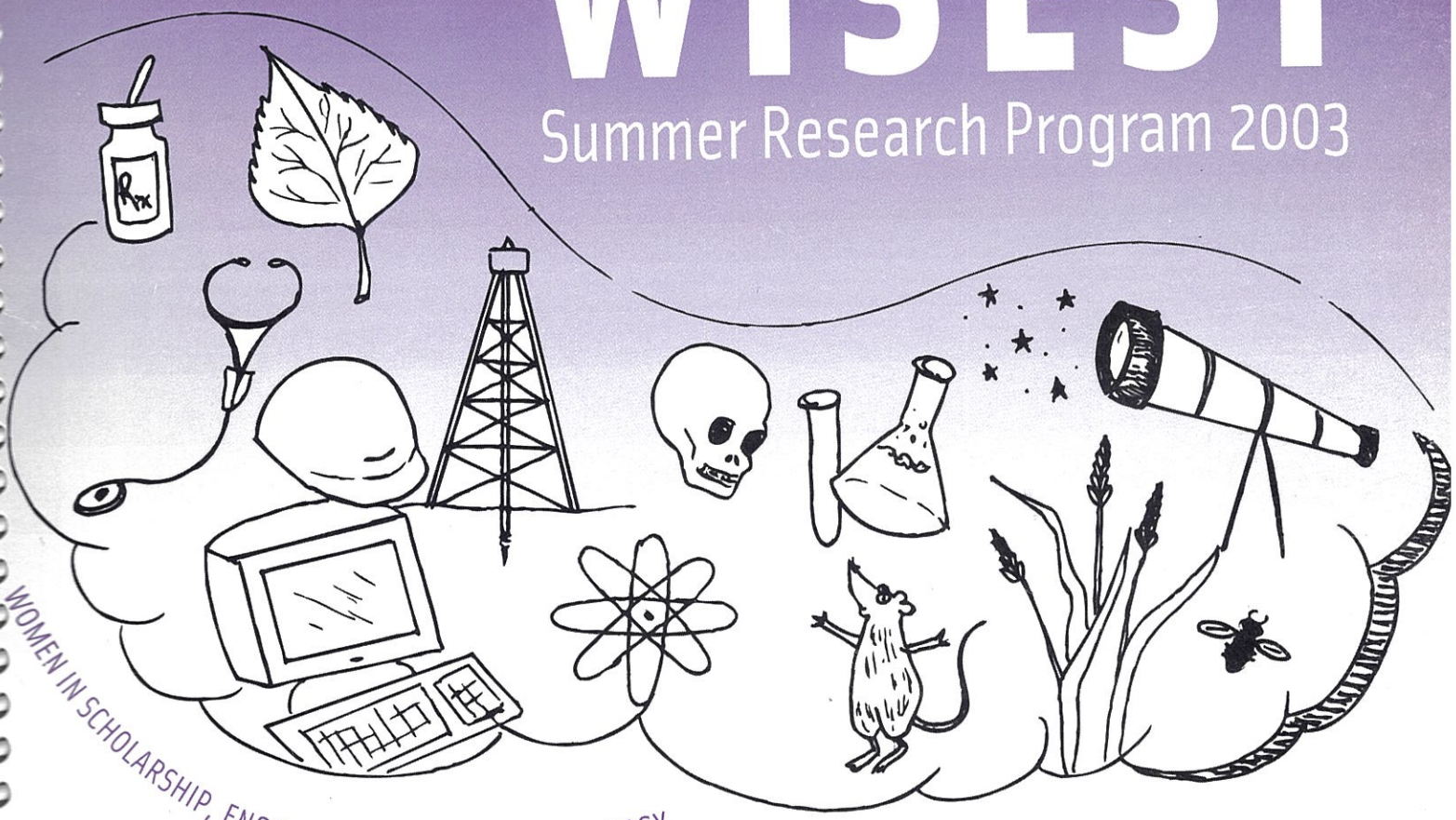
WISEST

Summer Research Program 2003



WOMEN IN SCHOLARSHIP, ENGINEERING, SCIENCE & TECHNOLOGY

STUDENT REPORTS

WISEST

(Women in Scholarship, Engineering, Science and Technology)

at the
University of Alberta
Edmonton, Alberta
Canada

WISEST is a University of Alberta-based organization whose vision is to strengthen science by increasing gender diversity and to enhance choices in science, engineering, scholarship and technology for women of all ages. Our programs foster collaboration and communication with partners in industry, in academia and education, and in governmental and non-governmental organizations in the community.

WISEST was founded in 1982 with a mandate to investigate the reasons why few young women are choosing careers in the sciences and engineering, to take action to alter the situation, and to work to increase the percentage of women in decision-making roles in all fields of scholarship.

The purpose of WISEST is to initiate action to increase the representation of women in all fields of scholarship. The studies and actions of WISEST are concentrated in the under-represented, decision-making fields of science, engineering and technology.

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Vice-President (Research) University of Alberta

Vice-Chair
Dr. Margaret-Ann Armour,
Associate Chair Dept. of Chemistry,
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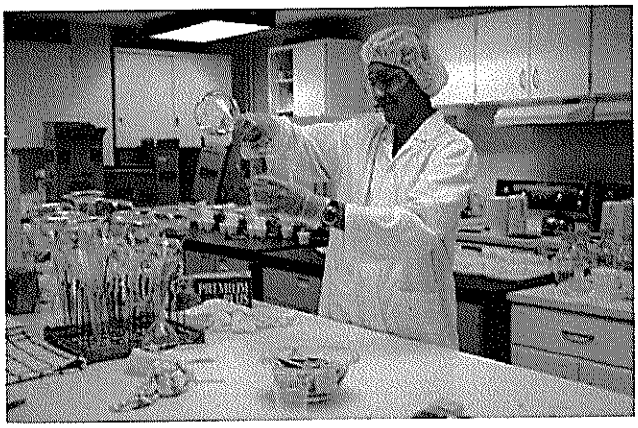
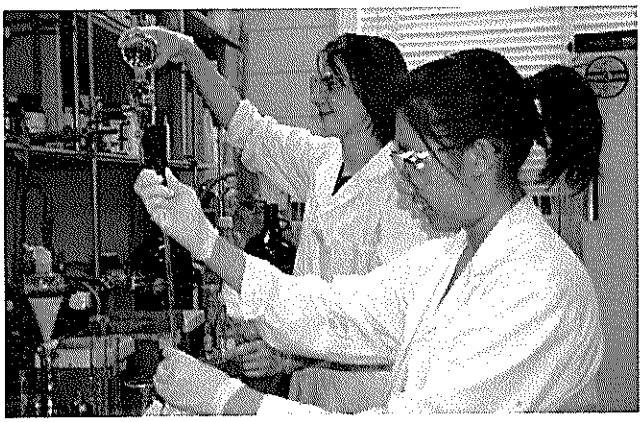


WISEST

Summer Research Program

2003

Student Report Book



WISEST Summer Research Program Students, 2003

WISEST Summer Research Program, 2003
STUDENT REPORT BOOK

The WISEST Summer Research Program

by Grace Ennis, WISEST Coordinator

Dr. Margaret-Ann Armour

In early 1982, while attending a seminar on microprocessors, Dr. Gordin Kaplan (then the University of Alberta Vice-President, Research) noted that there was only one woman among the 150 people present. This triggered the creation of a 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. Since women are still markedly under-represented in decision-making roles in the sciences and engineering, WISEST has concentrated its efforts to date on these fields. WISEST began by investigating why relatively few young women choose and remain in careers in the sciences and engineering and then initiated several on-going programs to change the situation.

One of the first major initiatives of WISEST was the WISEST Summer Research Program. It has evolved over the last 19 years into a Program that provides a valuable research experience to high school students, both young women and men, who are making decisions about their future field of study and career paths. In the Program, students who have completed grade 11 spend six weeks working as a member of a research group at the University of Alberta. The girls work in the fields of engineering, science, agriculture and the health sciences, and the boys work in the fields of nursing and clothing and textiles.

Within this Student Report Booklet you will read about the many experiences that the students had working in the research laboratories under the supervision of their scientist mentors and fellow research team members. They learned first-hand about cutting-edge research, the techniques and types of research being conducted, the research career opportunities available, and they gained an introduction to academic and university life. The students also participated in a variety of weekly activities that WISEST designed to supplement their work experience. Their reports reflect in their own words what a valuable and important experience this was for them.

Each year the success of the WISEST Program is a reflection of the support of many, many people: high school science teachers, faculty supervisors, research team members, and WISEST Partners and Contributors. We thank the high-school teachers for sharing the information about the WISEST Research Program and for encouraging their students to apply.

University of Alberta faculty members continue to strongly endorse the WISEST Research Program. Each year they welcome the WISEST students into their research teams to either join the team in an on-going research project, or to work on research projects specifically designed for the students. Many, many thanks and words of sincere appreciation to all research team members who mentored, guided and encouraged the students to explore their interests, take risks, and to not be afraid to fail, as well as to succeed.

The total number of students who can participate in the Program may change from year to year, depending on the funding that WISEST can procure. The funds allow us to pay the students at a minimum wage for their work, and to cover the overhead costs to run the Program. WISEST wishes to acknowledge and genuinely thank the several local industries, philanthropic groups, Deans of Faculties at the University of

Alberta, and the Provincial and Federal governments, for their financial support in the 2003 Summer Research Program. A detailed list of the WISEST Partners and Contributors is included in the Student Report Book and on our web page www.chem.ualberta.ca/~wisest.

It truly was an energizing and rewarding experience to work with the WISEST students. We took great delight in celebrating with them at the Research Team Thank-You and the WISEST Open House. It is now time for the WISEST students to share their experiences with their peers, teachers and family members and to encourage younger students to learn about the many options that are available to them in areas that they would not ordinarily consider.

