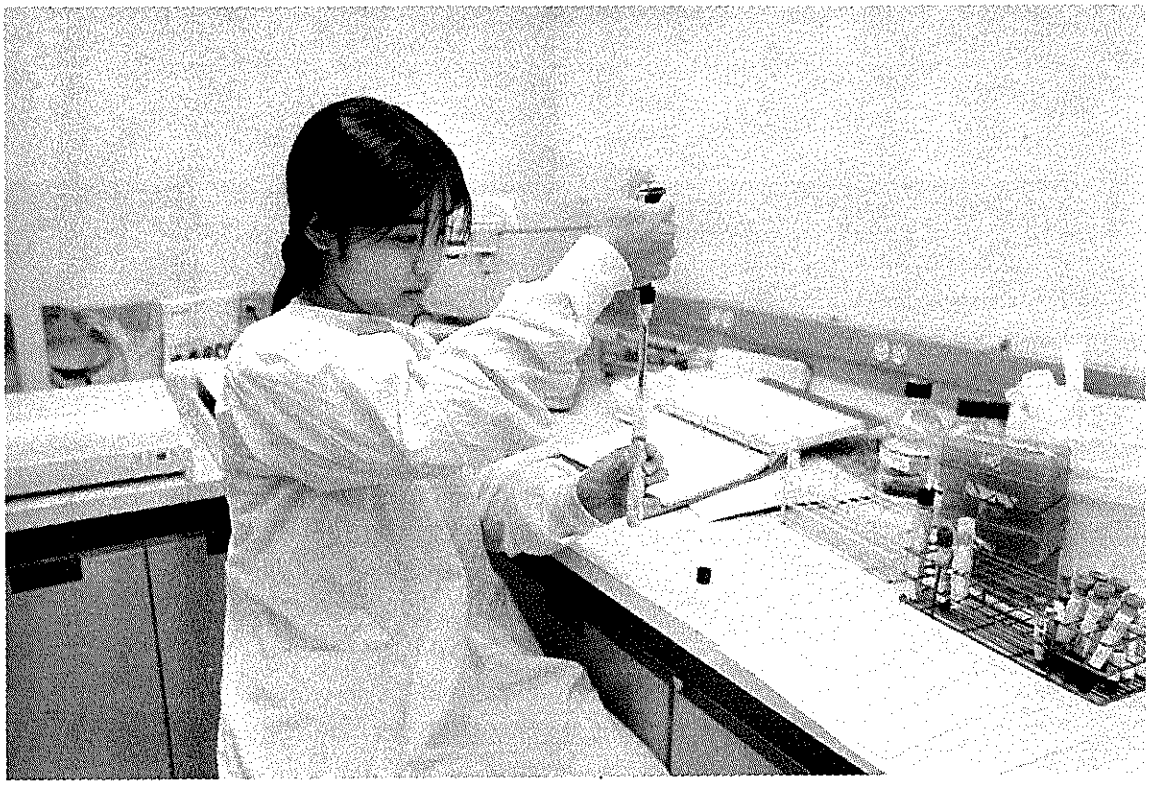


The Wisest Experience

Six weeks in the Department of Laboratory Medicine and Pathology proved to be an invaluable six week learning experience. In addition to the knowledge and skills gained from each project I undertook, there was also the laboratory experience from which I benefitted. Eager to begin, I could not possibly have been prepared for what the next six weeks would teach me. Under the supervision of Dr. Fiona Bamforth, I worked on a number of projects. Such projects included an assay on plasma porphyrins, in addition to an attempt to amplify and image DNA extracted from hair. In the midst of these two projects, I also had the opportunity to learn about "twin testing" which involves "DNA fingerprinting" to determine if twins are identical or fraternal. Thus, between porphyrins, DNA, and twins, one could definitely say that my six weeks were pretty busy.

My first project involved a method for determining the levels of porphyrins in plasma. Porphyrins are found in the non-protein portion of hemoglobin and function in the synthesis of heme. Porphyria is a disease caused by abnormally high levels of porphyrins which leads to clinical symptoms that may include extreme sensitivity to light, heavy growth of body hair, and severe anemia. Usually a patient can be diagnosed with porphyria by testing for increased levels of porphyrins excreted in urine. However, the patient of interest in my project was on hemodialysis and was therefore not producing any urine. Thus, I spent the next few weeks experimenting with a method for detecting porphyrin levels in blood plasma. The process involved extracting porphyrins from a plasma sample and scanning the extracted solution with a spectroflourometer. Because porphyrins have the unique property of absorbing light around 400nm, the spectroflourometer can detect the level of porphyrins in a given sample by emitting light of different wavelengths and measuring the intensity at which the light is absorbed. The higher the concentration of porphyrins in a sample, the higher the intensity measured at a wavelength of about 400nm. Through this process, a patient on hemodialysis can be tested for increased porphyrin levels.

I had always wondered at how a single strand of hair could connect a person with a crime scene as shown on television or in the movies (we all know how accurate Hollywood can be); for my next project, I finally got the chance to find out. I was given the opportunity to extract DNA from my own hair sample (it definitely takes more then a single strand of hair), as well as from hair samples provided by other people in the lab. The method involved the digestion of the hair using various reagents. Then the DNA was isolated through a series of extractions. Once the DNA was concentrated enough I could amplify it using a process called PCR (polymerase chain reaction). PCR amplifies a selected region of DNA exponentially so it can be viewed on an agarose or polyacrylamide gel. Following PCR, the amplified DNA samples are then applied to a gel and electrophoresed. Electrophoresis involves the running of an electric current through the gel to separate the DNA fragments according to size so that the separate bands can be viewed. Once electrophoresis is complete , the DNA is viewed under UV light (for a polyacrylamide gel) and a special camera takes a picture of the gel. The resulting photograph shows the bands of DNA which were amplified during PCR.



"Twin testing" also involves using DNA to determine the zygosity of twins (whether they are identical or fraternal). DNA samples taken from placental tissue or blood from the twins are prepared such that the separate bands of DNA can be viewed. Based on the position of the DNA bands, the twins in question can be classified as monozygotic (identical) or dizygotic (fraternal). While not directly involved in the zygosity testing, I did have the opportunity to learn a great deal about it. One of the aspects of the testing that I studied was some of the reasons why parents wanted to test for the zygosity of their twins. The most common reason was simply that parents wanted to know the answer when they were asked "identical or fraternal?" In many cases, a set of twins may have been identified as dizygotic at birth while parents may believe they are monozygotic, or vice versa. The only way to know for certain would be through DNA testing. Knowing the zygosity of a set of twins can also serve meidcal purposes, especially in the case of transplants or transfusions. I believe that in most cases, parents simple wanted to know as much as possible about their children, zygosity included.

Beyond everything I have learned about porphyrins, DNA, and twins, I have also learned from the entire laboratory experience. No matter how many times I have been told, the full realization of how repetitive lab work can be never completely dawned on me until I was the one who had to repeat the same experiment fifteen times. Yet by that same token, I never realized before how necessary it was for experiments to be repeated over and over and over to ensure consistency in the results. Another aspect of this experience which both suprised and pleased me was the fact that I could actually apply what I had learned in school while simultaneously learning things which simply cannot be attained from school. It was nice to know that the normal curves in math and the laws of physics actually had a place in the real world of science and were in fact applied on a regular basis. With any luck, I will be able to apply what I learned this summer in the all-too-real world of school.

Wendy Tran
Department of Laboratory Medicine and Pathology

My Summer With WISEST

This summer, strangely enough, was one of the shortest ones I can remember. I guess the days just flew by because there were so many things to do. I must say I am glad to have been a part of this: this was a great place to work and WISEST is a great program.

When I received the phone call that said I had made it into WISEST, I did not believe it. But when I finally did, I realized that it would give me an incredible experience that I could not get doing anything else. And, unlike school, I was looking forward to having this job.

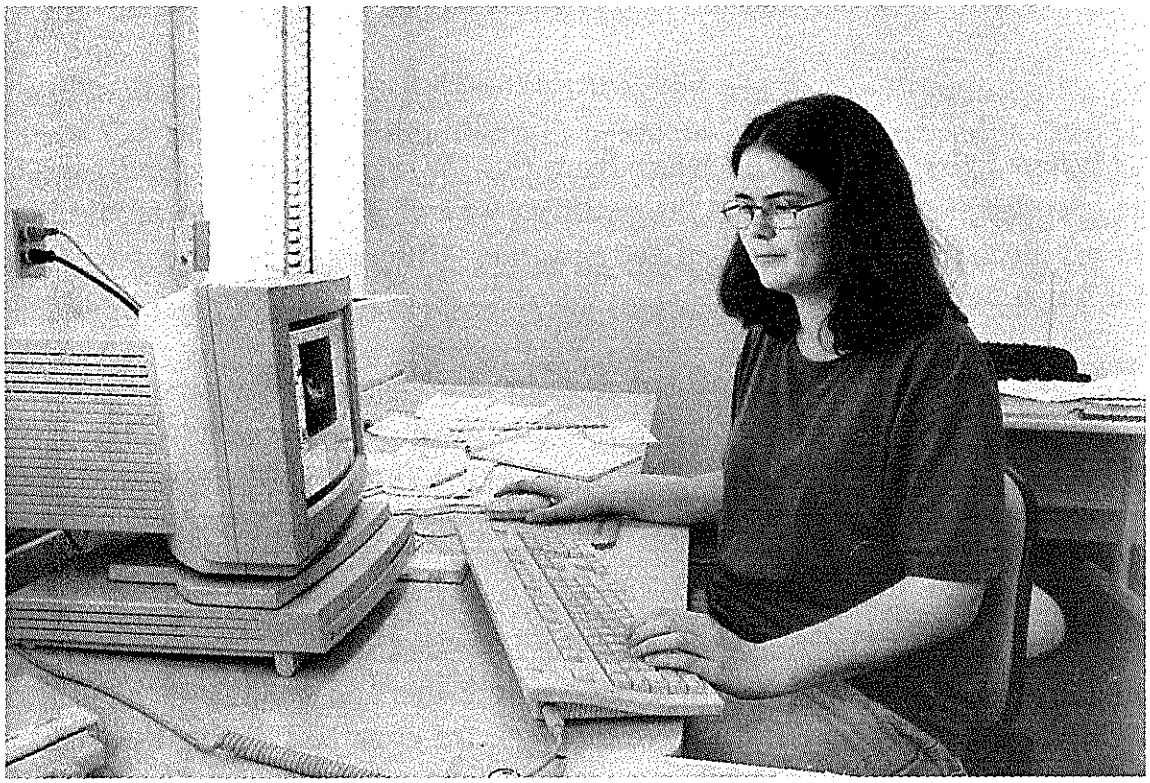
The bulk of my summer was sitting in front of the computer. What I got to do was: look at different images of the hand and wrist, locate the (median) nerve and trace it. The computer would take various measurements for me so we could see how the size changed, and how it moved in the arm. We would then compare these results of normal nerves to those that had carpal tunnel syndrome (where the nerve is large and swollen). Carpal tunnel syndrome happens when the tendons of the wrist start to rub (irritate) and put pressure on the nerve, so it becomes large and swollen (usually happens with people who use their hands often, like a typist). Comparing these results will show any patterns that damaged (or normal) nerves will take. The only thing is that we did not have enough time to compare enough nerves to find some patterns.

What we are really doing is studying damaged nerves. We are just starting with really simple damaged nerves (the median nerve with carpal tunnel syndrome) to work our way up to more complex problems, like those of the central nervous system. So, maybe one day paraplegics will regain full use and feeling of their lower body again. This is just one of the many uses this research has.

Probably, though, if I had to look at that computer for seven hours a day, five days a week for the full six weeks, I would have gone mad. So thank goodness when Krista needed some help with her experiments. It got me away from the computer and let me work in the lab.

So, I would just like to thank Krista Monagle, not only for that, but also her patience, Dr. Snyder for everything (which is too much to say) and everyone else in the computer lab for some pretty interesting conversations.

I would also like to thank WISEST for all the different Wednesday afternoon sessions and the various activities. The ones I most enjoyed were the trip to Syncrude Research Center (it was <u>very</u> interesting) and the trip to another research lab. It showed us what goes on in another lab of our choice (which was really great). And another great thing about WISEST, is that it is held at the University of Alberta, which is conveniently the



university I am going to go to (the program got me familiar with the campus and with the university setting).

Even though, talking to others, I did not do the type of lab work they did, I believe was lucky enough to have realized what exactly work and research is like. Research can be very repetitive (which I found out after just the first week) but also realized that it can be very interesting and mystifying. This certainly is not a summer I will forget. I will come away from here with a few dollars, lots of experience and having learned more here than anyone could ever teach me. It was a pretty terrific summer even if it was not as spectacular as some others. I think it was better.

Jennifer Fenwick

Chicken Summer

When I first opened the letter from the "WISEST" office, and found out I'd be spending six weeks out at the poultry research station, I was a little uneasy about my decision to be a part of the program. Chickens?!?!? I wondered what would be in store for me.

I soon found out what, indeed, was in store for me. My first day was... a trial. Seven thousand birds had to be moved out of their cages and onto a truck. I had hardly ever seen a chicken before, let alone carry six at once onto a truck. Let me tell you, it was a long morning. I did know, though, that after that day, the job could only get easier!