Putting Together the WISEST Puzzle Pieces

by Celia Valel and Tara Nord, WISEST Student Coordinators

We have been very fortunate to be invited to work in the WISEST office once again this summer with Grace Ennis, WISEST Coordinator, and Margaret-Ann Armour, WISEST Vice-Chair. Each summer brings new and exciting changes that allow the WISEST Summer Research Program to continue to evolve and change. It has been an honour and a pleasure to work for this highly prestigious summer research experience for grade 11 students.

WISEST Coordinators, Celia Valel, Tara Nord and Grace Ennis (from left to right)

One of the ideas that we try to convey to the WISEST students throughout the Program is to find out what the bigger picture of research is happening in their labs and to figure out where the work that they are doing fits into the puzzle. Similarly, there are many pieces to the puzzle that make up the WISEST Summer Research Program. Without each piece, the WISEST Summer Research Program would not be whole.

The first piece of the WISEST puzzle is the students. What a diverse group of bright and personable young people! Through our lab visits, the weekly sessions, the social activities and the Lunches with the Bunch, we were able to get to know the students better and quickly learned that their talents extended much beyond the classroom. The students truly shone at then end of the Program, when they presented their posters to their research teams, families, teachers and sponsors. It never ceases to amaze us how much the students learn in six weeks and how comfortable and knowledgeable they are when they present their posters.

The second piece of the puzzle is the supervisors and research team members. We were excited to have many returning supervisors and to have quite a few new supervisors join. It gives us great encouragement to know that so many researchers are supportive of the Program and the WISEST students. Another supportive group who we extend our sincere gratitude to is the research associates, lab technicians, graduate students and summer students that were often there to teach and guide the students on a daily

basis. Thank you can not be said enough times to the supervisors and research team members for their patience and willingness to mentor a grade 11 student (or two!) in their labs.

The third piece is the WISEST Partners and Contributors. Without the financial support of these companies, government programs, community groups and individuals, 60 students would not have had the opportunity to realize their research potential before entering university.

The fourth piece of the puzzle is all those individuals and groups that volunteer their time to help with our weekly sessions and activities. The Role Models took time out of their days to come to campus and participate in the Small Group Discussions. The people at C-FER Technologies, the Edmonton Waste Management facility and IBM hosted us for workshops and tours. The U of A community contributed to the program by holding poster-making help sessions and giving tours of their labs to the students. Emily Krauss and Louis Bezuidenhout, the Resident Advisors, were two people who were indispensable because of the enthusiasm they brought to the Program and the rapport they had with all the WISEST students. Our list of Program supporters goes on and on and there are too many people to mention in one article.

The final and crucial piece to complete the puzzle is made of two important people. This first person is Dr. Margaret-Ann Armour. It is with Margaret-Ann's leadership that WISEST has been able to become the organization it has in 20 years. She inspires us through her humanistic approach to science and life. She is an example for all of how one's passion for science can lead to great accomplishments. The second important person is Grace Ennis. Grace guided and mentored us daily in the WISEST office. Never have we had an employer more dedicated to the cause she works for! The Program keeps evolving because Grace's priority is the students and she desires to make sure that the students get a full research experience in the six weeks that they are with us.

We would like to wish the 2003 WISEST Summer Research Program students the best of luck in their grade 12 year and in their future endeavors. It is our hope that you have learned a great deal this summer and will continue to build on your WISEST experience. You have gained many valuable skills both inside and outside of your labs this summer that will not only help you in grade 12, but also as you make decisions for your future careers. We hope that you have had as good of a summer with us as we had with you!

Strong funding support gave 60 WISEST students a hands-on research experience in the summer of 2003

Thank-You to our WISEST Partners and Contributors

Thanks to the **2003 WISEST Partners**

Alberta Heritage Foundation for Medical Research
Alberta Human Resources and Employment
- Summer Temporary Employment Program

Alberta Ingenuity Fund
Alberta Ministry of Environment
Alberta Ministry of Innovation and Science
Alberta Research Council
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Dow Chemical Canada Inc., Western Canada Division
Edmonton Glenora Rotary Club
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Human Resources Development Canada
- NE Alberta Summer Career Placements Program

Imperial Oil National Centre for Mathematics Science, and Technology Education
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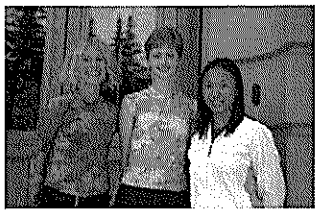
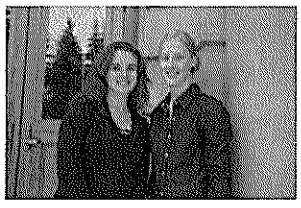




. . . and to the **2003 WISEST Contributors**

Dr. Arlene Ponting
Celanese Canada Ltd.

Ms. Esther Ondrack
Lehigh Inland Cement Ltd.

Become a Partner with WISEST

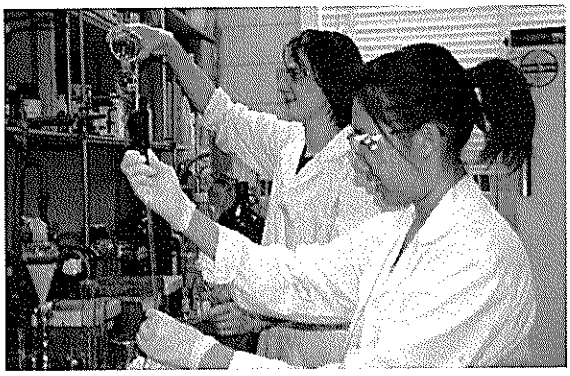
- The WISEST Summer Research Program students are paid an honourarium for their six weeks of work. The number of students who can be accommodated depends on the number of sponsorships available to pay the students.
- Several local industries, philanthropic groups, Deans of Faculties and Chairs of Departments at the University of Alberta, and the Provincial and Federal governments sponsor students.
- Sponsorships are $2,000 per student. The money is used to pay the students an honourarium, the costs of special activities such as field trips, group discussions, and poster sessions, and for administrative costs.
- An endowment fund helps to support rural students who stay in an Edmonton residence complex during their participation in the Program.
- Receipts for income tax deductions are issued for all contributions.
- Please contact us at the WISEST office for further information about any of our initiatives.

❑ **YES, we would like to become a Partner of the 2004 WISEST Summer Research Program.**

We will sponsor_____ student(s) at $2000 per student.

❑ **YES, we would like to become a Contributor to WISEST.**

We wish to contribute $_____ to:



- ❑ WISEST Summer Research Program
- ❑ SET Conference for high school girls
- ❑ Choices Conference for Grade 6 girls
- ❑ UA-WiSE (University of Alberta Women in Science and Engineering)
- ❑ Margaret-Ann Armour Endowment Fund for Rural Students
- ❑ We would appreciate further information. Please contact us.

Company Name: _____

Contact Person: _____

Address: _____

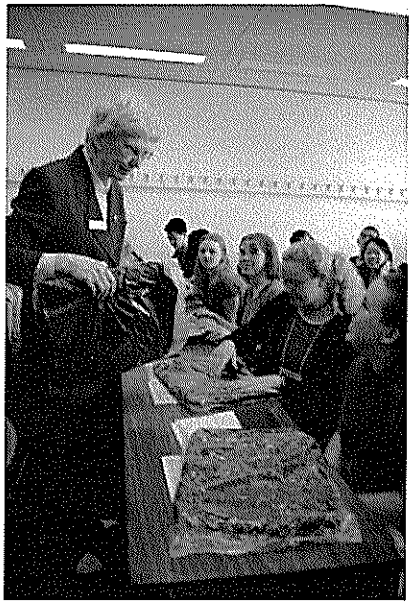
Phone: _____ Fax: _____ Email: _____

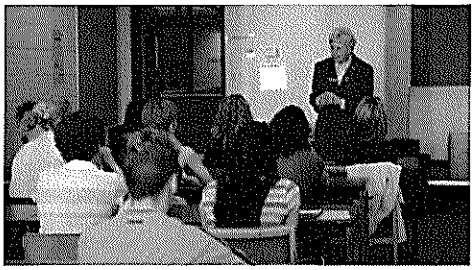
Please return to: WISEST, 295 CAB, University of Alberta, Edmonton, Alberta T6G 2G1

Opening Day

Welcome to the WISEST Summer Research Program

by Shelley Ma





I was completely surprised when I attended the opening session of the 2003 WISEST Summer Research Program because it began by having everyone participate in a *human* scavenger hunt. This activity helped everyone interact with one another and ease everyone's nerves. Everyone had the chance to gain an insight into the background and hobbies of other fellow WISEST students. This was also a great conversation opener. Next, we all attended a special introduction speech with some special guests. Throughout their speeches, we were reminded that we had a great opportunity in front of us and to take advantage of the wonderful resources and people that would be surrounding us throughout the next six weeks.

This was when it really hit me. I was among the chosen few that were selected to participate in such an amazing program that other potential participants would've jump for the chance! I was so humbled and made sure that I appreciated everything that this program had to offer. We also met former WISEST students and heard their story while they were in the program and how the WISEST Summer Research Program contributed to their present position. Not only did we meet intriguing people but there were delicious snacks provided as well. Another unexpected perk was that we all received WISEST bags. I took this chance to look around the room and saw new faces and I wanted to learn more about the personalities behind these faces. We then separated into two groups and had lunch together, again, provided by the WISEST Program. We were then named the blue team and code red as our group names and went outside to have a snowball fight. The snowball fight (which consisted of throwing scrunched up papers) helped us to open up a little bit more and also find out more about individuals in our specific groupings.

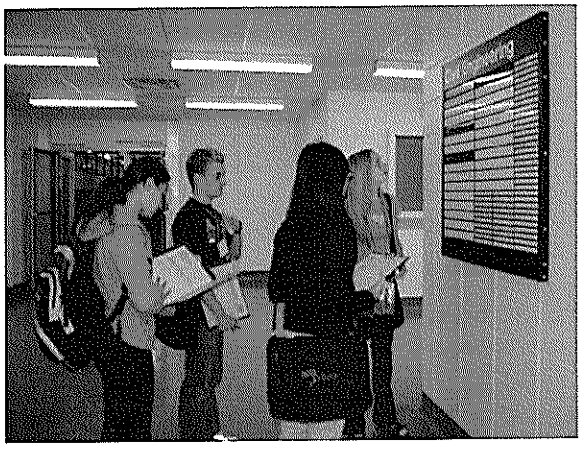
Following the lunch break was the safety seminar which was to help prepare us to stay safe and remind us of hidden dangers in the labs.We were also taught specific steps that would need to be taken if something unexpected occurred. Who better to be our speaker than Dr. Margaret-Ann Armour herself, a co-founder of the WISEST Summer Research Program.

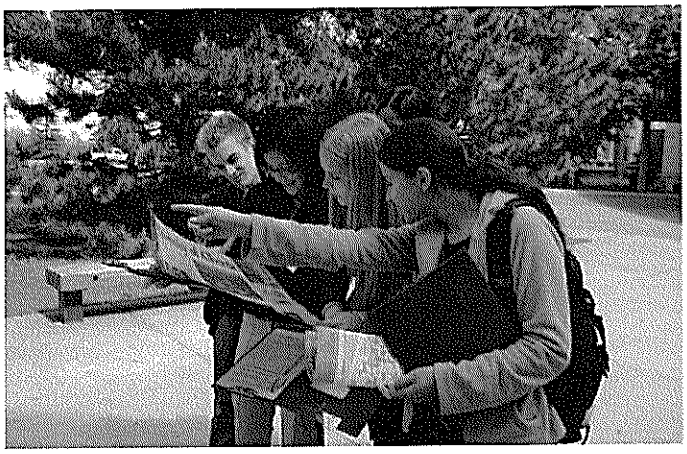
This first day was a great start to the program and for the next six weeks, we will all have the opportunity to expand our knowledge and gain a more in depth perspective towards the field of science and research and also learn more about what is takes to be a WISEST student.

WISEST Weekly Activities

Campus Tour and GATE Library Session

by Michael Woolley



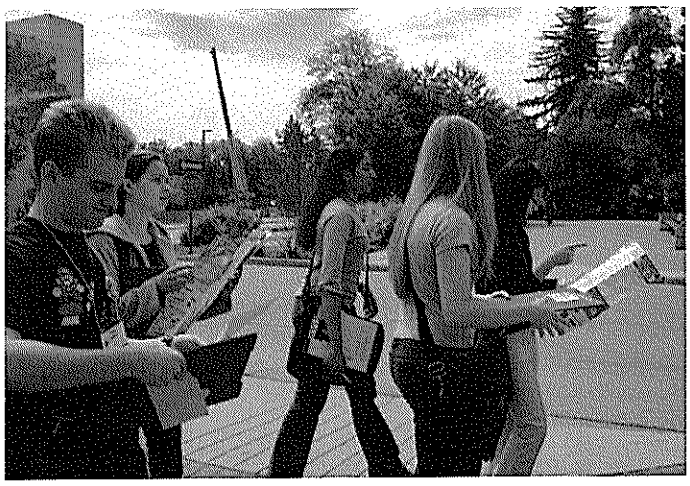


Picture yourself in this situation: You've been working at the university for one week. You know only two buildings, your own and the bus station. Now, out of the middle of nowhere, the WISEST coordinators give you a mock class schedule and a puzzle to solve. This is the situation we faced during the first half of our first weekly activity in the program. All the WISEST students were split up into groups of 4 or so and sent off with a mock university class schedule between them, carousing across campus, from one end to the other, in a mad dash to get to all their classes in the allotted time. On the door handle of each class was found hanging a colour-coded puzzle piece that, according to our wonderful coordinators, would fit together with the other pieces we would find at our other classes, and which would all come together to reveal to us the identity of a famous U of A alumni.

Unfortunately, it didn't quite work out like that. In the end, most groups came back with one or two different puzzle pieces, or five of the same piece. Only one group was able to fully complete the picture, but it was later revealed that they had traded with other groups to compile a full set. Despite this fact, everyone seemed to have enjoyed themselves, and no one really got all *that* lost... as far as we know.

In the end, it was actually a really great way to learn about the campus and figure out how to get around. It was better than a guided tour in the regard that you actually had to think about where you were going, and had to get yourself un-lost in the event that you lost your way. Essentially it was like a crash course in campus orienteering... minus the "course" part.

The second half of the afternoon consisted of the so-called GATE Session. We all piled into a darkened computer lab in the Cameron library, and had our first opportunity to get hands-on experience with the campus library and database systems. Our friendly instructor went through the entire process of finding a research article, step by step, and explained in detail a sample method of tackling a research question.



The very next day at work, my newfound knowledge was put to the test, and I was tasked to find an article on a particular coping instrument for use with adolescents. I logged

onto the system, entered the keywords into the appropriate database, and bada-bing bada-boom, ten minutes later I was on my way to the Rutherford to search out the hard copy of the article so that I could photocopy it. And, in addition to being able to find library listings using the GATE system, the university also has many digitized journals for online viewing, anytime and free of charge, which is extremely handy and time-saving.

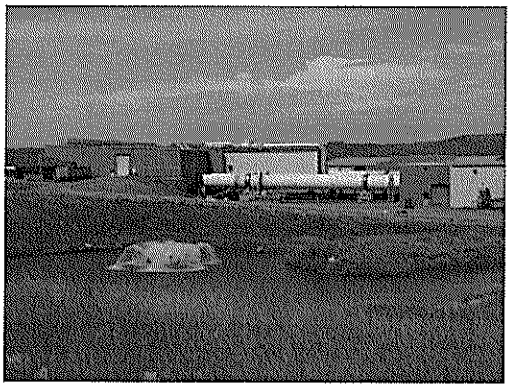
I can hardly wait until I get back to school and I'll be able to wow my friends and teachers with my amazing research skills and university resources when it comes time for that first big essay or research assignment. Well, at least I can hope.

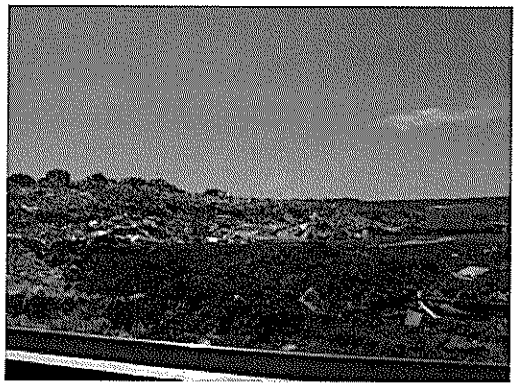
At the end of the day, our first WISEST group activities were a great success. I believe everyone had a fun time, and we all eagerly looked forward to the next week when we would be able to get together again, en masse, to share in exciting activities and new experiences.

WISEST Weekly Activities

Research In Action: Edmonton Waste Management Facility

by Cassie Tesche





On July 16, as one of our Wednesday afternoon group activities, the WISEST participants split up and half of us toured the Edmonton Waste Management Facility. As we found out, Edmonton is known internationally for its waste management — less than 40% of residential waste is sent to the landfill. Edmonton is also home to leading edge technology involving waste management and it was great to see some research in action.

Our tour began in the Administration Facility, where we met our tour guide, Larry George, and watched a video. As well as introducing us to the wonderful world of garbage, this video gave us an inside view of the large Composting Facility, saving us from the heat, (up to 60°C in the summer), and the smell! We learned that the Composting Facility was built with negative air pressure inside to prevent the smell from escaping the building when the doors are opened. After the video we returned to the bus and began our driving tour of the facilities.

The first stop on the driving tour was outside of the new facility that they are currently building. It will make use of recycled tires and concrete, and will have a grass roof. The next stop on the tour was the Gortex Composting Project. This consists of sewage sludge and wood chips covered in an expensive Gortex blanket. The Gortex has special properties that help keep ideal composting conditions inside. This project is fairly new and very expensive, not to mention stinky!

The next stop was the Clover Bar Landfill. Edmonton is one of the least-dependent cities in North America concerning landfill usage and they are still working to reduce the amount of garbage disposed of at a landfill. Unlike Edmonton, all of Sherwood Park's garbage goes straight to this landfill, without any composting. After each layer of garbage is added, a layer of dirt is also added to cover the garbage and prevent smells from escaping, (though we could still smell the stinky sewage sludge). The landfill must be paradise for gulls, because we saw a ton of them. Very near the landfill is one of the city's two Eco Stations

where residents can drop off everything from antifreeze and motor oil to old propane cylinders and fridges, all of which are recycled.

For the next part of our tour we got off at the relatively new Materials Recovery Facility. This is where the materials of Edmonton's very successful Blue Bag recycling program are processed. Combining both mechanical technology and human-power, the Materials Recovery Facility efficiently sorts the recyclables and then bales them to be shipped off to other companies (some as far as China) to be recycled.

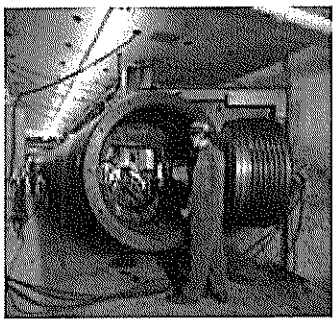
On our tour we also learned about a new facility that will be coming to Edmonton soon. It will be a large-scale metal recycling facility. Appliances containing metal and other components will be chopped into small pieces. Then the metal will be sorted from the rest of the appliance through the use of large magnets. This will be a great new recycling opportunity, and Edmonton was chosen out of many eager cities in North America to receive the facility.