I soon learned the routine around the farm and settled into one of my own. Every morning, I started work in a barn where there is about 300 hens and 60 roosters in individual cages. We have to check for eggs laid during the night, and mark them down on a sheet of paper and then feed the birds. Then it's off to another area of the barn where we have to collect eggs from nest boxes. I really enjoyed collecting the eggs from the boxes because they were usually a little warm when the hens had been sitting on them. Also, some of the hens were really weird and it was fun to watch them.

I did many different things on the farm during the six weeks and some jobs were much more enjoyable than others. Some, like cleaning out pens and shovelling chicken poop were not at all fun, in fact, believe it or not, I hated them, and some of the jobs were quite enjoyable. I even got to go to Lillydale hatchery twice and see the chicks when they first hatch. THAT was fun! I have never seen so many cute little birds! Fuzzy yellow balls of fluff everywhere. It was wonderful!

The WISEST activities were great. The Syncrude trip was quite interesting, although it was a lot of information to digest in one day. When we had the lab tours, I chose to visit the swine unit on the University farm and found it to quite interesting. The piglets were cute and tiny, but the sows sure surprised me. I was thinking, "Okay, no problem. Pigs. Little, like Wilbur in *Charlotte's Web*" Boy, was I wrong! The pigs may be little when they're young, but after that, I swear, with a little paint, those pigs could pass as cows! But I enjoyed my tour and learned a lot about pigs. (Especially their size!)

Another activity I really enjoyed was the trip to the Edmonton Space and Science Centre. I haven't been there in years and I really enjoyed it. The IMAX presentation, Stormchasers, was good, although I can't figure out why anyone would want to chase a storm. The laser show was really good. It was like being a kid again and shining my flashlight on the ceiling of my bedroom, of course the "flashlights" in this laser show were just a little more sophisticated!

The WISEST program was an experience that I'm glad I didn't miss and I thank the coordinators for giving me the chance to experience the things that I did. I hope the program continues for many more years and gives others the chance to learn the same things I did.

Heather Gibson

The Computer-Assisted 3-Dimensional Reconstruction of Fetal Specimens

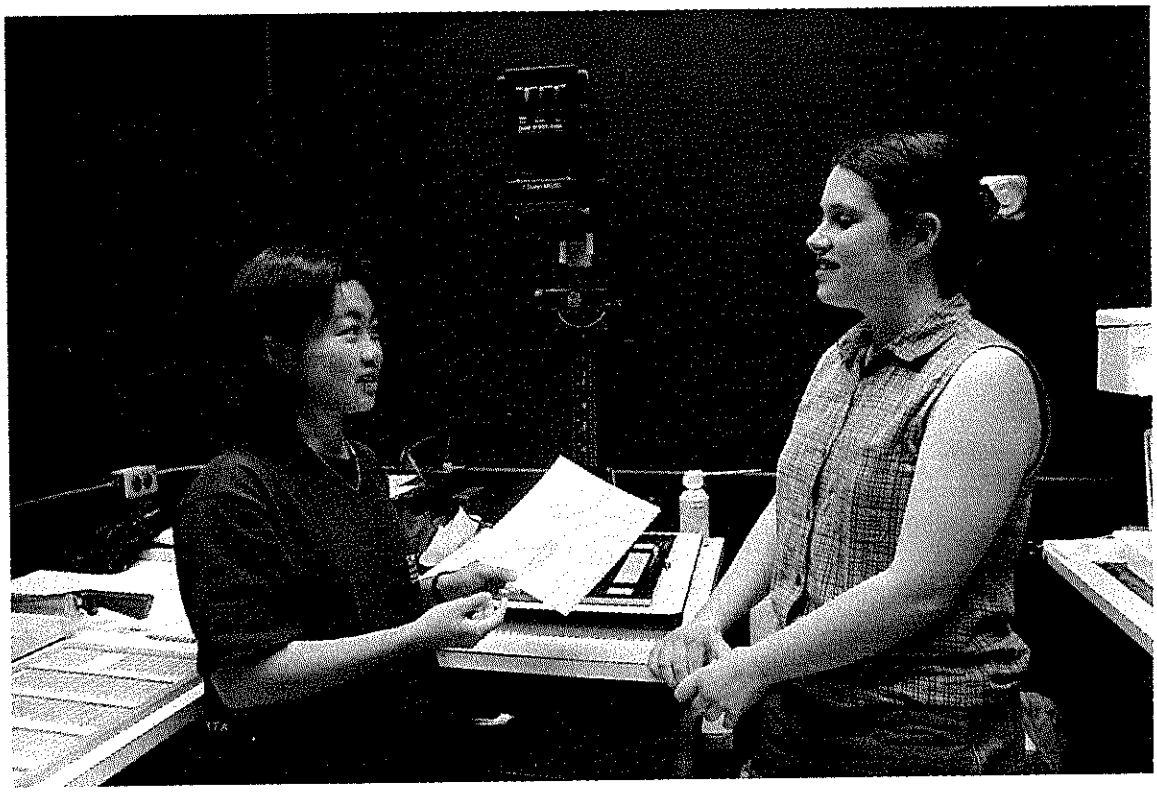
This summer we were assigned to work in the Department of Oral Biology, under the supervision of Dr. Sperber. Our project involved the reconstruction of donated fetal specimens, which enabled us to study the development of specific structures of the head, especially in the ear.

For the past six weeks, we have been reconstructing two specimens; the first was eight and a half weeks old (approximately 3 cm long) and the second was about forty nine days old. Prior to our arrival, the specimens had been sectionned at a thickness of 10 um, mounted onto slides and stained by a lab technician.

In order to properly reconstruct our specimens we had to follow many steps, some requiring more concentration than others, all essential in order to get an accurate recreation of the specimen. We discovered that planning, preparation and consistency are equally important in research.

The first step was histology, the viewing of our specimen underneath a microscope. Initially we had great difficulty visualizing and identifying all the different structures but with time it became easier. Since we were only concerned with the head region, more specifically the ears, we marked the slides which were to be photographed and were able to proceed to the darkroom.

The next steps, photography and photocopying onto transparencies, allowed us to enlarge the sections in order to be able to trace out specific structures into the computer. It is also easier to identify structures when the image has been blown up. Before we were able to get on the computer we had to outline the structures on the transparencies and then stack each page. Stacking involves the superimposition of each image and the best-fitting of each structure. This step is important in order to get an accurate recreation of the specimen.



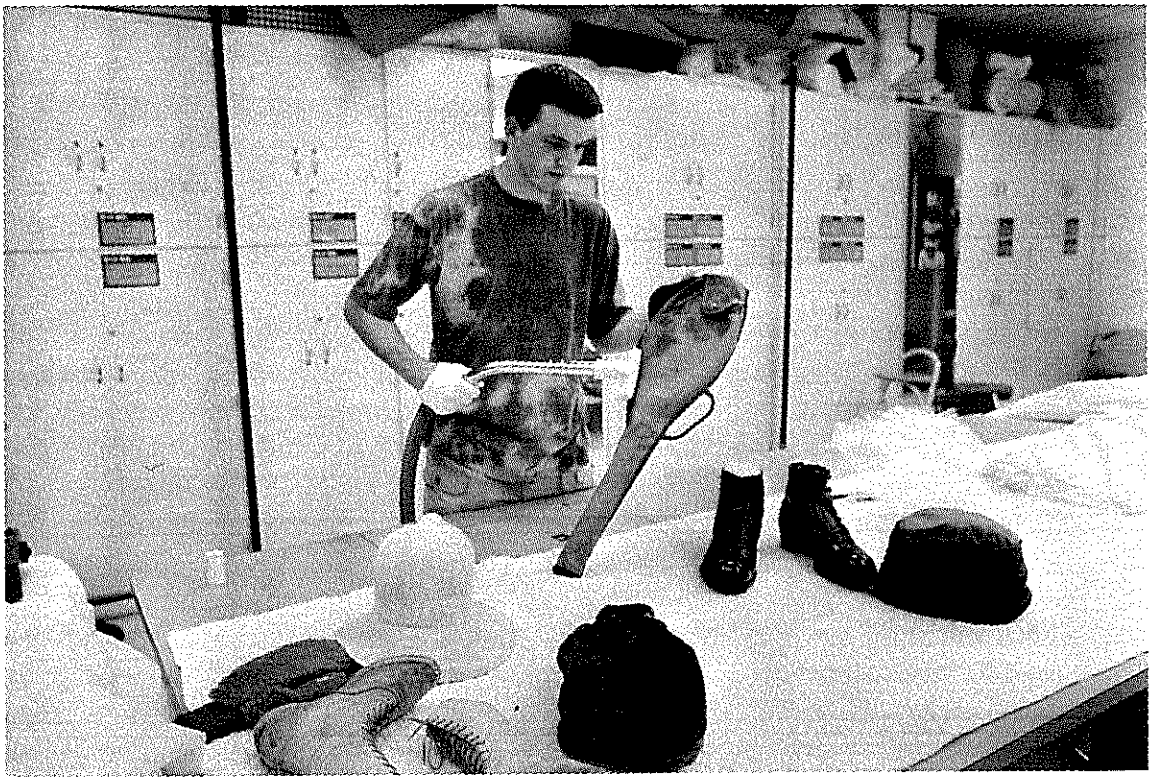
Learning how to use the computer program AutoCAD and doing the actual data entering is what took the most time and concentration. We started off fairly slowly, but now that the summer is almost finished we are able to enter the data at a reasonable and constant rate. Once the structures were all traced and named, AutoCAD was used to form wire-mesh images of the reconstructed structures. This enabled us to transfer them to another computer program, 3D Studio, and animate each structure. The finished product was stunning; we couldn't believe what we had accomplished!

This project allowed us to further our knowledge of human anatomy and learn what research is and what it involves. We would like to thank Dr. Sperber for this wonderful and interesting opportunity, and Steve for his guidance and help throughout the summer. As well, we were able to get aquainted with the campus and university life in general. This summer has proved to be essential in our intellectual and personal development and will definitely be a summer that will remain with us for years to come.

Krista Rondeau
Charissa Wong
1996

During my time at the University of Alberta I had the pleasure of working in the Clothing and Textiles Collection in the Department of Human Ecology. During the first two weeks my job was to familiarize myself with the University library system through researching and collecting information. The research which I performed was on sports clothing for women in the 1800's. The information collected by me was later used in a exhibition which was presented by the members of the Clothing and Textiles Collection in early August. After I concluded the task of collecting information from the library, I started to work with preparing the exhibition. In creating the exhibition all the necessary contents which later were presented at the exhibition had to be gathered. The most important component was the collection of authentic sportswear from the appropriate time periods. Most of the artifacts used were donated to the collection by people from all over Alberta. Before the artifacts could be prepared and presented however, they had to be inspected and a condition report had to be written on them. The inspection of all the artifacts and the condition reports were my assignment in the preparation for the exhibition. In inspecting the artifacts great carte had to be taken while handling the artifacts since most are quite old and fragile; it was crucial therefore to wear gloves at all times during the inspection in order to prevent any staining due to the oils from the fingers. Following a careful inspection of the artifact, a condition report had to be written. This report gives detailed information about the condition of the artifact, informs how to handle the artifact and gives a recommendation on what must be done to restore the artifact. In inspecting the garments, I looked for such things as tears, stains, loose threads and any other damage which were to be included in the condition report along with a recommendation which suggests on what actions must be taken to correct the reported damages. Next, the artifacts had to be repaired as indicated in the condition report. Due to the fact that most of the artifacts were in pretty good condition, very little repair had to be performed; the most common problem was with large amounts of dust accumulations on the garments which had to be carefully vacuumed off. The purpose of this was to restore the garments to their original appearance.

After the exhibition I conducted an experiment which was aimed at designing a new material that could be placed over artifacts in order to prevent dust from the vents from soiling the garments. In the



experiment, nine different materials were used which were placed under vents in various rooms to see which material prevented the penetration of dust through it. I was unable to receive any results because the samples of the materials must be kept under the vents for a couple of months in order to determine which material works best. Once the samples are collected, they will be analyzed using a colorimeter, which measures the amount of light that penetrates through the sample to determine which sample is most effective in preventing the penetration of dust.

In conclusion I would like to say that I really enjoyed my time working in the WISEST Summer Research Project because it exposed me to the University, it allowed me to experience a field of work usually dominated by females and it also allowed me to learn about different departments like physics and engineering. Even though I was only one of the 2 guys in the program I felt that everyone treated me well and with respect. The Wednesday sessions were particularly interesting in that they allowed all program participants to share their ideas and experiences in their field of work. I would like to thank my supervisor Anne Lambert, Karen Liebel, and Bonnie for assigning numerous tasks to me and for making sure that my time at work was spent efficiently and productively. I would also like to extend my gratitude to the WISEST administration for creating the program and making it a great success.