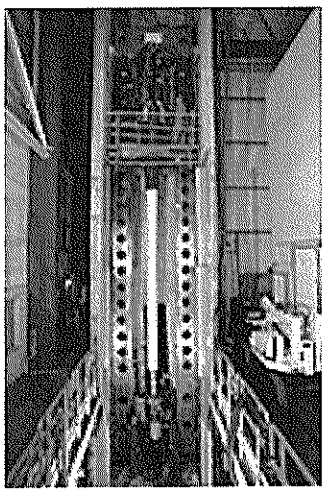
Our tour to the Edmonton Waste Management Facilities was very interesting and informative, (although quite stinky), and we learned a lot. It was neat to see the amazing role that research has played in an area that one wouldn't usually think of as a major field of research and development, and now we know what happens to our "donations" after the bin.

WISEST Weekly Activities

Research In Action: C-FER

by Justine Goodkey





For a Wednesday afternoon activity it was arranged that we go and tour CFER (Centre for Frontier Engineering Research). I had never heard of the place - I didn't know what to expect for that afternoon. Upon arriving it took us about fifteen minutes to get inside because of all the security measures that we had to follow. At CFER they test pipelines in different simulated conditions for example extreme temperatures and pressures. We toured the research facilities with Brian. This was very interesting because of all the different extreme cases that are generated at their fingertips to further research. The tour guide was telling us some of the companies that give them research to do. One example of this was a company from Ontario wanted to use their extreme climate generator to figure out how they would stack the cases of pop that they produce. This saved the company a lot of money from fatigue in the pop bottle.

After the tour our group went and listened to a presentation by an engineer who works for the company as a consultant. She was very helpful in describing to us how the company works and how much help it is to companies. Not only was she helpful in letting us know about the company, she was interested in what the WISEST students want to do. She modeled her presentation in a way that it included possible careers for us. The tour at CFER was excellent in the respect to opening our eyes to worldwide research happening right in Edmonton and another possible workplace for us in the future.

WISEST Weekly Activities

Small Group Discussions with People in Non-Traditional Roles

by Amelia Bird

Students participating in the WISEST program have interests in science or engineering, whether these interests are general or extremely specific. Many turned to the program to discover possible careers that they may have never considered in the past.

On Wednesday July 23rd we had the opportunity to talk and listen to women in various fields of science and engineering. Each guest had a unique experience to share.

Before the discussions began, we heard an inspiring speech from Dr. Margaret Ann Armour, who discussed the importance of networking and building a community of supportive, accepting people so that others may learn from their experiences.

Apprehensions quickly faded away as the women were more than happy to answer any questions and address concerns expressed by the students. A surprising and relieving point was made throughout the discussion that it is okay not to know what you want to do with your life. There are no straight paths in life. Sometimes they curve, shoot out at right angles or rotate 180 degrees!

Although each role model had a different profession, they all had certain things in common. Firstly, each mentor thoroughly enjoyed her career. Secondly, they all found university to be extremely important. The women also discussed that it may take a little while to find an area of study that is completely enthralling.

An interesting point discussed was that people like to be asked about their work. The best way to find out about an area of research or a career is to ask! People usually enjoy talking about what they are doing and it is a good way to learn something new.

As the discussion progressed, time seemed to fly and what seemed to be only the beginning came to an end. Having these women take time out of their day was greatly appreciated as well as the stories and advice that they shared. Seeing such successful women enthusiastic about their careers was very inspirational.

WISEST Weekly Activities

WISEST Learns About Project Management at IBM

by Diane Woo

Yay! Another WISEST Wednesday afternoon field trip! This time, the WISEST students are going to the IBM Workshop. At first, most of us didn't know where this place would be and what we would see or do there. When we got off the bus, we stood in front of an elegant building that had revolving doors. After having fun going through the revolving doors, we had to get through security before we could go any further. Once we got through and had settled ourselves in the room in which a presentation would take place, Laurette Rajotte greeted us there with food and drinks. Although the projector and laptop was not working properly at the time, our host went right into her speech without needing to rely on what she had planned. She did a wonderful job and her effort to make our stay enjoyable was greatly appreciated. Afterwards, all 60 of the WISEST students were split into groups to take part in a role-playing activity.

Now settled into our groups, the individual members were assigned their roles and given their task. This activity is supposed to give us a general idea and feel for what it is like to work there and what the different positions work together. A staff member there would pretend to be our customer. Now to the mission at hand. A customer has hired us to build a website for their company, Singsong productions. There were specifications for the type of website they want us to make, and with this in mind, the group went to work. One of the group members were to organise our time and make sure we are on task, some others would talk to and negotiate with the customer to guarantee that we get a better understanding of what the customer wants and what our company can do. Also, there were, of course, the designers, the people who actually design and make the website. Finally, there was the customer, who was the staff member at IBM who was also answering our questions about the career and anything we may not understand. The role-playing was so much fun we didn't want it to end. This was much different from any other tours we have been on so far. The other tours were interesting too, but we never got a chance to actually do anything, like getting some hands-on experience. I certainly learned a lot from this experience and at the same time had lots of fun.

After our role-play, the different groups each had a spokesperson that told the rest of us of the lessons learned during this trip. Many learned that time is a very important factor in planning, designing, and creating websites and programs. The planning needs to include everything within a reasonable set of time, and must also take into account the problems that may arise. The people that talk to the customer must ask all possible questions that may be of help to the designers. Questions like purpose, themes, and what exactly do they want on the site. Questions not only have to be asked in the beginning, but also during the whole process because there may be little gaps in the information that the customer gives them. They are the main people that communicate with the customer and sort of act as the translators between the customer and the designers (because we all know that designers and computer programmers have a language of their own). So overall, we learned that time is a very valuable thing, especially to the people at

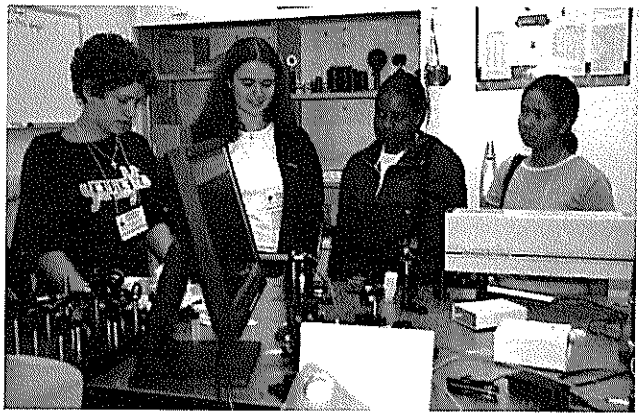
IBM, and that everything must be thorough. Oh, and that the customer has the power.

Now that the learning part is done, the draw for prizes begins and several members of WISEST received various prizes from IBM. Now our tour of IBM has ended, and as the WISEST students left one by one, thanks were said and we piled back onto the bus. This experienced provided a different view and a different career to contemplate for the future. The WISEST students certainly earned a few more experience points and left the IBM building with a broader view of the careers available for women in scholarship, engineering, science and technology.

WISEST Weekly Activities

WISEST Students Visit Research Labs on Campus

by Kristine Abana



August 6 highlights our last Wednesday afternoon event. That afternoon, all of the 60 WISEST participants had an on-campus research lab tour. It was an event full of excitement and surprise as we set foot to our yet to be known research lab tours. It was really a surprise as we only got to know of our respective labs few minutes before the tours.

The lab tour was our chance to meet other academes, get a glimpse of their research work and catch sight of some fancy machines. I was fortunate enough to have a tour on a couple of research labs in the Physics building. We started our trek in the basement of the building, visiting the Transmission Electron Microscope (TEM) lab. We got to see this exceptional microscope, which they use in studying the microstructure of nanowires and thin films. We also felt proud as we visited the Ion Beam Facility, which is a room for authorized personnel only. Also, we were able to play with liquid nitrogen and hold air gels (a material of 95% air) in a lab that deals with low temperature. In ending our tour we walked through the thin film laboratory which houses several deposition machines for thin films.

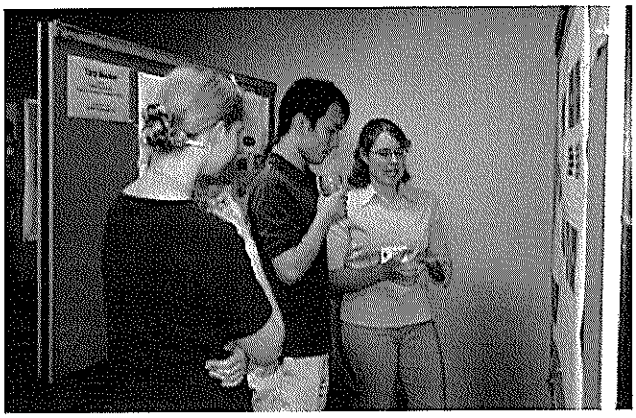
The lab tour was an informative and enjoyable experience. Not only we had a glimpse of other research work but also we got to meet very nice people. They were very warm in welcoming us in their labs and were very enthusiastic to share their learning and experiences. It's nice to see that undergraduate students are also involved in research. Also, it is interesting to know that science is really an interconnected field. It is evident as different departments like ECE (where I spent my summer) and Physics are collaborating on the cutting edge research of nanotechnology.

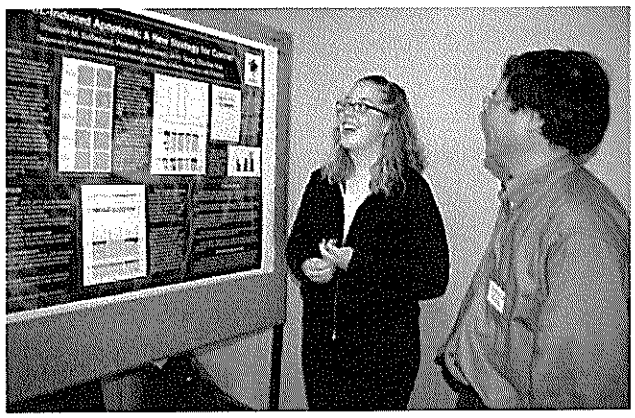
The on-campus research lab tour was an extraordinary experience. We felt honored to be able to see the groundbreaking and cutting edge researches but also it gave us an insight of the other career opportunities that awaits us in science and engineering fields.

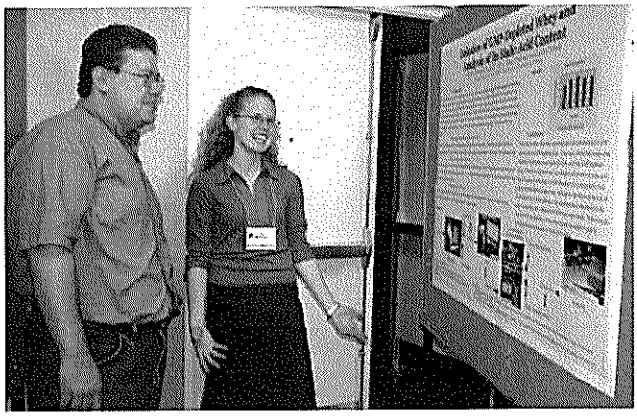
WISEST Special Events

The Research Team Thank-You

by Kelly MacGregor







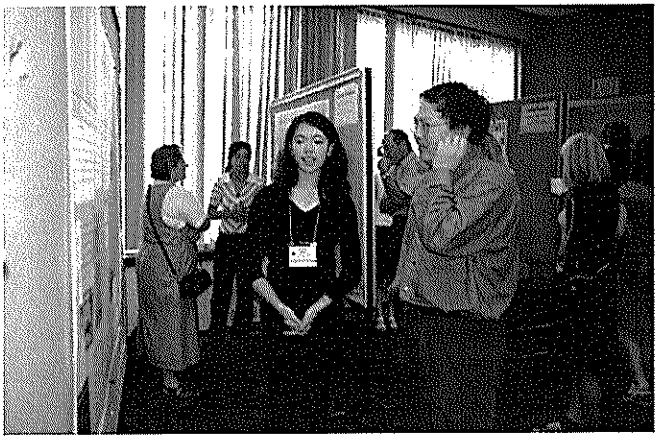
August 13th 2003 was the conclusion of 6 hard weeks spent researching and learning by all 60 WISEST students. Although this day marked the end of an incredible research opportunity it also birthed much enthusiasm and newfound interests in all participants. The Research Team thank you-held at Lister Hall-proved to be a very memorable day, an excellent way to bring to a close the 19th annual WISEST program.

The day began bright and early with all 60 students arriving ready to show the world, or rather the other students and professors, how they spent their 6 weeks. The morning consisted of much excitement, great food, and a lot of fun. It was a great privilege to see all of the other students work and meet the people who they had worked with over the summer. The time spent with the other students and their fellow researchers was a great learning experience as everyone had the opportunity to meet a variety of people and learn about many different research projects.

The poster presentations made by all the students were very well done and incredibly varied. For some students their 6 weeks of research consisted of working with amphibians in Athabasca or for others gene mapping and the designing of social programs to help troubled youth. Having the opportunity to see such a vast array of research really provided the chance for everyone's eyes to be opened to the diversity science provides. Everyone did a great job and it was very evident that all of the researchers felt incredibly proud of the students they had personally worked with over the course of the 6 weeks.

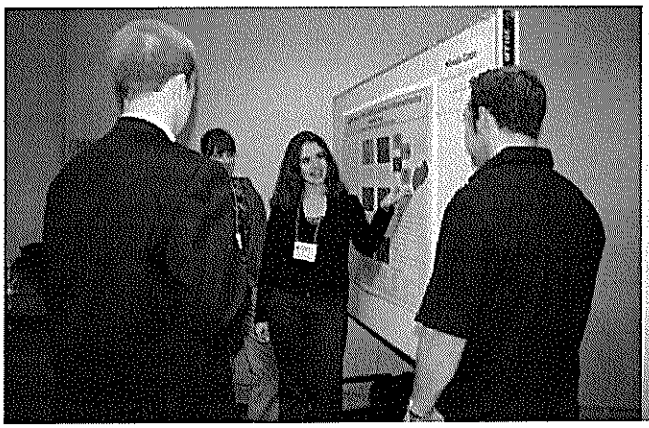
The interaction between the students and the research teams was great. The research teams made all the students do their share as they presented their posters with lots of enthusiasm and competence. It was

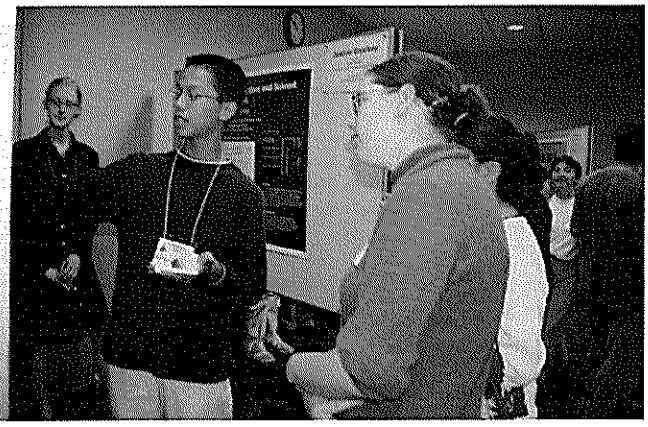
impressive how quickly all of the students learned the technical jargon and procedures related to the areas in which they worked. From the beginning to the end of the 6 weeks each student was transformed from an everyday grade 11 student into a fully functioning researcher. One student made the comment "going back to school will be boring" and she is definitely right. The time spent within all the labs stretched and exposed the minds of every WISEST student as they learned interesting and at times difficult concepts. Going back to school just wont be the same!



In addition to the wonderful poster presentations; the research teams had the exciting opportunity to hear Dr. Walied Moussa, the Assistant Professor of Mechanical Engineering, along with Marta Korz and Mihaela Carpo, two WISEST students, talk about the benefits of the WISEST program. It was great to hear the excitement in not only Martas and Mihaelas voices over the things they had learned, but also to hear Dr. Moussas talk about all the great things he personally learned from having WISEST students work in his lab. It was well communicated that the WISEST program, once again, proved to be very beneficial as it provided an environment that encouraged learning and growth.

In the end the Research team thank you was a success. It was sad to say goodbye to everyone as many close relationships had been formed. The friendships made within the labs not only made the time spent there very enjoyable but also will prove to be very helpful as each WISEST student embarks on post secondary education. The 6 weeks spent working in various research labs on and off campus provided all the WISEST students an experience of a lifetime and the Research Team Thank you did a great job of expressing all of the students' gratitude. It was a job well done!

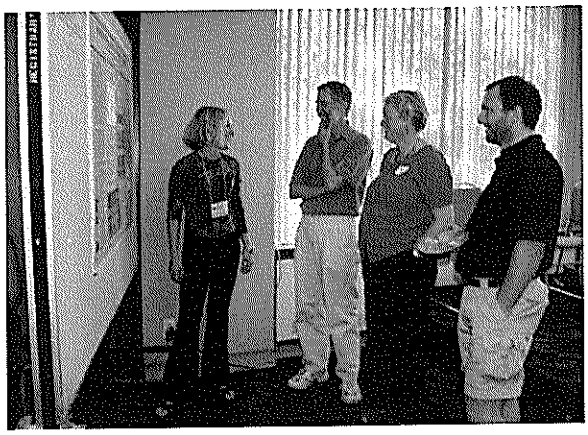




WISEST Special Events

WISEST Open House

by Heather Stewart



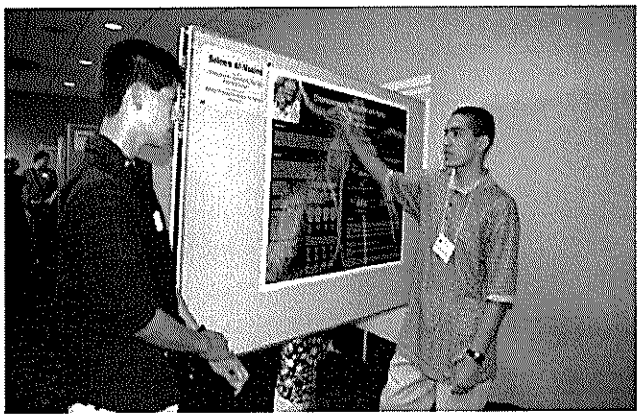
One by one as each WISEST student entered Lister Hall with friends, family, teachers and dignitaries, the nerves of uncertainty of what to expect grew. The atmosphere had changed from an easy-going and laid back gathering at the Research Team Thank-You, to a friendly but semi-formal commemoration of all of our success. Our posters were laid out across the top floor of the banquet hall, each one having a professional appearance with personal touches, visible for all to gaze at and read.

As the many individuals and groups gathered to recognize the individual achievements of all of the students, they also joined together in recognition of the impact and success the WISEST program has had over the past 20 years. The program, one of the first of its kind has been supporting and leading many people through areas of interest they may never have considered pursuing such as engineering and sciences for women or home ecology and nursing for men. That afternoon acknowledged not only the students' determination to break through traditional walls, but applauded the program itself for inspiring and supporting so many people to pursue their ambitions.

The first hour was open for everyone to mingle through the separate rooms, sharing refreshments and stories while going from poster to poster, listening to the many students descriptions for their work. Proud parents tried their hardest not to gush over their own child's achievements, while students tried to avoid their parents embarrassing exclamations "Oh honey, what an excellent job you did. We'll have to show it to everyone we know!" The first time guests were awed by the professional quality of the work; while returning guests were impressed again, by the effort each student put into their project to make it unique.