Greg Nowak
August 14, 1996

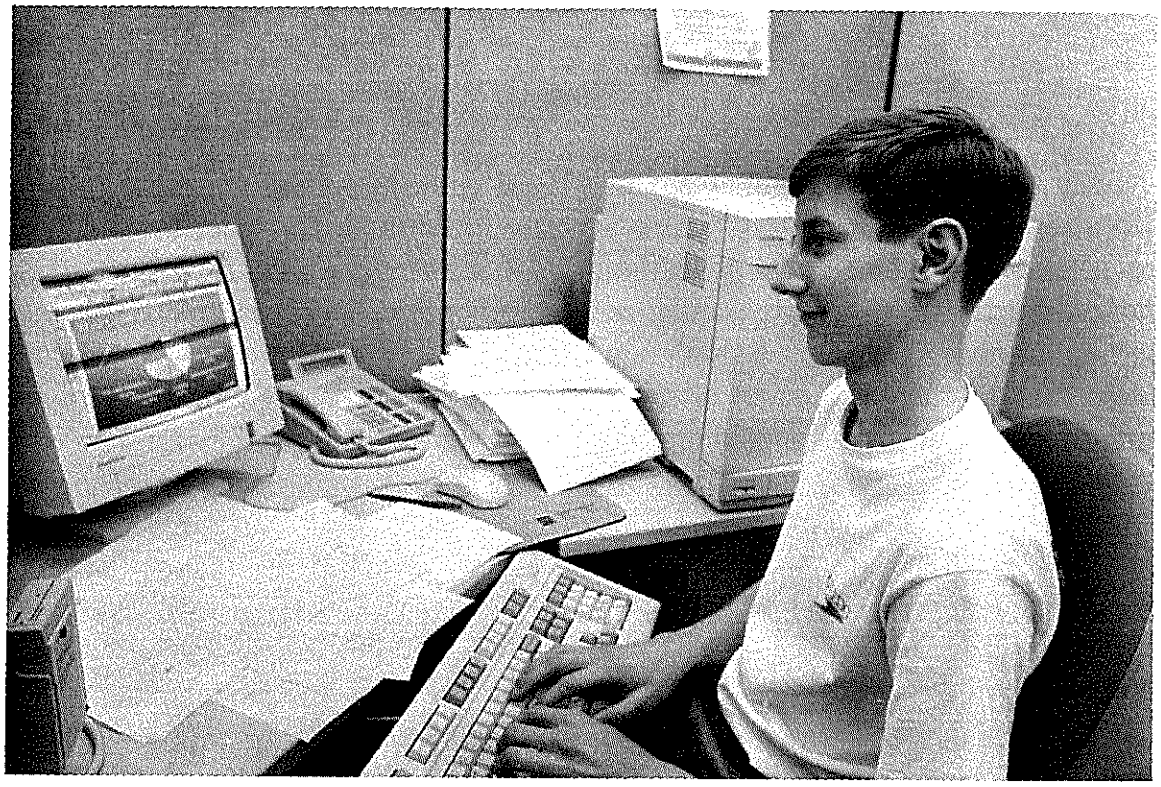
My summer job at the Faculty of Nursing has proven to be an enjoyable and invaluable learning experience for me. My professor was Dr. Janet Ross Kerr, but I worked mainly under the supervision of Dianne Godkin, the public relations coordinator for the faculty.

The main project that I was helping with had to do with seniors and health promotion, called ALIVE (Active Living In Vulnerable Elders). It is aimed at the seniors living in three subsidized housing units in downtown Edmonton who are at risk of developing illnesses and a loss of independence. I have learned the importance and benefits of such studies, and now know that as the number of seniors grows in the following years, the needs for programs to be implemented that will allow the elderly to maintain and improve their health status on their own, without the need for professional care services, will increase drastically. I was also fortunate to learn about things such as the various instruments and scales used to score and interpret the data for such studies. Much of my time helping in the project consisted of making slide presentations which will be presented in upcoming conferences later this year. The slides are made on the computer and then exported onto negatives. The slide presentations usually gave information concerning ALIVE and included charts and graphs discussing results.

Part of my job encompassed the use of several research tools, and I was fortunate enough to learn and use these as well. I learned to use the GATE and the nursing database, CINAHL, and how to find the requested material at the libraries. I also used a computer a lot, and since I had never used a PC before, only a Macintosh, I learned the in-and-outs of such a computer system, and the useful programs on them, such as WordPerfect and Harvard Graphics. A very interesting part of my use of the computer was searching the World Wide Web for home pages and articles on the area of my research. As I had never used the web for such a purpose before, it amazed me as to the diversity and practicality of it being used as a research tool. My experiences in this job helping in research will be useful in any career, as it showed me some of the processes that go on in such projects.

One thing that I also enjoyed a great deal was my experience outside the campus, such as my trips to PIN House (People In Need) and the Home Care Centre. At each place I followed a nurse around for the day to see what they did and what they encountered in their jobs. In some cases, I did things myself, such as taking a person's blood pressure. Since I had been working with research all summer, it was different to see the applied, or hands-on part of nursing. It was quite interesting and I liked it quite a bit.

Not only did I learn many things about nursing, I also learned a quite a bit about the University in general. As this was the first time I had been to the University, I learned the locations of buildings and services, and how to get around. I also learned what it was like at the University, and the diversity of people there. As I will be going to the University in a year to continue my education, I know I will find this previous knowledge of the University very helpful. The WISEST activities that most of us participated in, such as the weekly picnics and the trips to Shakespeare in the Park and the Edmonton Space and Science Center, also helped to make the atmosphere of the University change from somewhat intimidating at first to quite pleasant.



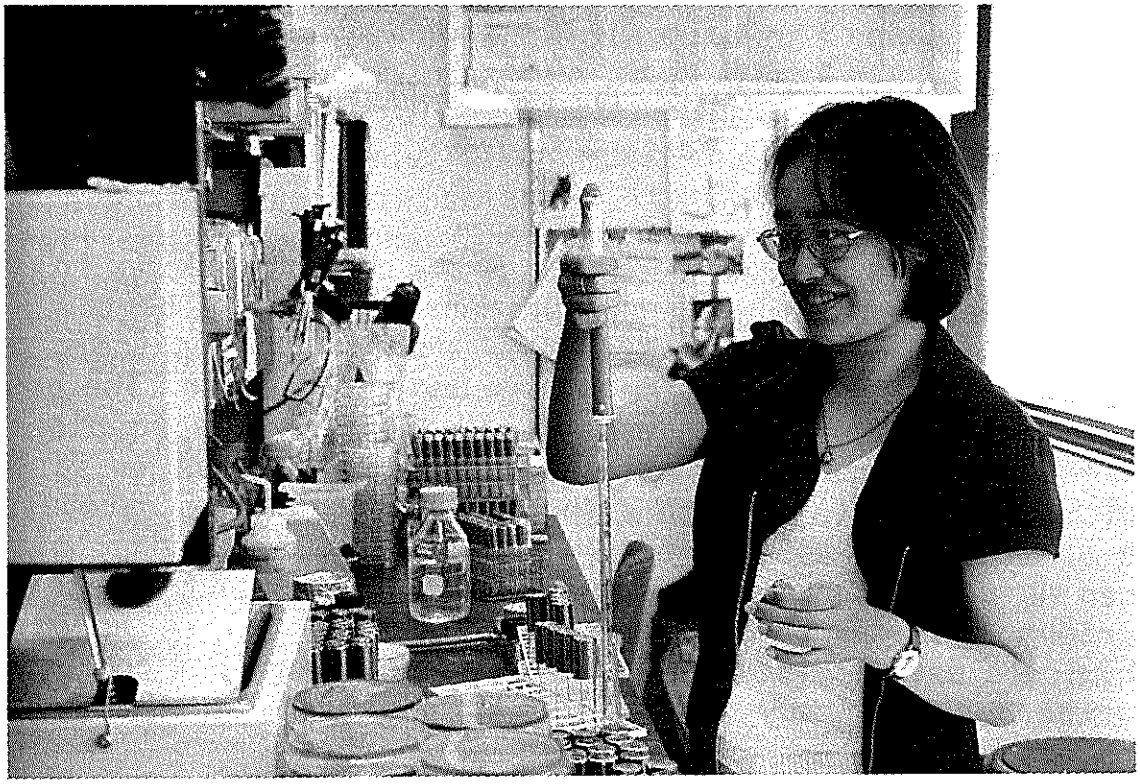
All in all, the summer has been one big learning experience for me. When I applied for the program, I didn't know what it would be like or what I would be doing, but the program has lived up to my expectations. I have enjoyed it a lot, and hopefully will be lucky enough to find another job with coworkers that were as friendly and as supportive as mine in the future. The things I learned were interesting, and I will no doubt use them in the future, whether in another career, or while furthering my education.

Kevin Bilesky

My name is Jiao Yang. I am a WISEST student working in the Department of Biochemistry in Dr. Susan Rosenberg's lab. My first week here at the lab was quite challenging. I probably learned more about genetics and biochemistry than I will through grade-school. But through much guidance, as well as patience from the students working in this lab, I think that I finally grasped some of the concepts of recombination and adaptive mutation in *Escherichia coli.*

In my first week here at the lab I worked with a former WISEST student, Kim Ross, on her project. She was removing nucleases from cells and asking what effects these changes have on mutation rates. Nucleases are enzymes which chew up DNA. We found out that the more nucleases that are removed, the higher the mutation rates. After this project I was more familiar with my surroundings and so I moved on to my own project.

My project was to test if adaptive mutations were RecA-dependent in slow growing populations. In this lab we called these mutations SLAM, an acronym for Stressful Lifestyle Associated Mutations. As a grade 11 student the only labs that I did in high school were all out of old text books which were used by millions of other students. And if by chance the labs at school failed then we would simply move on to the next topic. But in this lab I was the first ever to tackle the problem of RecA-dependency of adaptive mutations in slow growing populations. And if the results contradicted my predictions, I had to find out why. This was a new experience for me. After gathering all of my data, the fun part came. I interpreted what all the numbers meant. To me this was like a jigsaw puzzle and I was the one who got to put all of the pieces together. The results I found were all very positive. When RecA was removed, mutation frequencies were dramatically lower as compared to the parental strain. Because of my results we can safely conclude that SLAM is RecA-dependent in slow-growing populations. For many people in this lab the results mean that they no longer have to rif plug (a technique that is used in this lab to make a daily count of the populations on the petri dish) everyday for 2 hours to make sure there is no or little growth in the population of cells. Thus, their valuable time can be spent doing other experiments. In school labs the results never had such a dramatic effect on people. This was a new and exciting experience for me!



Not only did I learn a lot about science, I also had tons of fun in this lab. I have made many good friends and now it seems that I have a home on campus. WISEST is definitely a program that I would recommend to my friends. It is a unique program that allows young adults to explore their possibilities for the future. For me, I now know that I am definitely entering Biochemistry next fall. This was a great experience and a terrific way to spend the summer!!

Jiao Yang

MY SUMMER WITH THE WISEST.

By Tatiana Soviak

During the past six weeks I was working in the Chemistry department of the University of Alberta. My supervisor was Dr. Margaret-Ann Armour and my immediate supervisors were Dr. William Hunter and Sara Salmon. The group I worked with is developing and testing new ways to dispose hazardous and left-over chemicals. My project was to find a quick and efficient way to dispose a chemical named pyrogallol (a benzene ring with three OH groups on it). Pyrogallol is used as a developer in a photography and for manufacturing of various dyes. This compound must be converted in harmless chemicals before discarded since it is poisonous and corrosive. Furthermore the way pyrogallol is disposed of now by the process of incineration, burning it in a high temperature, is very expensive.

Different oxidizing agents could be used to break the benzene ring and thus destroy the chemical. First I tried to use potassium permanganate. After adding $KMnO_4$ to the 1% pyrogallol solution I took samples at one, two and three and a half hours. Then I ran the samples on the gas chromatographer that detects what chemicals are present in a compound. The gas chromatography results showed that the two hours' sample contained only 40.5% of the original pyrogallol and there was no pyrogallol present in the three and a half hour's sample. Although the potassium permanganate did destroy pyrogallol it cannot be used in large quantities since during the reaction it releases manganese ions and there is a limit to how many of them could be present in atmosphere. Therefore I tried to use different oxidizing agent -- ammonium persulfate. In course of the reaction it produces ammonia and sulfate salts that are used in fertilizers and thus are present in the atmosphere in large quantities. As a result there would be no additional harm done to the environment. I repeated the experiment using the ammonia persulfate and took one and two hours' samples. The gas chromatographer showed that there were 59.2% of the pyrogallol present in the one hour sample and there were none left in the two hours' sample. The reasonable conclusion is that ammonium

persulfate destroys pyrogallol quicker then potassium permanganate.

The WISEST Summer Research Program did not only introduce me to the university, research work, and other people who are interested in sciences it also provided a useful experience in various "non-traditional" areas of work. Wednesday afternoon sessions gave me insight into the industrial research (tour of the Syncrude Research Center) and different areas of science, engineering and technology.

It is very important for the WISEST to continue its work, to help others in choosing their future careers, and to present the importance and value of research and science to the young people. I thank everyone who made this program possible and I hope that future high school students will be able to have the same experience as I had this summer.