Slowly people began to take their seats for the formal part of the program and the many speeches inspired by the uniqueness of WISEST and its value. WISEST vice-chair Dr. Margaret-Ann Armour was absent from the occasion and unable to act as mistress of ceremonies so Dr. Mary Fairhurst, a chemistry enthusiast and present DOW Chemicals employee, presided over the ceremonies. Aside from being an excellent speaker and MC, she is also a role model for the WISEST program by participating and supporting the program as much as possible, in as many areas as possible. Her belief in the program, and all that it can do for students looking to nontraditional roles, was evident in her encouraging comments on all of our accomplishments this summer.

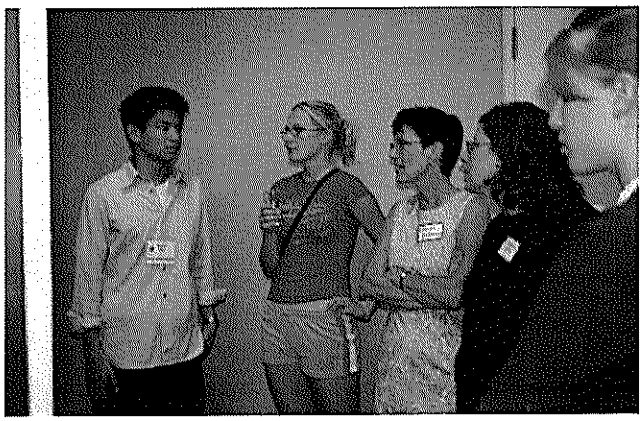
Her strong but positive feelings were reiterated through all of the speakers that evening. Lisa Hall, another women who found her career in a typically male field. Lisa is a chemical engineer at Weyerhaeuser, who happens to be a proud WISEST Partner. Alana DeLong, an Alberta MLA representing Victor Doerkson, Minister of Innovation and Science, expressed the importance of programs such as WISEST, as they will lead us into the future and help eliminate barriers preventing people from pursuing there aspirations.

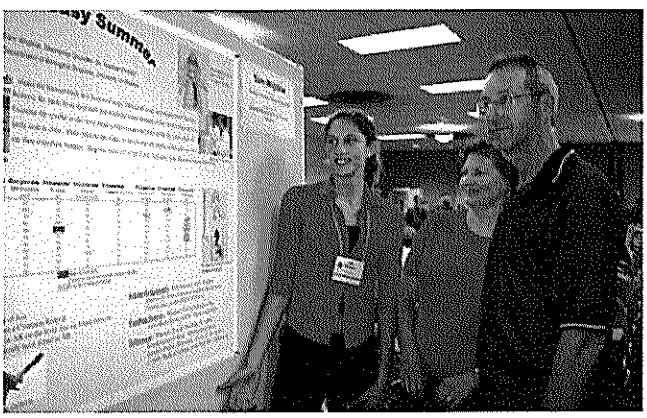


Amelia Bird, a fellow WISEST student, expressed the general thoughts of all the students. The program was unforgettable and will help each one of us some point in our lives. All of the experiences in our labs and around campus were completely worthwhile and stimulating. Her thoughts were clearly described through the words she chose, "It has been an amazing opportunity to go to the university at the end of grade eleven as we have been given insight into aspects of the university that will help in making decisions about post secondary education. The people met through WISEST are all interesting people who want to learn and inspire others to do so as well. Our eyes have been opened to many careers that we may have never considered in the past."

Bill McBlain, the Associate Vice-President of Research at the U of A, finished off the presentations with a speech stressing the importance of the interaction between high school students and researchers. High school students aren't the only ones learning during the process, the students in their lab can astound the researchers as well. With a final word, Mary Fairhurst finished the program by sharing some thoughts filled with promise and belief in our ability to do great things in the future. Allowing everyone to dream as big as possible without the walls of fear and tradition blocking out paths.

After 20 amazing years the WISEST program continues to inspire women and men throughout Alberta to attain their hopes and goals. After six weeks, sixty students left the university campus with an infinite number of new possibilities and paths to follow. The university has so many people working as a community enabling individuals to strive for their own personal best. The excitement is contagious and as we return to high school we know that the WISEST program and all that it offers will have always influenced our future decisions. A huge thanks to the program for granting the opportunity of a life time.





WISEST Social Activities

Thursday and Friday: Time for Lunch with the Bunch

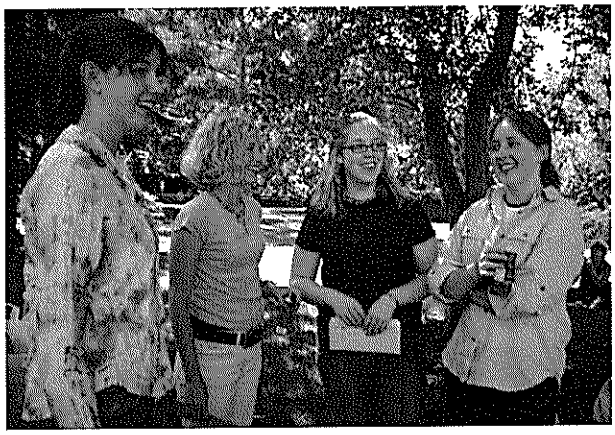
by Amy Loo

Lunch with the Bunch was exactly what it sounds like. Once every week, the WISEST students would get together to have lunch and get to know each other a bit better. Tara's group, Blue, met every Thursday while Celia's group, Code Red, met on Fridays.

When the weather was nice, we met outside in Quad to eat, usually in the shade of a nice big stand of trees. On rainy days, we met by the Info Booth in SUB and had our lunches there. Fortunately, the weather was fantastic most of the summer so we only had to eat inside a few times. It was okay if we didn't show up every single week or we could show up on both Thursday and Friday if we really wanted to.

Most of the time, we just sat around and talked – about the work we were doing in the lab, about the many different people we got to meet, about our posters or the weekend – about pretty much anything we could think of. Sometimes people would get a Frisbee and toss it around for a while. The lunches were also an opportunity for the student coordinators, Tara and Celia, to go around asking us how we were doing and about the labs we were working in.

Lunch with the Bunch was a great way to see and talk to each other somewhere besides at the Wednesday activities. It was also a nice change of pace from the day-to-day lab work.



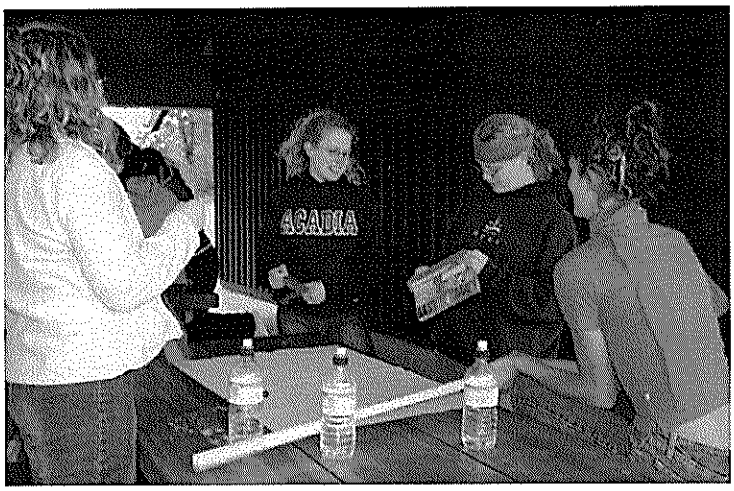
WISEST Social Activities

History in the Making: The 2003 Silly-mpics

by Jane Hilderman

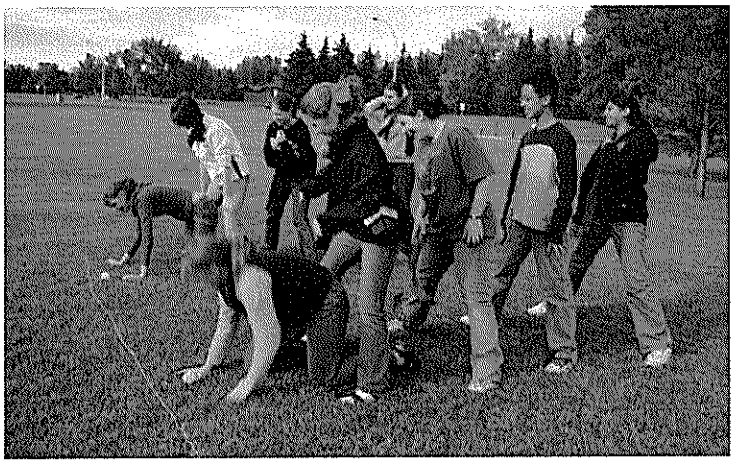
It was a beautiful evening for such a historic event when representatives gathered from far and wide, each bearing their country's noble colour in flag and cloth. After fuelling up with a dinner of subs and cookies, Eggplantia (Eggplants), the Republic of Greenia (Leprauchans with Shamrocks), Blutopia (Blueberries), Pinkasia (Pretty Pink Princesses), Sunflower Island (Sunflowers), and Rust-o-pia (Rusty Nails) stood by as torchbearer Louis Bezuidenhout lit (or attempted to) the torch of our games (other wise known as a bundle of matches) to officially open the games as the theme song was beautifully hummed by the duet of Tara Nord and Celia Valel.

Do not be mistaken! This was not your average Olympic games. Oh no! This was the Silly-mpics – the ***first*** ever Silly-mpics. There was no training and certainly no warning of the task to come. Only a sense of humour and a willingness to forget personal embarrassment would ensure a good time, and with some luck, points!



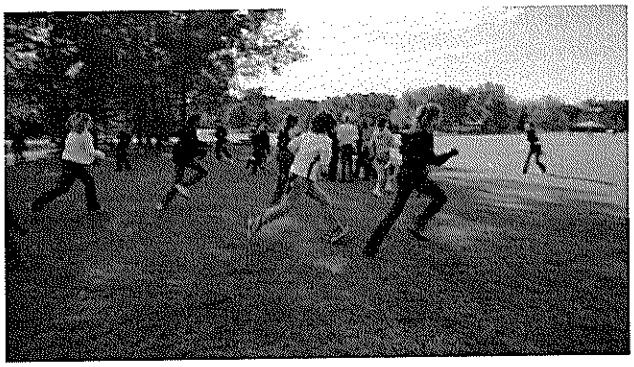
For the first round, in good sportsmanship, the borders of countries were forgotten as two teams battled it out in a close match of "Capture the Sponge". The importance of teamwork was exemplified with the follow through of serious strategizing and self-sacrifice of time in prison. Of course all players ended the game entirely intact and warmed up for the next challenge.

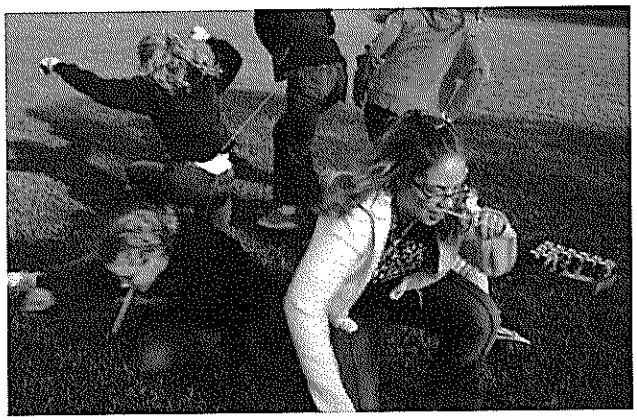
Now was the time for countries to shine in 3 relay events when two teams would go head to head. You must be warned the best description will not suffice – you had to partake to understand the struggle.

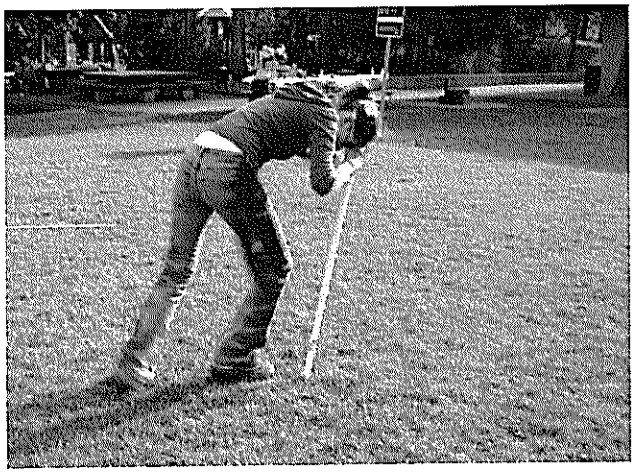


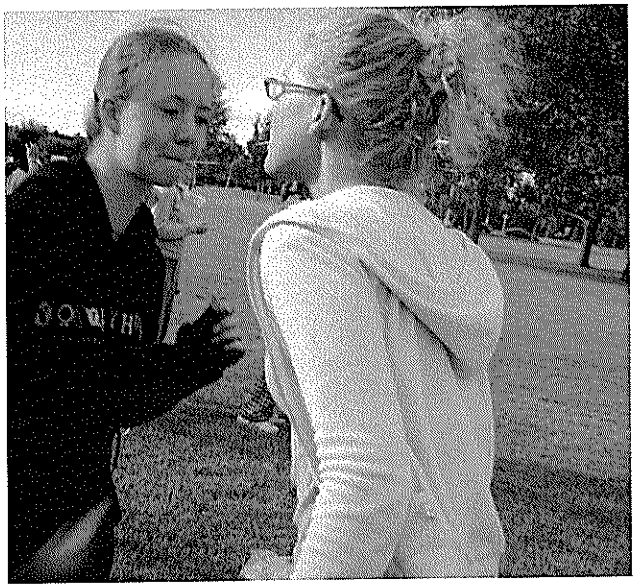
Relay #1 consisted of scrambling through fellow teammates legs, a dash with tennis ball between knees, spinning 10 times bent over a vertical baseball bat with one's forehead touching it, and managing to get back with tennis ball between knees. To begin with, it is much more difficult than you might imagine to run with a tennis ball between one's legs without it falling. In fact, "run" is nearly impossible – ever heard of a speed walk? Well this was a speed *waddle*. The spinning did several people in (you know who you are) as they found themselves falling drunkenly to the ground much to the amusement of the teams. If you are ever looking for a trippy (legal) experience – give it a try!

In relay #2, you were forced to get to know your teammates better whether you wanted to or not! Tied in circle, backs inwards, a team had to first zigzag its way through pylons before dropping to suck back 3









cans (felt like 4) of sprite (warm) through straws. Huddled around a large bowl, you prayed for no backwash. A bug, however, was an extra point. And just for the torture of it: crab crawl back to the starting line.

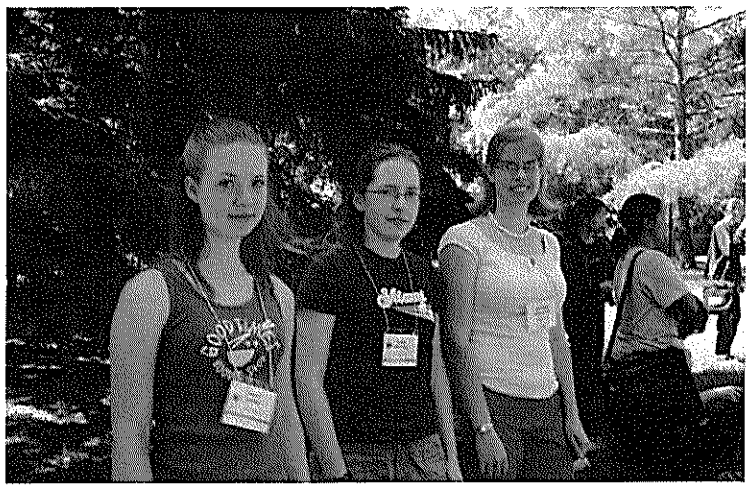
At last in the third relay, the classic lifesaver-toothpick pass combined with the skittle-on-the-spoon relay that required agility, balance, and a steady mouth. By each team's last relay, the laughter had grown to a verberating roar in Hawrelak Park. As the results were tallied, it was every man for themselves in a sudden death popping game where everyone had an inflated balloon fastened to their ankle. Only two unburst balloons remained belonging to Shannah Sutherland and Cassie Tesche when a truce was called.

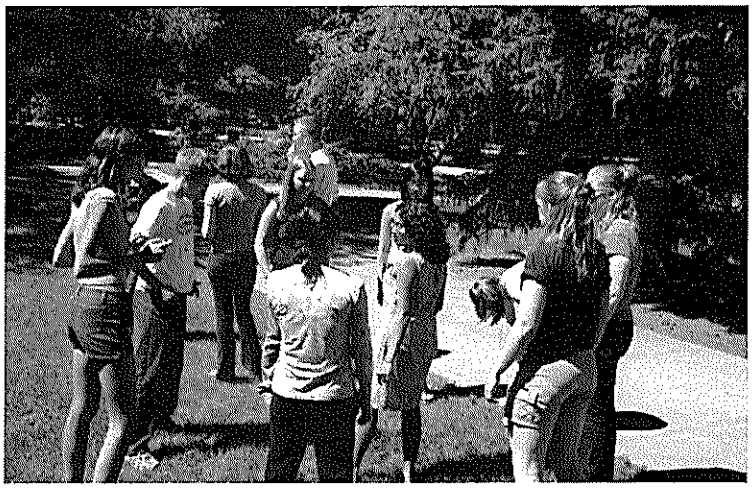
As we gathered, not in teams, but as friends, Rust-o-pia was awarded first (goes to show that being pretty doesn't help) with several teams tied for second and third, but we all left winners with memories and new friends to share them with. Be proud all you Silly-mpians, for you competed fairly and with such enthusiasm to make the first WISEST Silly-mpics simply a success! Who knows? It could become an annual event.

WISEST Social Activities

The WISEST / HYRS Lunch!

by Heather Stewart





On a lovely Tuesday afternoon, a large group of eager beavers gathered in the sun for lunch and polite, stimulating repartee. Well, not exactly but there were people and there was lunch.

At first, each tribe (WISEST and HYRS) stuck to their own village, with the few brave souls willing to step out and actually speak to foreigners from the other program. These politics of isolation were dealt a deathblow with the arrival of the snacks. Tribes swarmed together and were united, the original alliances forgotten.

As everyone became comfortable with this blended group, the tribal leaders introduced a "get to know ya game". Due to the poor acoustics of the great outdoors, the enthusiastic cheers of the crowd sounded remarkable like moans and groans. We efficiently organized ourselves into groups with a performance that would have made a six-year-old proud.

Then came the hard part, actually playing the "get to know ya game". It involved everyone learning and remembering your neighbor's name. Okay, not so tough, until the pressures on and life and death are at stake and you have to remember when and who to blast away to stay alive. After many rounds of play, and lots of laughs, the winner was declared and crowned with their own pride.

As the hour dwindled away everyone headed back to their own lab, for a nice restful work break after a grueling (but fun) lunch break.