Wisest Summer Research Report
Janice Bolen

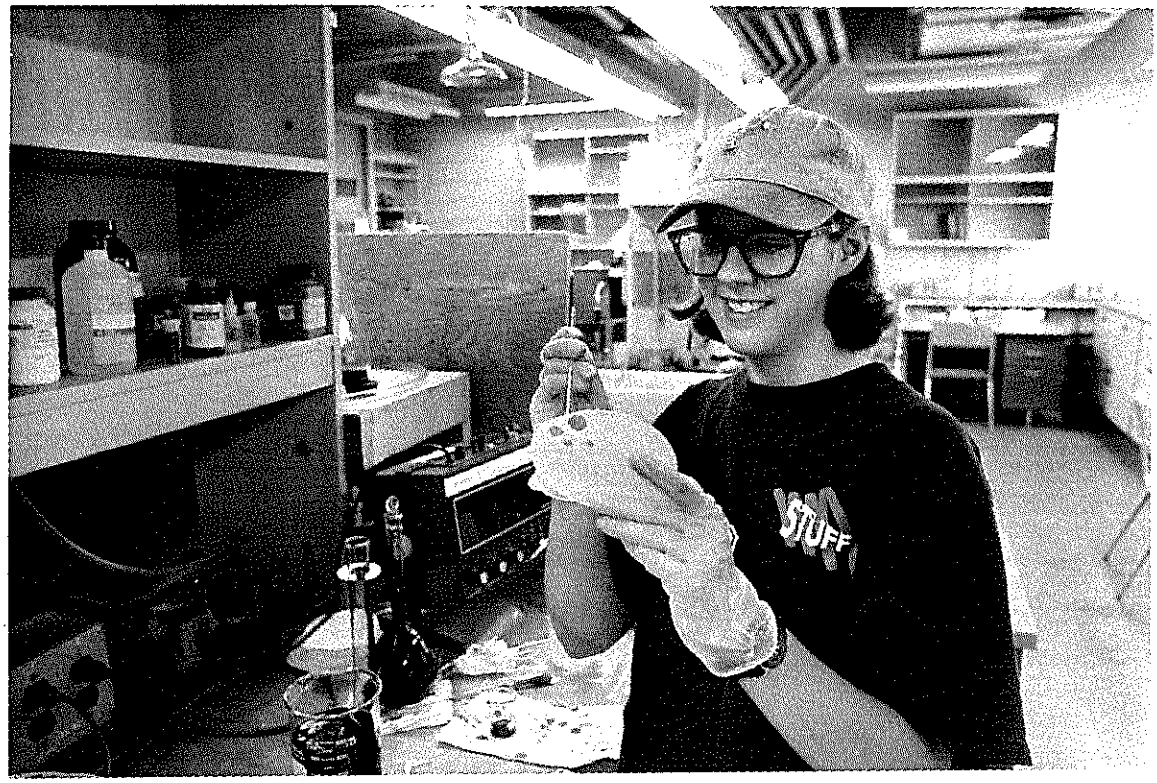
I have spent the summer in a soil science lab in the chemistry department. I have carried out an experiment to determine how sample preparation affects the surface area of clay.

I used a compound called methylene blue (MB). On clays, there are ions on the surface, so when the MB was added to the clay solution, the MB would take the place of the ions. The clay would then become dyed blue. At this point the amount of MB absorbed by the dye could be determined using one of two methods.

The first is called the spot test method. It involves titrating the MB into the clay solution, in 1 mL increments. A drop of the clay and MB solution was put on filter paper. When a blue halo formed around the dyed clay, the endpoint had been reached.

The second method uses a spectrophotometer. An excess of MB is added to the clay solution, and the dyed clay allowed to settle to the bottom. On top of the dyed clay portion of the solution there would be a blue water layer. It is in the blue water that the excess MB is contained. Part of the top water would be withdrawn, diluted and the absorbance measured using the spectrophotometer. Knowing the amount of MB added in the beginning, and excess MB as measured by the spectrophotometer, can tell you the amount of MB absorbed by the clay.

In my opinion the spectrophotometric method is faster, easier and more reliable than the spot test method. The results do not depend on who is doing the test, as the spot test method does. Neither of these methods are really good and I believe a better method can be found in the future.



Generally the MB absorption was most when the samples where sonified (same as ultrasound), followed by dry grinding, no preparation, and wet grinding.

The amount of methylene blue absorbed and therefore the surface area of the clay compared as follows;
Na-Montmorillonite > Ca-Montmorillonite >illite > kaolinite.

The results obtained using the two different methods were similar, (around 10% difference, probably due to the different amount of time the clay was exposed to the MB).

This summer I have learned a lot about chemistry and what research is really like. I enjoyed being a part of the Wisest program and would like to thank the organizers and sponsors. Also, thanks to Renate for organizing the social activities.

I would also like to thank R. Shutte, K. Donkor, X. Li, and Dr. Kratochvil for their time and help.

Recombinant DNA and T4 Bacteriophage

Tina Dasgupta

Under the supervision of Dr. Linda Reha-Krantz and her student Ms. Kelly Murphy, it was my pleasure to work in the Department of Genetics on a project involving T4 bacteriophage, DNA polymerase, genetic mutations and recombinant DNA.

DNA polymerase is an enzyme that, with the assistance of other polypeptides like helicases and primosomes, synthesizes DNA. T4 DNA polymerase is encoded by the 898 codons of gene 43 (g43) in the viral genome. In order to determine in part how replication occurs and malfunctions, Dr. Reha-Krantz has devised a set of experiments which involve creating g43 mutations and examining how the resulting polymerase functions. There are three previously isolated mutants of T4 with which I worked:

a) The first is A777V, an OptA sensitive ($OptA^s$) mutation of g43. When translated, the wild type or original amino acid Alanine on residue 777 is replaced with Valine. A conditional lethal mutation, OptA sensitivity implies that the bacteriophage cannot survive under low nucleotide levels due to excessive DNA polymerase "proof-reading"[1] activities when infecting an OptA1 host that produces dGTPase[2].

b) A phosphonoacetic acid sensitive (PAA^s) suppressor mutation that suppresses the OptA sensitivity of S411T-L412M (TM) is the second. This suppressor phage dies on PAA media. The principal difference between A777V and TM is there relative locations on g43: TM lies somewhere about the middle, while A777V is on the 3' end.

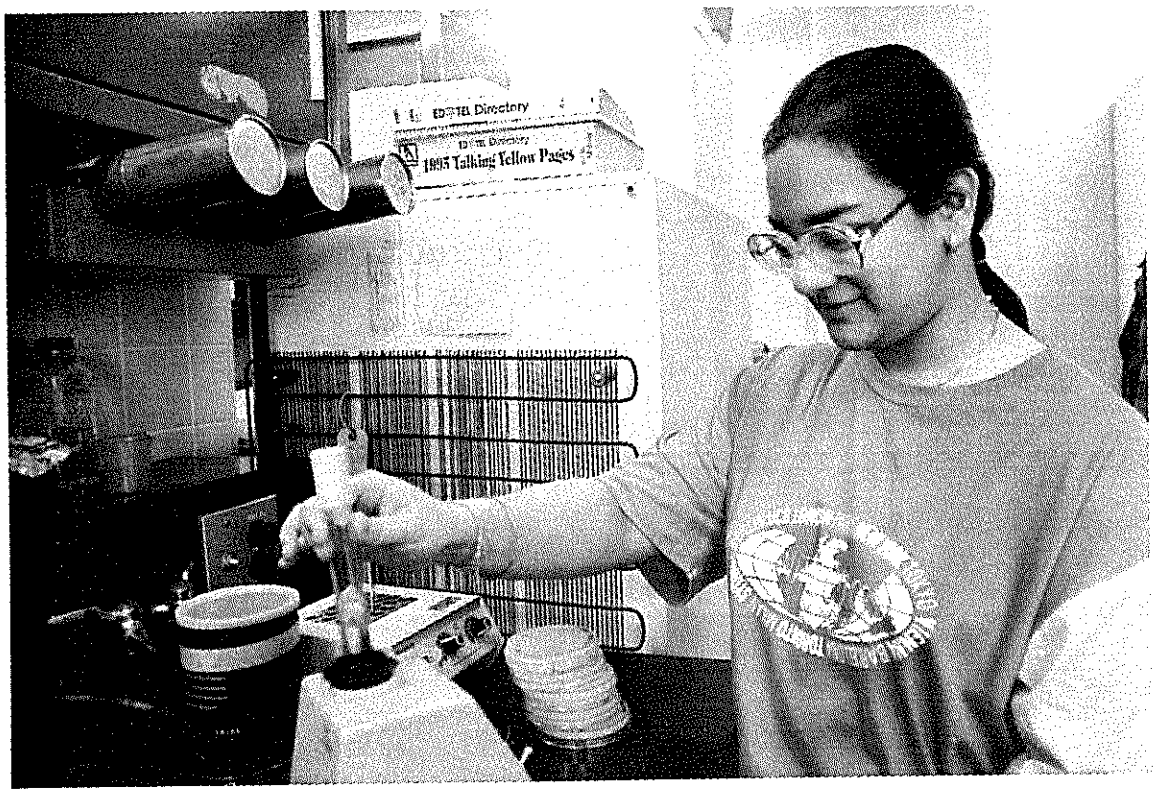
c) An amber mutation, C798am is a CUA stop codon at nucleotide triplet 798 of g43. This prematurely stops g43 mRNA translation, and thus an incomplete and ineffective DNA polymerase is formed. Unless a mutant tRNA with a CUA anticodon exists to incorporate an amino acid during translation, protein synthesis ends too quickly and functional DNA polymerase is not formed. DNA replication stops, and T4 phage progeny are not produced. Bacterial hosts (strains of *Escherichia coli*) with the mutant tRNA's are said to be "permissive" (i.e. non-lethal) to ambers, while those which do not are named "restrictive" (or lethal).

It was my project to determine whether the PAA^s suppressor can suppress the conditional lethality of A777V as well as that of TM - that is, is the suppressor global or specific? This will help characterize the function of the unknown suppressor protein and its interaction with DNA polymerase.

Before any suppression of $OptA^s$ can be measured, A777V and the suppressor must be in the same T4 genome. To produce such a bacteriophage, the suppressor DNA is recombined with that of A777V. This is done by adding phage of both kinds to permissive host cells and allowing the phage to infect the bacteria. Since lytic phage dissolve host chromosomes and start replicating their own DNA (to produce progeny) after infection, if two different phage infect one cell, then their DNA can recombine during the process of replication. Progeny of four types can be produced: either of the parentals, wild type, or recombinant. Recombinants can be selected because they are restricted on different hosts. (e.g. $OptA^s$ mutations die in OptA1 hosts, etc.)

Recombination was to be carried out in two steps. First, C798am and the suppressor were crossed to facilitate characterization in the end. To discover phage progeny that are recombinants, many phage plaques were allowed to infect different hosts in different media (by replica plating).

[1]Proof-reading means removing and replacing misincorporated nucleotides. Excessive proof-reading sometimes removes nucleotides that are correct as well and wastes energy as those nucleotides must gain a pyrophosphate again.
[2]dGTPase is an enzyme that breaks up dGTP's. (dGTP is a guanine nucleotide and sometimes a source of energy)



If a phage is restricted on media where both C798am and the suppressor are restricted, then it should have the double recombinant genotype of C798am+suppressor. A phage culture was then made of suspected recombinants, titred, recharacterized and back-crossed to be certain of its genotype. However, though PAA^s and unable to grow without mutant tRNA's, the phage back-crossed proved not to have the recombinant genotype. This may be due to the fact that the suppressor has a low rate of recombination, or that it will not recombine with C798am at all. The experiments will be completed at a later date when the double recombinant is crossed to replace C798am with A777V.

This is what I have experimentally accomplished in the past six weeks. My laboratory technical skills and insight in the area of genetics were enhanced tremendously during this time, and, for this, I must thank Dr. Reha-Krantz, Ms. Murphy and all the other members of the polymerase laboratory. Their patience and much simplified explanations of complex concepts encouraged and enabled me to understand my project and its purpose.

If one were to ask me my opinion of the WISEST programme, I should say that I found it to be educational and enjoyable. Textbooks inappropriately portray scientific research to be an effortless process based on well-drafted experiments and no ambiguities: much thought, much work and many control experiments result in real science. Very often, an investigation is not even planned - its necessity arises out of the previous day's results. The WISEST group sessions included a wide variety of information with examples of the application of theoretical science and instruction on the preparation of scientific reports. I thank the administrators of WISEST for giving me the opportunity to take part in this exciting programme.

My Summer at WISEST

When I applied for the WISEST program, I started to question my sanity. I figured that I would be spending the summer doing what I waited the entire school year for not to do. I was pleasently surprised when I found myself involved in an exciting experiment.(I believe it was the first time I have ever been excited about an experiment) Let me explain.

Hyluronic Acid (HA) is a molecule made of several thousand repeating disachrides units. It is found in all tissues and fluids in adult animals. The reason HA is important is that it is believed to aid in motility of lymphocytes and monocytes to areas of damage and cause (or aid in) inflammation at these sites. The hypothesis is that if you can inhibit the interaction between HA and its receptors on lymphocytes and monocytes, you will block their migration to areas of damage and therefore prevent inflammation. I compared the ability of the subsets of lymphocytes to bind with HA in patients with heart disease and inflammatory bowel disease (IBD) to normal controls.

The procedure I used involved human blood from patient with heart disease and IBD. I began by separating the blood by putting the blood over a Ficol gradient, which separated the blood into its different layers with the help of a centerfugue. I then took the lymphocyte layer and spun it down again and placed equal number of cells into 14 different wells of a cell culture tray. Then I attached fluorochrome which were conjugated to antibodies to the cells.I then ran them through a machine called a FACS. The FACS uses a laser to detect HA binding to subsets of lymphocytes, as well as other information.

The WISEST program was much more than a science program to me though. The program was about exploring different aspects and opportunities of university and science life, an opportunity that most high school students are unable to have.

Personally, that meant many things. I lived in residence at Lister Hall for the summer, which was an experience by itself, but that is a different story. As well, I, and the other Lister WISEST students, were able to explore Edmonton and take part in many of its festivals. We toured the Syncrude lab and learned about real life problems that are handled in labs. The attitude everybody had who contributed to the program was unbelievable. I was made to feel welcome at every tour we went on. The most important part of the program was all the people I met and worked with for the duration of the program, they will not be forgotten.

The WISEST summer science program let me experience the labratory science setting in an excellent enviroment. I learned many things about science, labratory work, and university throughout my six weeks. It was definatly the experience of a lifetime.

In closing I would like to thank Dr. Linda Pilarski for giving me the oppurtunity to work in her lab and taking the time to explain the many everything to me. As well, I would like to thank Renate Pfeiffer for being a great "big sister"

WISEST student for life,

Karen Nevett

Mirror Mirror on the wall, Who's the WISEST of them all?

(Rose for thinking up the great title)

When I found out I was accepted to the WISEST program I was excited but I was not sure what the experience would be like. My first day was quite long learning different skills required for the lab work I would be doing, and injuring my forefinger and ever important pipetting thumb. Nevertheless I learned fast what to touch what not to touch and what not to sniff. My lab is studying the loblolly pine tree (*Pinus taeda*) which is a native of the southwestern United States. Concentrating mainly on the processes taking place during early seedling growth. I found everything I learned and the experience quite enthralling.

The experiment set up for me to do dealt with the transport of broken down proteins/amino acids from the megagametophyte to the embryo inside the seed. This process is very important to nurture the embryo while it still cannot perform photosynthesis. I wanted to find out if I could make a better sink (like the embryo is to the megagametophyte) to extract the amino acids from the mega. My experiment involved plating mega halves on agar and the extremely absorbent Kimpack with a sucrose antibiotic solution in it. My results made my supervisor happy so it worked. It turned out that by transferring my samples every day there was a decrease in the amount of amino acids left in the megas and an even more decrease when plated on agar compared to the Kimpack. When I assayed the agar from my plates I was surprised to find that the amount of amino acids increased the older they were. I would of expected there to be more on the first day then on the last but the megagametophyte has to start to metabolize the proteins and then with each day the amount increases.

Other than my main experiment I harvested the cotyledons from young seeds for my supervisor's experiment. I did some work with a really fancy expensive microscope looking at prepared slides of loblolly seeds. I worked with liquid nitrogen almost every day and amazed my friends with it when they came to visit me. It is important for studying the processes occurring in different stages of the seed to stop everything happening inside the seed. Liquid nitrogen kills everything because it is so cold and that is why I used it often. As well as assaying my heart out, nasty chemicals like cyanide and ethylene glycol monomethyl ether were put into my hands to work with. My

friends wondered why there was no psychological evaluation performed before I was let into the lab.

I feel that my experiences from attending the WISEST program will be valuable to me in the future. My familiarity with lab life will help when I go to University. Moreover since I am interested in science as a career I can ask myself if this is what I want to do every day. Thanks to the efforts of my supervisor Janice, my supervisor's supervisor Dr. Gifford and everyone else in the lab (Sandra, Dana & Tito). I feel that my work this summer was good and I had fun doing it.

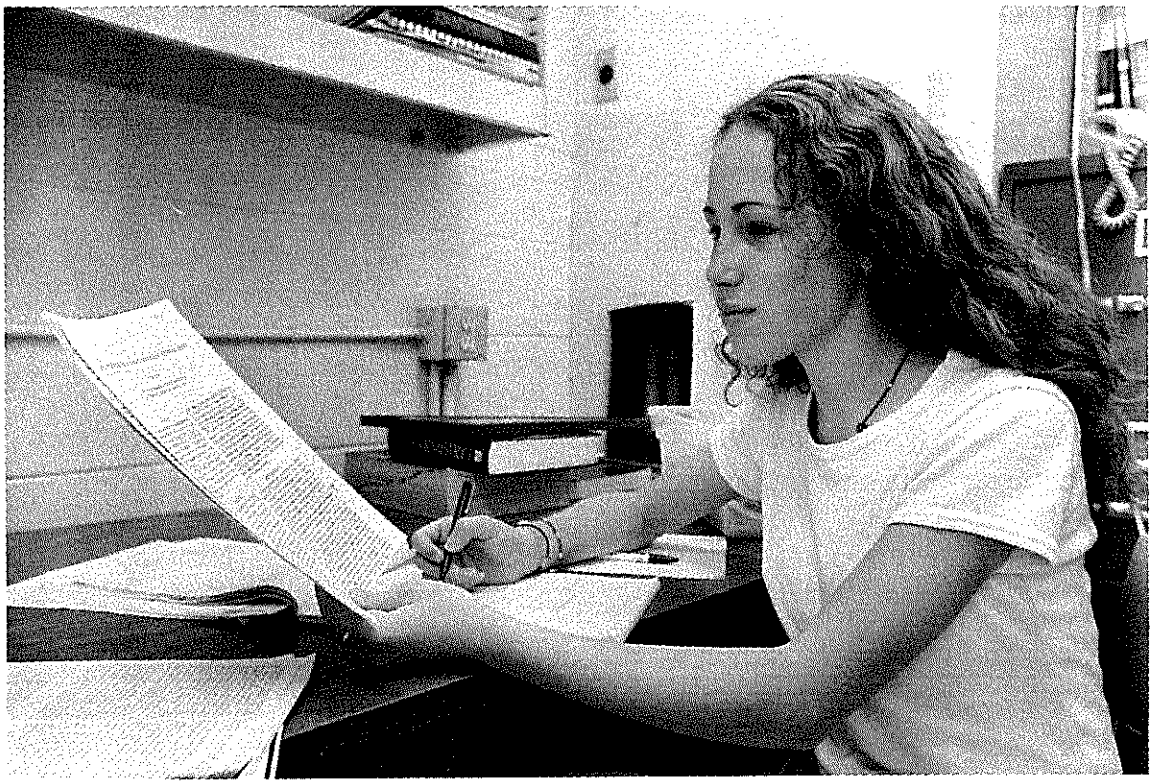
Tanya Foubert
Canmore AB

WISEST
Alberta Microelectronics Center

Last June, I knew absolutely nothing about microelectronics. When I received the letter from WISEST briefly outlining what I would be doing for most of my summer ("using hot caustics and measuring etch rates of Si and Al"), I was desperately going around to all my science teachers, trying to get an idea of what I had gotten myself into.

I am now conducting my own experiments and even understand what it is I am doing as well as the theory behind it. Most of my time was actually not spent doing experiments however. One of the first things I leaned was how much I didn't know. At first, I just followed my supervisor around, helping when I could, while she explained basic concepts in chemistry. Then, I had a lot of reading to do. University chemistry textbooks gave me the knowledge to comprehend some scientific papers on the etch solution I would be working with. The final paper I read was what my project was based on. I was trying to duplicate the results of the scientists who had written the paper. It reported the addition of dissolved silicon and strong oxidizers to a TMAH etching solution in order to make it more efficient towards etching silicon and at the same time, not etch aluminum or silicon dioxide.

However, I learned a lot more then how to use a machine to measure a layer of silicon thinner than a single strand of hair, or how to use a solution with a pH of 14 at 80 degrees Celsius safely. I learned what it is like to actually work in a research laboratory. I may have began doing experiments to find a specific piece of information, but soon I was doing a lot of work trying to figure out what went wrong with those experiments and how to solve the problem. Dealing with realistic situations was also a factor. The



frustrations of machines breaking down, the amount of work needed just to prepare for the experiment, and sharing equipment and lab space with other people were all things that became a part of daily life in the lab. Once the experiments began to work, though, it was gratifying to get results that others could use to improve their work.

I feel lucky to have had this opportunity to actually be able to work in a scientific lab and do important experiments and research. It was much more realistic than the labs I am used to in school. This experience has made me sure that I want to pursue a career in the sciences, and to continue my education at university after high school. I would like to thank Lianne Lester for all the time she has spent teaching and helping me and also all the people at AMC for making me feel welcome and making my first job experience an enjoyable one!

Rose Fuchs

Rose Fuchs

Doing Something Fishy at the Meanook Biological Research Station, with the WISEST Summer Research Program.

This summer I worked at the Meanook Biological Research Station near Athabasca, in Northern Alberta. I worked with Sue Kiesling, a graduate student, working on her Masters Degree, and her assistant, a former WISEST student Kathy Vladicka. Sue's main research objective was to determine the effect of nutrient enrichment on the size and abundance of young-of-the-year fathead minnows, *Pimephales promelas*. Other objectives were to determine if the intensity of size-selective mortality among young fish is influenced by growth rates and to quantify individual characteristics of eggs and young fish that affect growth rates and survival. Three experimental ponds were divided in half, and stocked with fathead minnows. One half of each pond was enriched with inorganic nitrogen (NH_4NO_3) and phosphorus (H_3PO_4). Nestboards were set up in each pond as spawning substrates for the minnows. When I arrived at Meanook I was too late to help setup the main experiment, but was in time to help setup two enclosure experiments. The first experiment was conducted to determine the effects of food (high vs. low) and the presence or absence of predators on the growth of young fish, and involved counting out thousands of tiny larval fish before placing them into small enclosures. The second enclosure experiment involved, again counting out thousands of larval fish for an otolith validation experiment. Otoliths are calcareous concretions in the internal ear of vertebrates and the discovery of microincrements in the otoliths formed on a daily basis permits the aging of larval fish. A relationship between otolith size and fish length as well as age can be used to determine growth rates, size-at-age, and hatch dates of the surviving young of the year fish and therefore indicate the intensity of size-selective mortality. Each of the enclosure experiments were conducted to validate different aspects of the main experiment in the ponds.

Various samples had to be taken throughout the season. Adult fish were collected, their lengths and weights were measured, and then returned to the ponds. Young-of-the-year fish were collected for otoliths, for lengths, and to be dissected to discover stomach content. Nestboards had to be checked every second day to quantify newly laid and newly hatched eggs. Phytoplankton and zooplankton were also collected bi-weekly, as well as various samples for water chemistry, which provided me with some lab experience. It was enlightening to realize the many many factors that need to be monitored and that could affect the research. Another thing that surprised me was the amount of maintenance that went into research, especially when you have several hundred fish to take care of!

Aside from her research, Sue Kiesling, also provided me many interesting papers and helped me set up a small experiment of my own. Fathead minnows are unusual in that they spawn on the underside of floating objects, and that it is the male that guards, protects and aerates the eggs. Even more unusual, the male fathead minnow will acquire certain secondary sexual characteristics to aid him in his job. Tubercles (bumps) on their snout and a dorsal pad develop and are used by the males to keep the eggs fungus free.

I was attempting to monitor this paternal care behavior, and to observe the appearance of the secondary sexual characteristics in a controlled environment, and not a pond. I was, however, unable to do so, as the spawning season was nearing completion before I was able to begin the experiment, but it was interesting and fun to try.

An advantage of being at Meanook was the variety of people you were able to meet, and the projects I could learn about. I was lucky enough to be taken out into the field one day by some birders who were investigating the effects of forest fragmentation on a type of songbird and was able to hold a baby bird. It is unbelievable how small and fragile they are! I was also able to spend a day with "the Fluxers", a research group from the US, who were investigating methane emissions and ventured knee deep through a bog that looked like an enchanted forest.

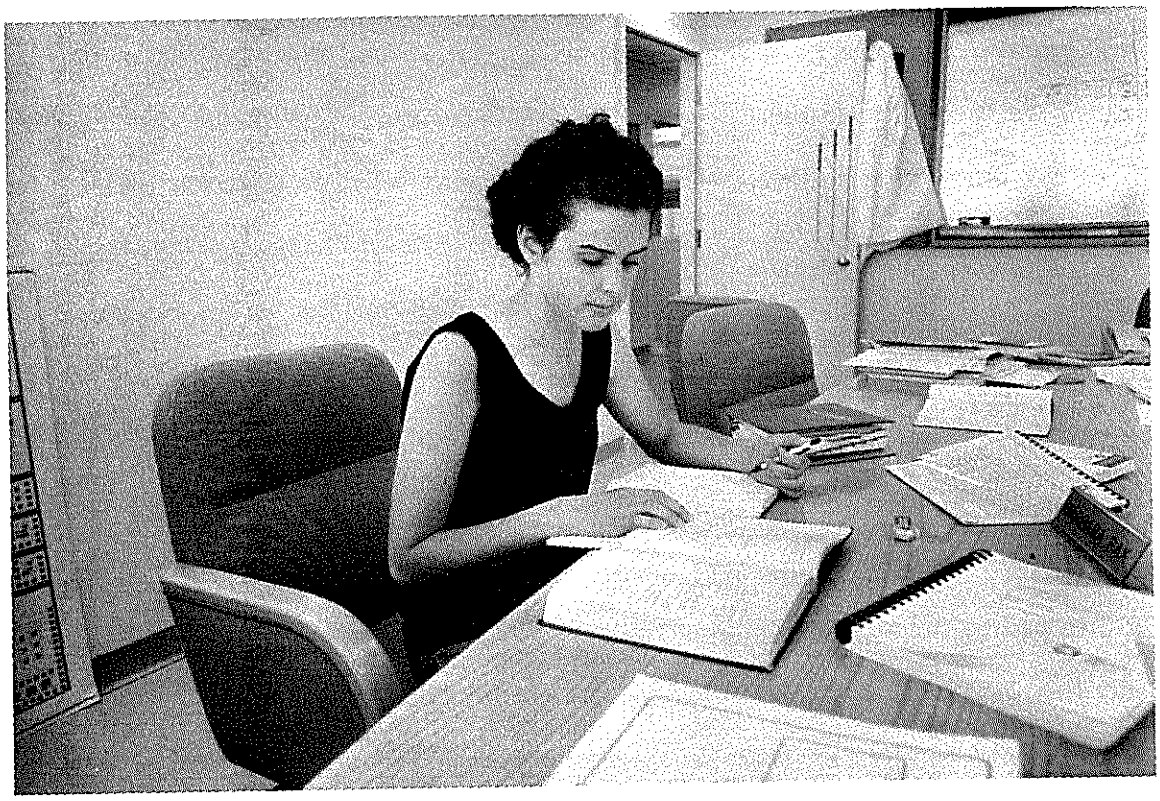
All in all my experience at Meanook was a wonderful one, and I would like to thank everyone there for their hospitality and kindness. I would also like to thank Dr. Tonn for all his advice and most of all Sue Kiesling for her patience and kindness. Thanks also to WISEST for the wonderful opportunity and experience.

Carmine Herzog

Barbara Pak

What I did at TRlabs

One of the projects at TRlabs was the making of microscopic lenses. On each small piece of glass, around three centimeters by three centimeters, two arrays of lenses were made by placing polymers onto the glass. One array contained around one hundred lenses. My job was measuring the lenses' diameters and focal lengths to make sure that they were close enough to the desired size, and that they were all the same size. To measure the diameters, the sample of lenses was placed under a microscope that was attached to a video camera. The video camera's image showed on a screen, which could be transferred to a computer screen. Using the mouse I drew a line across the diameter of the lens' image on the computer screen. The computer calculated the size of the diameter. To calculate the focal lengths of the lenses, the lenses were placed in front of a laser beam. A camera placed in front of the lenses showed the lenses on a television screen. The sample of lenses was held in front of the camera by a device that allowed the sample to be moved closer and away from the camera exact distances by turning a knob which had lines on it to record how much the sample was being moved. The sample was moved close to the camera to focus on the lens being measured. The number on the knob was recorded, and the lens was moved away from the camera, until it focused on the focal point. At the focal point, the beams of the laser were focused together in one small bright dot. The number on the knob was recorded, and the difference between the numbers was the focal length. One sample of lenses that I measured had lenses that were shaped as an ellipse, and were called anamorphic lenses. These lenses were designed to be placed at the opening of lasers, to make the beam circular. The opening of a laser is a rectangular shape, and the beam is elliptical. It is difficult to guide an elliptical beam through a fiber, but if an anamorphic lens is placed in front of the beam the beams shape will become circular. For the anamorphic lenses, I measured two diameters, and two focal lengths. At each focal point the light concentrated into a line. The two lines were perpendicular to each other.



Another project at TRlabs was the making of polymer wave guides. The wave guides are used in circuits, to guide light over small distances. On a small piece of glass, around twenty wave guides were made. Some of the wave guides were straight, and some were two way, or four way spliters. The goal was to make wave guides which had as small a loss of light as possible, and to make spliters that divided light evenly among the branches. I measured the losses of the wave guides, by lining up a fiber emitting a visible red light beam at one end of the wave guide, and another fiber at the other end of the wave guide. I lined up the fibers to get the smallest loss possible. The loss was measured in decibels by a machine which could measure the amount of light it was receiving from the fiber.

A TASTE OF THE LAB AND THE FEILD

This summer, I worked at the Meanook Biological Reasearch Station. It was a great time, made even greater by the fact that I got to work on two projects instead of just one.

The first was the water lab. Here, I didn't exactly have a project. In fact, the point of having the lab there was to analyse samples from other projects working out of the station. The two main ones were NCE and TROLS. They both basically do the same thing, that is sample boreal lakes, but they do it for different reasons. NCE (Network of Centres of Excellence) is working with Sustainable Forestry Management to gather baseline data on boreal lakes (that is, they're studying what no one has studied before). From analysing the water chemistry of these lakes (this is where I come in), they can more or less prdict the effects of deforestation.

TROLS has a much more specific project . They're looking at buffer zones, the forested areas left around lakes after deforestation. Specifically, they're studying what size they should

be. TROLS (don't ask me what it stands for) also has teams studying the biological aspect of the lakes: the fathead minnows. They're conveniently known as Team Fathead. I spent a day with them, or rather one of them, looking at nestboards in three of the lakes being studied (there are three sets of four lakes). And this time, getting there was definitely half the fun, because we used quads (all terrain vehicles with four wheels), another thing you don't get to do in other unversity labs.

Anyway, back to the lab. These two groups would send us samples, and we'd basically go through a drill of labelling, filtering, and analysing. Different samples would be analysed for different things, depending on what whoever sent them wanted. I became very good friends with the automatic titrator and the spectrophotometer, which we used for almost everything. And then there was always menial stuff to do, like washing dishes, which involved putting stuff in an acid bath, taking it out, rinsing it (at least seven times for each piece of equipment) and putting it in the dryer. It was a drill, just like the analysis, but then again, everything in lab work is. It might sound boring, but it really isn't, especially with people like Shelley and Andrea, my supervisors, to talk to.

The other part of my job (periodically I would switch off with Kirsten, another Wisest student) was working with the Fluxers. Their project was analysing methane emmissions from boreal wetlands. This is where I got most of my feild work. The fluxers have two feild areas: the fenn and the bog. Most of

the time was spent at the fenn, because of the easier access: not far from the highway, with only a dirt road, a dry path and a boardwalk to navigate. The bog is farther from the highway, and most of the way there is a path that could be described as less than solid. In fact, it was all wet, bootsucking sludge. In most parts, you'll only sink up to mid-calf, but there are some very deep holes which can be very hard to get out of without losing at least a shoe, as one person I was with found out the hard way (this was the third Wisest student, Carmine). But the same kind of research is being done in both places. Basically, they're working with the knowledge that methane is produced under the water level in anaerobic conditions, that some of it travels up through plants to be released into the atmosphere, some is just released in bubbles, and some is re-oxidized. Some of the things they're looking at are where the methane is released from the plant, what happens to it as it travels through the plant, how the methane is formed, etc. You might be able to tell that very little is understood in this feild. Fluxing, from which they get their name, is the part I helped with, and it involves drawing air samples every few minutes from closed chambers placed over groups of plants. It may not sound very interesting, but it's a small price to pay to spend all day in the sun.

All in all, there is nowhere I would have rather worked. Meanook is the perfect balance between labwork and feild work, and I'm glad I got to experience both. It was a great summer.

Heather Smith

WISEST, A Summer of Stinky Chemistry, and Me

When I applied to get into the WISEST program I didn't know what I was getting into. Into organic chemistry, that is, the stinkiest science field of them all. Still, it was great fun, well ...most of the time. My job description ranged from lowly lab glassware washer to operator of the infamously troublesome mercury microwave and vacuum system. But then how many people my age can say they know how to run a GC, how to crystallize a solid and check for purity, how a mercury microwave splits oxygen molecules apart, or has watched an experiment go up in flames, literally? Now I can say all that...and even more! I can say I had fun doing it.

This summer I worked with Dr. Dennis Tanner and two post doctoral fellows, Qizhu Ding and Pramod Kandanarachchi, in Organic Chemistry. One of the great things about working with Dr. Tanner in his lab, even if it was very stinky, is that I got to do a whole bunch of different things and I learned a lot of basic Organic Chemistry. I didn't work on just one specific project or perform one set of tasks over and over again like some WISEST students did. Instead, I worked on projects that Dr. Tanner, Dr. Ding, and Dr. Kandanarachchi each had.

Dr. Tanner's research is involved with proving how reactions take place in our body - whether by hydride transfer (the movement of the entire hydrogen atom at once) or electron transfer (the movement of the electron followed by the hydrogen proton). I helped him by making a compound that he needed. The whole process of the synthesis of riboflavin tetracetate from vitamin B12 was a learning experience. I went from reacting vitamin B12 to make the riboflavin tetracetate, to isolating, purifying and crystallizing it, and then to checking its purity by Thin Layer Chromatography and by measuring it's melting point.

For Pramod Kandanarachchi I analyzed one of his reactions. I mixed solutions of the starting material, the product of the reaction, and the desired product, and ran each of them in the GC to see if he got the product he wanted or if no reaction took place. This was more difficult than we thought because the peaks for the starting material and the product he wanted came out at the same place in the GC, so we couldn't tell them apart. We resorted to other methods. By the way, the GC is the machine I'm standing in front of in the picture of me on this page.

For Qizhu Ding I ran reactions on the mercury microwave and vacuum system with oxygen and 4% DBT/acetone, to see if we could react the two to create a product that we could remove easily. He is trying to perfect a high yield method of removing sulfur-containing compounds from crude oil for industry. A truly effective method is not out in industry yet and there is a demand for one. There is also a lot of competition between labs and different fields for the development of the best method.

Working with them has taught me so much. These are the machines and methods I've learned about and how to run over the six weeks of this program: the GC, GCMS, NMR, EPR, and TLC; methods of filtration, extraction, crystallization, purification, distillation, evaporation and drying; and about how to run a reaction, analyze what happens, and how to manipulate the variables accordingly. By now, I can perform a lot of the lab work a post graduate student in Organic Chemistry would, and I'm not even out of high school yet. This is a great advantage because a lot of university students, even third and fourth year chemistry students, have yet to step into and work in a chemistry lab. I've learned how repetitive and narrowly focused research can be, but also how fun it can be. You never know what's going to happen or what you're going to discover next even if you think you do! It's only in science that what you don't want to happen can be as rewarding and informing as what you want to happen.

Another great aspect to Wisest is all the people you meet. I've made lots of friends and met many people here who share an interest in science. This was wonderful for me because not many people in high school are actually interested in science, sometimes not even the science teachers! I've also gathered a lot of inside information about university and having a career in science from people who are there. I know it's advice that will give me a head start in pursuing a career in science. As well, WISEST has really helped me to learn social skills which I'll need in the future. In the lab I've learned how to work closely with people and follow instructions. In the Wednesday Group Sessions I've learned how to co-operate with my peers, both on a friendly and a professional level. Being sponsored by Syncrude has taught me about working in industry and business, and I've learned tons about the art of conversation over the many lunches I've had with supervisors, managers, and chemists.

I admit I groaned when I found out I was one of the few people being sponsored by industry instead of government. I thought it only meant I had to write a thank-you letter and the government-sponsored people could get away with ingratitude. I was wrong though. I got even more out of the program by being sponsored by Syncrude. They took Rhianna, another girl they sponsored, and I out for a day at the Syncrude Research Centre here in Edmonton. We spent the day looking around, finding out what they do at Syncrude, running experiments with them, and meeting and talking to many interesting people. I met Jean Coolie, an Analytical Chemist at Syncrude who 'adopted' us. We learned a lot from her and she came to our labs on Open House.

Then, for one of the Wednesday Group Sessions, all of the WISEST students went to Syncrude for a tour. This whole experience was wonderful because it showed me what it's like to work in research in industry as opposed to the Unversity. So, a special thank-you to Syncrude for making my WISEST summer especially enjoyable!

There were other WISEST Wednesday group sessions and activities going on which also contributed to make the summer a fantastic one. The tour around the campus has helped, along with working here, to orient me around the University. Small group discussions with Women in Non-Traditional Careers opened my eyes to the fact that whatever you start out doing is not necessarily what you'll end up doing and that your interests can lead you anywhere, so don't feel locked into a particular destiny. For the Wednesday session where you visit another lab, I went to the Centre for Subatomic Research. It was fascinating, and I discovered that there are many different fields and career options in science. I also went to the Space and Science Centre and it was a time to get out with friends I'd met at WISEST.

I certainly haven't regretted being in the WISEST program. It's been an honour to be one of the ones chosen out of the hundreds of applicants, and to be involved in actual research which could someday lead to a breakthrough. I've gotten back even more than I've put into the program. Not only have they actually paid me for being involved in the program, but I've gotten back the reassurement that if all these people I've met have made it in science, so can I, and that University isn't the big, scary experience it is made out to be. It's made me more comfortable about going to University and has equipped me to enjoy and appreciate my upcoming years there. Besides, who can resist slipping into a lab coat, sexy latex gloves, and safety glasses a size too big to play mad scientist with vats of stinky chemicals for a summer?

Tarrah Berger

Meeting the Mycoplasmas

This summer turned out to be an eventful one. When I applied for the WISEST program in the spring, I was unsure of what to expect. In a letter that briefed me on my project, I discovered I would be working in the Department of Medical Microbiology and Immunology with another student, Tabitha Chiu. What I was going to be doing remained a mystery.

On my first full day at work, my supervisor, Dr. Janet Robertson, explained to us the basic idea of the project, including some of the biology behind it. The project involved bacteria called mycoplasmas. Specifically, Tabitha and I worked with two types: *Ureaplasma urealyticum*, and *Mycoplasma hominis*. The ureaplasma bacteria are present in quite a few people, but usually do not cause problems. However, if a woman who has this organism is giving birth, her baby may get some of the bacteria in its mouth from the mucous membranes containing the ureaplasma in the birth canal. If the baby is healthy, the bacteria will often not cause a problem. But, if the baby is of low birth weight (usually under 1500 grams), a problem can arise. Low birth weight babies are placed in an incubator and intubated (a tube is connected to the baby to deliver gas for respiration). It seems that this intubation encourages the growth of the bacteria. If the ureaplasma begin to thrive, they can spread to the respiratory tract and cause pneumonia. Unfortunately, this creates a difficult situation: the baby has to be incubated to grow properly, but the intubation can cause the ureaplasma to thrive in the baby. This is the problem that Dr. Robertson and her team are researching.

The project sounded interesting, but the question remained: How will I be involved? That ended up being answered for me piece by piece over the entire six weeks. The jobs that Tabitha and I did were quite varied. For example, near the beginning of our time at the lab, we learned how to make different solutions, including liquid medium (broth) for the bacteria to grow in. We also learned how to make doubling dilutions, and to identify ureaplasmas underneath the microscope by turning them brown in what is called a urease spot test. Later, we performed identification tests (called GITs, or Growth Inhibition Tests) on *M. hominis* bateria. Another, called an MIC (Minimum Inhibitory Concentration Test), involved finding the minimum amount of antibiotic required to kill the bacteria. One interesting reaction that we assisted with was the PCR (Polymerase Chain Reaction). It operates by amplifying the DNA until there are enough strands to be dealt with.

Besides the work in the lab, all WISEST students were given the opportunity to meet with each other to talk every Tuesday on bag lunch days. In addition, each Wednesday afternoon, we were able to engage in special activities. These included a tour of the Syncrude Research Centre, a visit to the Edmonton Space Science Centre, and a visit to any lab of our choice. A tour of the Slowpoke nuclear reactor at the university was arranged for us during one lunch hour tour.

One of the best things about the program was that I became very familiar with the University of Alberta campus. Another is that in the lab itself, I learned a lot from a both a biological and a practical standpoint. I also learned much about all of the problems that must be faced when trying to obtain satisfactory results. Frustration is definitely a part of research, but when each minor problem is solved one by one, the work is worth it.

Overall, I consider my WISEST experience to have been very beneficial in gaining experience, getting familiar with the campus, learning a lot about research, and meeting everyone from grade eleven students to professors. I would like to thank Dr. Robertson for giving me the opportunity to work in her lab over the summer, and for being encouraging and hospitable throughout my time there. Thanks also go to Illeen Chen for teaching me a lot of laboratory techniques, especially the PCR, and for her company and kindness. Another thank you goes to Neelam Mahil, who aided me in "learning the ropes" and provided ongoing support for my entire stay at the lab. A special thanks goes to Tabitha, who spent every day in the lab with me doing tests, pipetting (and pipetting...and pipetting...), and giving me overwhelming support through it all. I hope I have the opportunity to work with all of them again in the future.

By: Christina Hansen

A CORN-Y TITLE?

Maybe, but that's what it was all about--corn. Our WISEST experience began with a major discovery!...Corn is a FRUIT!. So are peas, zucchini and cucumbers.(If your mom ever tells you to eat your vegetables and is serving you corn, peas etc., you can say "I don't see any vegetables on my plate" and thank WISEST for saving you from eating your "vegetables"). This is one of the many things we learned while working on maize(which is corn in french) transformations.

One of the first things we had to learn was how corn reproduces. First, we had to guess but now it sounds like common sense. When the pollen falls onto the silks, a pollen tube is formed containing two sperm cells. This tube travels down the silks until it reaches the kernel. In the kernel is an embryo sac, which contains two synergid cells, two polar nuclei and an egg cell. As the pollen tube makes its way down the silks, chemical activity causes one of the synergid cells to degenerate and allow the pollen tube to enter the embryo sac. At this moment one of the sperm cells fuses with the egg cell to form a zygote. The other sperm cell fuses with the polar nuclei to form endosperm, which is nutrient tissue.

We never had a specific project to work on but we helped with many of the procedures in the lab. What we tried to do was to inject the embryo sac with a gene called GUS(β-Glucuronidase) or with sperm nuclei, which was extracted from the pollen grains. There are however several steps that must be taken before all of this occurs.

For GUS injections, the cobs have to be pollinated by individuals working in the lab so that the time of pollination is known. Then the cobs are taken from the plant and soaked in alcohol and water to sterilize them. After this is done, the small kernels on the cob are taken off and glued onto blocks. Then these blocks are put in the vibratome to section the corn. The section that contains the embryo sac is approximately 250 micrometers thick. Once we have a large number of sections we check them under the microscope to ensure that the embryo sac has not been cut. The good ones are then placed in another petri dish and are then ready for injection. They are injected using a very small glass needle(5 micrometers thick) which is made in the lab. When GUS is injected, it is just used as a marker to see if the zygote has picked up the gene, and they know this if the specimen turns blue.

For sperm injections the same procedures used in injecting GUS are used except, we inject sperm nuclei. The purpose of this is to get in vitro fertilization, which will produce an embryo.

Different things are done with the specimens that express the results desired. Sometimes the specimen is turned into a plant and a section of its DNA is studied to see if the GUS gene is present, or the specimen is fixed, dehydrated and embedded in a plastic block. The specimen is then sliced into sections so that the structure can be studied using the microscope.

The two main objectives of this lab is to successfully inject genes which will allow corn to be resistant to herbicides. The other objective is to create a greater success rate of in vitro fertilization in plants.

Our adventures in the lab were not exactly like Alice's adventures in Wonderland, but we can laugh at them now. We sucked up important specimens with the pipette, Reem set the alcohol tray on fire(twice in one day), hours were spent in the hood trying to clean up the mess we left after snapping kernels off the cob and more hours were spent waiting for the dishwasher.

We would like to thank Dr. Cass, our supervisor, for inviting us into his lab and to Grace, Guichang(The Great Doctor Zhang) and Micah for helping us around the lab, for their patience and acceptance.

Our WISEST experience will stay with both of us for a very long time and the benefits and knowledge we gained from it will be very helpful in the future. Thank you to all the WISEST staff who made this such an enjoyable six weeks.

Heather would like to say thank you to Reem, who taught her many things. Don't be afraid of chemicals, I'm sure with your double gloves and lab coat on, nothing will harm you, my paranoid friend! Thanks for making the endless hours go by in a flash.

Reem would also like to thank Heather for being such a good friend the past six weeks and being so so patient with me when I was around chemicals(especially Spurr's). Also, I would like to thank her for all the laughs I had just looking at her sun burns!

Reem Elbekai

Heather Allen

My WISEST Summer

When I applied for The WISEST Summer Research Program, what I thought I would be doing could not be more remote than what I ended up doing. I was so excited to be accepted, the idea of spending six weeks in an entomology lab really had no effect on me. I figured this was definitely better than the usual boring summer jobs. I've never been scared on insects, but just the thought of such constant contact with *wiggly worms*, and *creepy crawlers* really began to *bug* me! My first day at the lab was worse than I expected. But, once I had gotten into the routine of dissecting water striders, conducting flying and mating experiments, and cleaning decaying flies out of the tanks, everything was great.

We were dissecting the water striders to look for three different types of parasites: trypanosomes, gregorines, and ciliates. We take the number of infections at different sites and try to determine where it is common and how it spreads. I was thankful I didn't have to work in the fly room. Its the only lab I know of in the department where lab coats, rubber gloves, and face masks are required. The room is full of trays of maggots and larva, and netted cages of adults which we kill by putting them in the freezer so we can feed them to the water striders. I was also involved in a lot of other projects that the grad students in the department were doing such as sorting and weighing leaves that were taken to simulate caterpillar damage. I also had to count and separate different stages of growth in caterpillar larva and water striders. Another project had to do with beetle population and diversity. Pitfall traps, containers full of antifreeze, were set up at different sites. The insects that fell in and died, we collected and preserved in alcohol to sort back at the lab. I was also involved with determining the similarities between the resulting species of a strider hybrid cross and looking for population patterns in spiders. We did this by catching 16 females with egg sacs, which I tore open to count the eggs. The whole time I was terrified that all eight hundred, or so, eggs would hatch at once.

I would have to say the best days were out trips to George Lake; I think field work is great. The university has a field site a George Lake, which is about an hour away, that we go to every Tuesday. Most of the people in the department have lived at the cabin there at one time or another. The on going study there that I participated the most in was the bug count. This means everyone dresses up in chest waders and we drag nets with five foot handles to 'Experiment Pond', which is one of the ponds we do research on. Luckily for us, its not very big, but unfortunately the water level is

high from all the rain. Every week at least one person gets flooded while we chase and catch all the water striders on the pond. The new ones we catch we paint and release to catch again the next week. Then we record the number that are already marked. This data has been used for over a decade to determine changes in strider populations and species. There are two other ponds and the lake that we collect striders form to use in experiments. Some of the other projects running at the field site are: determining if caterpillars prefer different types of foliage, describing the development of wasps, and population movement of beetle species.

I loved the time I spent in my lab. I learned an incredible amount of information. Everyone I worked with was great, my supervisor and the other students in the lab were always ready to help or teach me. My summer experience is one I greatly value, I'm glad I was given the opportunity to participate. I would definitely recommend this program to anyone with the chance to apply.

By Alicia Matemisz
Aug. '96

Life at Meanook

Working at Meanook Biological Research Station offered valuable insights into different aspects of life on a research station. I was fortunate enough to work in two different areas of at the station. I worked with the Fluxers for 2 weeks, and then switched off with Heather Smith, (my wisest buddy) to work in the water lab.

The fluxers have an independant project, studying methane emissions in Northern Alberta wetlands. Methane emissions from wetlands account for an amazing 50% of methane emissions into the atmosphere. Although methane is naturally produced by boreal wetlands and rice patties, levels of methane in the atmosphere have skyrocketed since the industrial revolution. This is of great concern to scientists because methane is one of the greenhouse gases that is eating the ozone layer. Fluxing is a good balance of gathering samples in the fen and analysing them back at the lab. A day out in the field, gathering samples, involves driving down gravel roads at twice the speed limit, hauling gear in down to the boardwalk, and sitting out in the sun for a couple hours. Of course, there is serious work to be done as well. Chambers are placed over plants and air samples are taken from inside the chamber with syringes. The process is repeated with different screens covering the chamber, emulating different amounts of light that are emmited by the sun. Chambers are placed over plants that are fertilized, cut, or absent all together. All air samples from the fen are analyzed for methane with the gas chromatograph.

A good number of hours were also spent working in the water lab. The water lab receives water samples from various projects around Nothern Alberta. There are many initial analytical tests such as alkalinity, pH, and conductivity that are done on the original sample as soon as they come in. Other, more complicated processes are used for phosphorus. The sample is filtered twice, persulphate is added, the rack is put in the autoclave, a mixed reagent is added

to the tubes, and they are analysed on the spectrophotometer. There are many, less glamorous, jobs that also need to be done in the lab. Everything must be rinsed many, many times, put into the dryer, and taken out again. It is essential that nothing is contaminated, because it will alter results.

Working at Meanook was a realistic look at work on a Research Station. I did fun jobs and not so fun jobs that are all part of work in the field of Science.

Kirsten vander Meer

The Devonian Botanic Garden is no ordinary research work site, but then again a summer with WISEST is no ordinary summer! These past six incredible weeks have been filled with anticipation, education, satisfaction, and enjoyment as I've made my way through the WISEST Summer Research Program. Although I've had a great time here in Edmonton, I can't wait to get home so I can share a piece of my experience with those who did not participate, and hopefully convince others to apply in the future.

In mailing my application to this program, I was looking to learn about, and experience, different scientific areas than the one I plan to enter at the completion of high school. Through the Wednesday afternoon activities and the work I've done, this has been made possible.

The project given to me by Dr. Dale Vitt, DBG director, was the development of a self-guided tree tour. The effectiveness of such a tour is to help visitors recognize the variety of trees located in the Garden (amongst all the blooms), to provide educational information about the different species, and to help visitors locate and identify different examples of introduced and native trees.

The first step in developing this guide, basically involved compiling an inventory of all the trees; their full identity (genus, species, variety, common name, origin, and accession number) and location. The way I achieved this, was by using a map of the Garden and giving each tree an identification number. The tree was then presented on the map using the I.D. #, and a corresponding page held each recorded description. When I was finished, my tree inventory contained 465 trees!

Of the 465, however, many were the same with regard to location and age. It was easiest to type my records into a data base file so that I was able to sort and eliminate the reoccurring examples. This began my second step. Once I finished entering all the data into a file, I sorted the file to make it easier to select individual species to include in the tour.

I realized that I would not be able to complete the entire project in the amount of time that remained, so instead of wasting time deciding on which specific trees would go into the brochure guide, I started taking a sample of each species and with the assistance of a word processor, began writing descriptions for each of them. Following is an example of a description:

Betulaceae
Betula occidentalis
Water Birch

Water birch is a large shrub or small tree (up to 12 m tall) of the Rocky Mountains and most of the forested areas of western Canada. It is commonly found along rivers, streams, and springs, but occasionally grows in drier sites. The trees mature at an early age, usually producing seed by 10 to 12 years. Its bark is almost black on young trees but lightens to a reddish-brown as the tree matures. The branches are covered with numerous glands that appear as small bumps, and leaves that are alternate, deciduous which carry a double row of fine, sharp-pointed teeth. They have a dark greenish-yellow and shiny appearance above, and one that is paler and gland-dotted beneath. The male and female flowers are held in separate catkins on the same tree; the male flowers in slender catkins produced at or near the tips of the branchlet. The fruit is found in the form of hanging or spreading cones and all cones consist of many 3-lobed scales that each enclose a tiny winged seed.

The file I have begun, may be completed by anyone working at the garden. Once completed, Dr. Vitt and Ian Dymock, my supervisor, will decide upon which gardens or areas they wish to produce tree guides for. These guides will then be composed by simply transferring information from the master description file to new files. Dr. Hickman has agreed to format the ready information into suitable material for the brochure format and will also insert leaf or tree photos and diagrams beside each description.

Working on this project, I learned a great deal and acquired many new skills - both practical and scientific. I can now successfully identify a number of trees, as well as Alberta Wild Flowers, which I worked with each morning taking care of the Plant Sale. There was a bright side to rainy days as well (ironic as that may seem) for on such days when I was kept indoors, I assisted with a variety of tasks like making plant labels and transplanting plants. Every week I also prepared a display case of blooming flowers, and in this way, came to learn some of their names. I found that although some of the work I did, didn't directly relate to my project, I learned a lot from it, and it kept things interesting.

I am happy to have met most of you and learn about your projects. It has been an interesting and enjoyable experience. Grace, Renate, and the WISEST crew - you were wonderful. Thanks for a terrific summer!

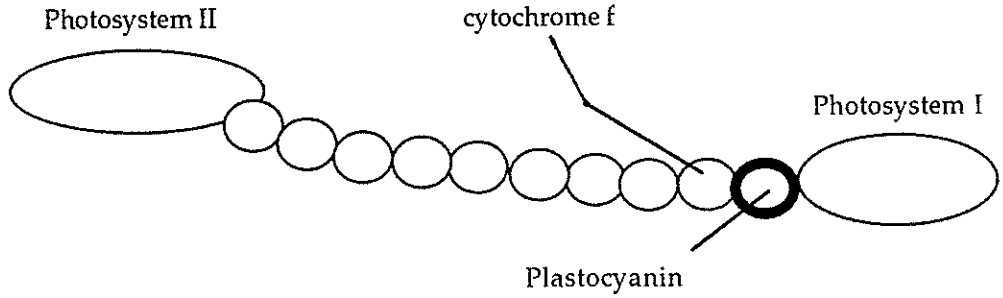
Angela Fenrich

Angela Fenrich
WISEST '96

The Protein That Could

Hi, we're Anna and Rhianna. This summer we spent six weeks in the University of Alberta's Department of Chemistry. We were under the supervision of Dr. Loppnow and worked closely with his lab assistant Ester Fraga. We were involved in the process of isolating and purifying the protein Plastocyanin from different plant species. Plastocyanin is a copper-containing blue coloured protein found in the chloroplasts of green plants and algae. Plastocyanin has a molecular mass of about 10 000 g/mol and a charge of negative six. Acting as an electron mediator between Photosystem II and Photosystem I, Plastocyanin plays a very essential role in photosynthesis. Plastocyanin lies between cytochrome f and Photosystem I in the electron transport chain of photosynthesis.

Electron Transport Chain



Having pure Plastocyanin extracted from plants, with the help of lasers, researchers are able to study the motion of electrons through the photosynthetic process and also see how proteins differ in different plants. Thus our job involved extracting this blue protein from the leaves lettuce, spinach, zucchini and cucumber. Some of the steps involved in the extraction included homogenisation, centrifugation, dialysis, chromatography and concentration.

Homogenisation involved liquefying the plant leaves in a large blender. After this, the liquid was squeezed through either cotton or cheese cloth, depending on the species of plant. The liquid was then collected for centrifugation and the pulp was discarded. Centrifuging the liquid separated the components of the liquid. The centrifuge works by spinning the sample at very high speeds. The larger molecules will come out of the sample in the form of a hard solid that collects at the bottom of the centrifuge bottle, while the smaller molecules stay in the liquid. In the procedure we followed centrifugation is used more than once. One stage we

kept the liquid, the other stage we kept the solid.

The sample was then put into dialysis bags and put into a buffer overnight. The dialysis bags had a molecular cut-off of 3 500 g/mol. Therefore any molecule with a smaller weight than 3 500 g/mol would leave the bags. Thus, Plastocyanin would stay in the bag and the unwanted smaller molecules would leave the bag.

Purifying the protein involved the use of column chromatography. In the procedure we used, two columns were used. The first used a gel (DE-52) that separated the sample on the basis of charge. It is called ion-exchange chromatography. The second column used a gel (G-50) that separated the sample on the basis of the molecules' size. This chromatography method is called size-exclusion or gel-filtration. If the sample still contained impurities after two columns, another ion-exchange column was used.

Between columns and before final storage the protein would be concentrated to remove more unwanted molecules. The final concentration would bring the protein to a final volume of about 0.6 mL. This 0.6 mL of protein would come from about 5 kg of leaves. The protein is then stored in liquid nitrogen for later use in research.

When I applied for the WISEST summer research program at the end of April, I did not believe at all that I would be chosen. I already started planning my summer; thinking about where I would go and what I would do. Thus, I was extremely surprised when one evening I received a phone call informing me that I got the position. I admit I was a little bit nervous, but also excited. Six weeks went by very quickly. I had an opportunity to see much of the university campus, visit the Syncrude Research Centre, and a seismology lab. I talked with geophysicists, chemists and other scientists about how they decided on their careers and how much they enjoyed them. Seeing other people's attitudes towards science was interesting and the whole program was very worthwhile.

Anna Dabros

My experience with WISEST this summer was an incredible one. It amazes me how much I learned in such a short period of time, and how much fun I had in doing so. I enjoyed working on campus and in the lab because I got to experience a whole new setting. I loved actually getting to do things that I had read about in school textbooks. All the things that we did as a group were a lot of fun. It was interesting to learn about what everybody else was doing. I had a great experience this summer and will remember it always.

Rhianna Morris

My Six Weeks in the WISEST Program

For the past six weeks in the WISEST program, my partner Kristen Federchuk and I, have worked in the department of Civil and Environmental Engineering. However, we did not work with one supervisor or on one project; we had three supervisors and worked on many projects.

Our first supervisor was Marie-Christine Bouchard, in the Environmental discipline of Civil Engineering. During the one week spent in Environmental, we ozonated water and collected water samples on the North Saskatchewan River. To ozonate water, ozone was bubbled through waste water to lighten its colour. This was done so sunlight can penetrate the lighter water when it is disposed into the river. This is necessary so the plants in the river can receive sunlight. Kristen and I also went on the river to collect other samples to assist a graduate student. After collecting the samples, we went on a tour of the river which very interesting. In addition, we went on trips to the Rossdale Treatment Plant, the Gold Bar Waste Water Treatment Plant, and the Esso refinery to witness what an Environmental Engineer does in the workplace. Our week quickly ended, and Kristen and I moved on to the Construction discipline in Civil Engineering.

Kristen and I spent the next three weeks in the WISEST program with Brenda McCabe in the Construction discipline. We assisted in many literature searches, Internet searches, and phone surveys of construction companies. I cannot walk by a construction site now without noticing the construction company. It is necessary to perform these searches before work can begin on the projects being developed by Construction engineering. Right now a system is being developed for concrete reclamation. This system would then be used by construction companies.

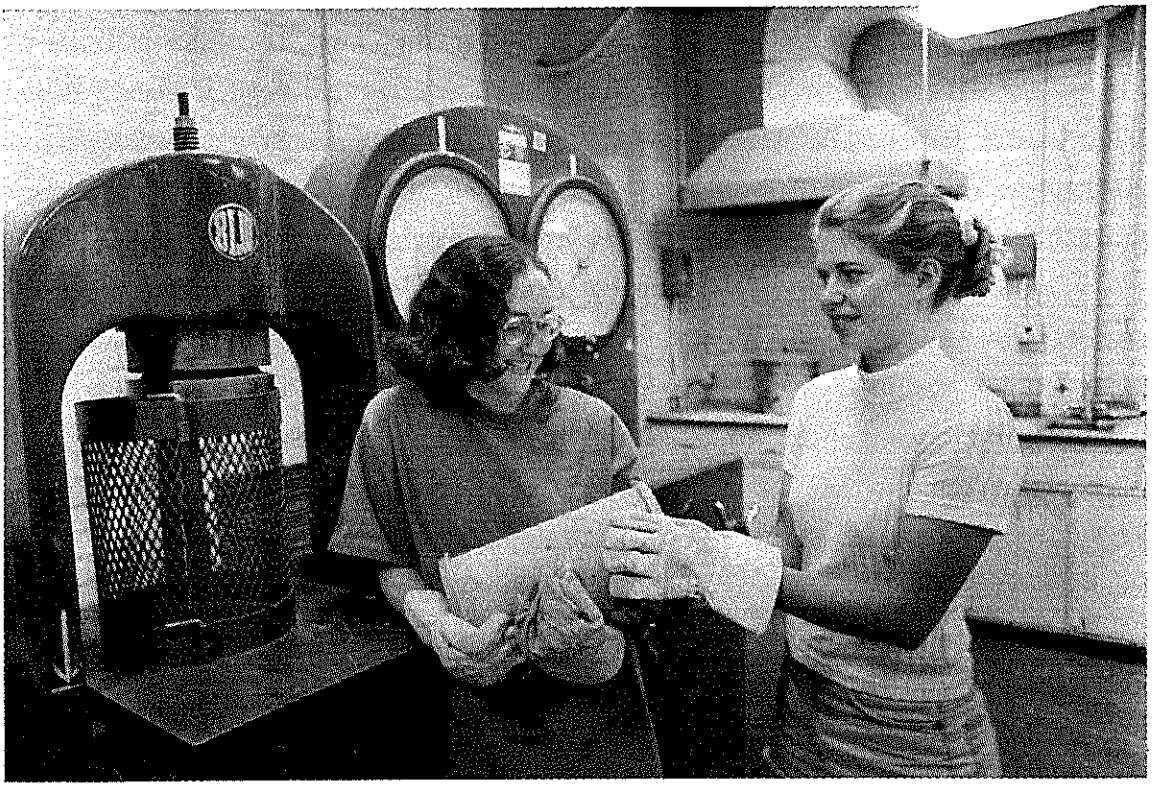
Besides the above, we assisted in lab work and visited the construction site at the Gold Bar Waste Water Treatment Plant. At the site we poured concrete cylinder samples which was hard work! The concrete was difficult to shovel into the forms. Afterwards, the testing of the forms began. Some cylinders were tested five days after pouring and some were tested twenty-five days after pouring the cylinders. A hydraulic press was used to place pressure on the concrete cylinders until they failed. Sometimes a low boom was heard when the concrete cylinder failed.

As a part of Construction engineering, Kristen and I were also shown cracks in buildings and learned about some of the causes. If I see a crack in a building I now try to figure out the cause. I now know what is involved in construction engineering, both in the research side and the practical side. Our three weeks in Construction engineering were both enlightening and engaging.

After three weeks in Construction engineering, Kristen and I moved to the Geotechnical discipline with Dr. Robertson for the final two weeks of the WISEST program. We were busy in these last two weeks. First of all, Kristen and I helped set up solids tests for sludge. This sludge was from the Syncrude waste pond in Fort McMurray. The tests were being performed because the waste ponds are becoming full and space could be saved if the water is removed. In addition to the solids tests, we assisted in another Geotechnical lab. Kristen and I sieved oil sands which were again from Fort McMurray. We each used one sieve and washed away the fines from the oil sands. Then, the samples were placed in the oven and afterwards the mass was recorded. The two weeks in Geotechnical were over quickly and the six weeks in WISEST program had ended.

I would like to thank the WISEST program and everyone that I worked with as I have achieved the goals I set at the beginning of the WISEST program. I know more about the university and I can walk through campus without becoming completely lost. More importantly, I have learned about civil engineering and its many divisions. I would like to thank my supervisors, Marie-Christine Bouchard, Brenda McCabe, and Dr. Robertson, for their help and for supervising Kristen and myself. I have now decided that I will go into engineering as a result of my experiences this summer. Thank you again to the WISEST program for giving me this opportunity.

Sheila Colborne



Civil/Environmental Engineering

I spent my the first six weeks of my summer with WISEST working in civil/environmental engineering. My first week was spent in environmental engineering where I ozonated water, took river samples,and went on two tours; one to gold bar waste water treatment plant,and one to the ESSO strathcona refinery. Ozonating water is where effluent (which is waste water) had ozone added to it in order to lighten the effluent to an acceptable level before returning it to the river.

The next three weeks were spent in spent in construction engineering which is a disipline of civil engineering. With construction engineering we went on a tour to Goldbar again, but this time we viewed it from a construction rather than environmental perspective and worked on a PCL site. We made concrete forms which after letting dry overnight, and stripped of their cardboard casing, were then taken back to the lab at the U of a and tested. Each concrete form was capped with sulfur, in order to insure equal weight distribution, and tested to see the maximum weight it could hold. As well we often toured the campus, and surrounding neighborhood learning about building structures, eminent and existing building problems. During our three weeks we also learned more about civil engineering in general; the 8 sub divisions which existed, difference between cement and concrete, and the reason why civil engineers where their rings.

Our last two weeks were spent in geotechnical engineering, a disipline of civil engineering, where we did both wet and dry sieves, took test samples, ground soil, did a freeze thaw test (where we got to work in a freezer), and went to a drilling site.

At the end of the six weeks I had not only learned so much more stuff about civil engineering, which I previously knew nothing about, but I also learned more about the U of a, other job possibilities, and made new friends. WISEST was by far the best job i've ever had.

Kristen Federschule