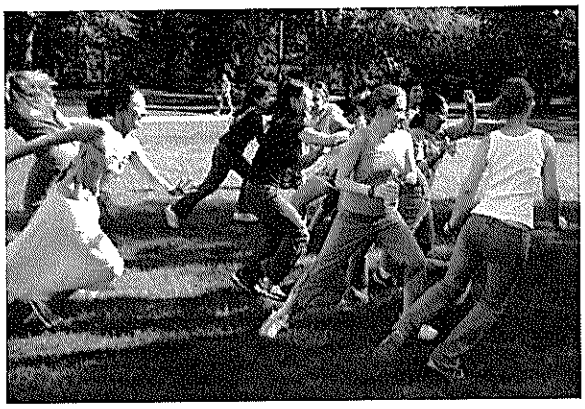
WISEST Social Activities

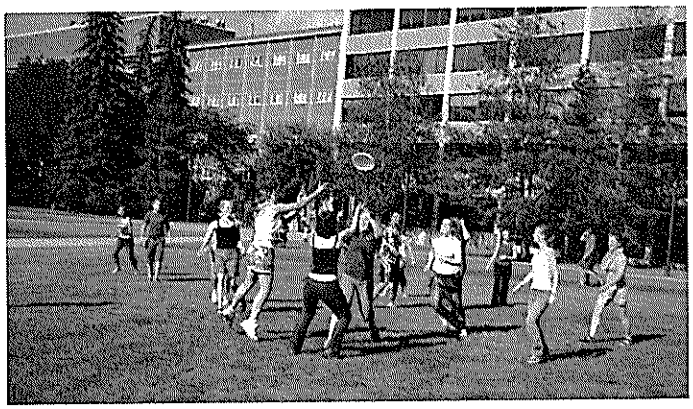
Hawaiian Luau BBQ!

by Teresa Storch

Once again WISEST gave us a prime opportunity to have some fun in the sun; and in Hawaiian style nonetheless! We got together for an awesome BBQ on Quad after work on Monday, July 21. Some people really got into the spirit of things and even dressed up in Hawaiian garb. Some very stylish leis and colorful skirts helped to set the scene.

Before we ate, we played a few games. To start it all off, there was an intense game of group Rock, Paper, Scissors. It was a ton of fun to participate in as well as being an excellent spectators' sport. Next we moved on to a game of Ultimate Frisbee. It was an extremely close game with one team only scoring about 15 goals to the others team's one. There were some fabulous moves made by several of the top-notch players who were participating. The defense of both teams was particularly strong with some awesome blocks and saves made on both sides. Congratulations everyone on a game well played.





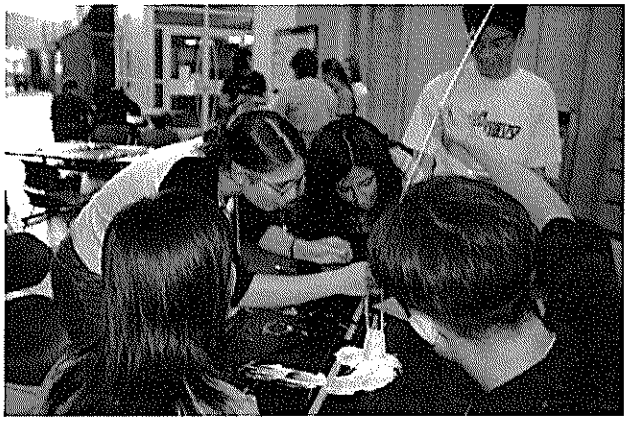
Everyone was quite tired after all of that physical exertion, so it was time for some good eats. Our first-class chefs, Tara and Celia, cooked delicious burgers for us. On top of that, there was also salad, veggies, chips, cookies, candy, and a wide variety of beverages. The food was great and there was lots of time afterwards to visit with everyone.

Special thanks goes out to: Emily for bringing her regulation weight Frisbee, Tara and Celia for running the BBQ, and to the WISEST office for organizing the event and providing the awesome food! Also thank you to everyone who participated in the event and helped to make it so much fun!

WISEST Social Activities

The WISEST Challenge

by Jonathan Chin



On a sunny Wednesday afternoon after the sixty WISEST students had taken their research laboratory tours, it was time for the 2003 WISEST Challenge! For this event we convened on the second floor of the Engineering Teaching and Learning Complex. It had been reported to us that we had to put our 'youthful abilities' to the test, and everyone was excited and curious to learn what the challenge would be.

Teams for the WISEST Challenge were based on the lab tour groups, and upon arriving at the ETLC we noticed garbage bags wrapped over a set of tables. Naturally we presumed that things could get messy—this was a science program after all. Were we going to make chemical compounds? or mix solutions? After an introduction from Celia and Tara, curious eyes finally set their sights upon...a cupful of shaving cream.

Our task at hand was to construct the tallest freestanding tower using only the materials given. They were: 5 straws, 50 toothpicks, and a foam cup filled with shaving cream. It seemed appropriate that the WISEST Challenge was held in the new engineering building. After some planning and preparation time, we set off to build! Amid an electric atmosphere teams were heard discussing their plans and seen furiously attaching pieces together. After a few minutes some teams realized that their planning and cooperation had paid off, while others saw that the shaving cream worked to their detriment. Some students reported that the shaving cream had no structural purpose whatsoever and was simply there to make things messy. Others felt otherwise, as one seemingly exasperated female student remarked: "Okay, just give me a razor and I'll do my legs!" (I must say, only in the WISEST Summer Research Program...) After the initial trial, the teams were given the opportunity to evaluate their design and soon commenced with the second attempt. The students made improvements in this round, and finally it was the team of Cecilia, Jane, Martha, Michael and Teresa that won the WISEST Challenge with a height of 137cm. Fittingly, this team had just returned from an engineering research lab tour. A coincidence? I'll leave that up to you.

The WISEST Challenge was an amusing, interesting and enjoyable contest of creative wit. Innovative minds spotlighted what teamwork can achieve, and there were definitely a few engineering geniuses in the crowd! This final Wednesday social event before the poster presentations proved to be an excellent wind-down, as it was also marked with a pizza party where students munched and chatted away. The WISEST Challenge of 2003 was definitely an event to remember!

We are the WISEST Residents

by Shannah Sutherland and Andrea Marston

Greetings from room A19! This is Andrea, and I'll be giving you a tour (with my partner in crime, Shannah) of life under the sea – no, just kidding – life at residence. Still, it's a pretty exciting topic.

It all started one rainy afternoon with a bunch of unfamiliar faces gathered around a delicious chocolate cake - courtesy of our resident advisors, Emily and Louis. Everyone in the program was more than likely feeling very nervous for those first few days. Living far away from home for six weeks was definitely going to be tough, but our awesome roommates and residence advisors sure helped things along!

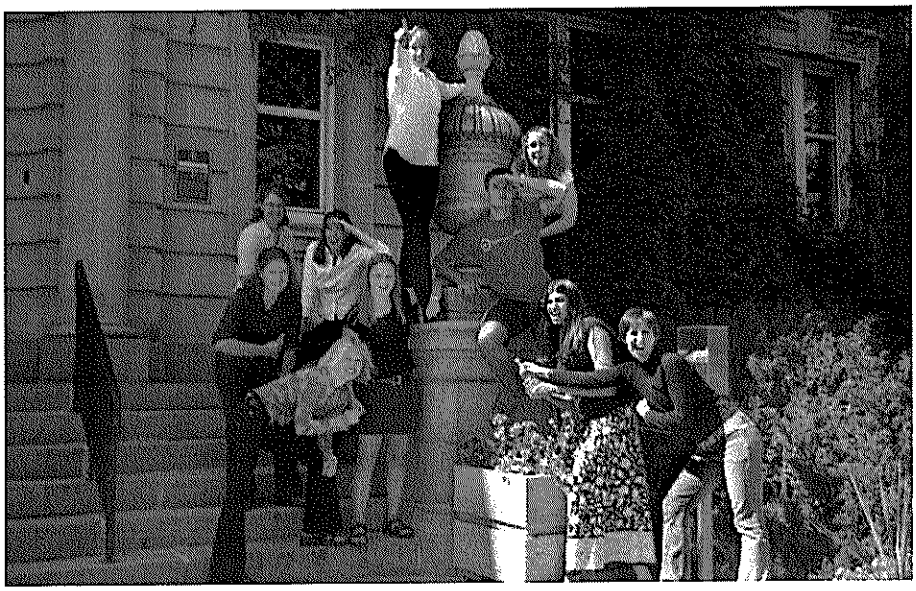
The six weeks actually went along very quickly. Emily and Louis had tons of awesome activities planned for us and somehow, we're not sure how, we managed to fit three years of outings into one short summer. We actually considered lengthening our days to 34 hours so we could have more time. Unfortunately, that made getting to work on time rather tricky.

A: OK, Shannah, I don't know where to go from here. How do we explain all the fun we've been having in 750 words or less? And in any case, who's going to get all of our inside jokes?
S: Well, I guess we could talk a little bit about all the stuff we've been doing – like, the things that we've been doing either as a group with Emily and Louis, or on our own, or whatever.
A: That first night we went to see the Canada Day fireworks... Everyone from Edmonton thought that they were the worst fireworks ever, but coming from small towns, we all thought that they were awesome!
S: And the Chantal Kreviazuk concert, you can't forget that! We had amazing seats, even if Amelia did have to sit next to that creepy guy.
A: But we should talk about the little things first. That's what made living in res. so much fun.

My standard day started out at 6:00, when I was brutally dragged out of bed and forced to go to the gym by Jane (true, I had agreed to go, but that was last night's Andrea.) After sweating for an hour, we'd come back to a truly delicious pancake breakfast and then head off to work (don't worry, we showered first.) Lunchtime was always something to look forward to, because we all met in CAB to share morning horror/ success stories and gossip about the people in our labs. Originally, it was just res. people who met, but we slowly managed to collect "honorary residence students" to join us in our feasting (sandwiches and juice...yum yum.)

S: Our "honorary residents" were so funny! I think that the best part of staying in St. John's was the people we were living with – I still can't believe how well we all get along with each other.
A: I know. I really don't know how they assigned us roommates but it all turned out great! We all love our roommates!

S: Being on Whyte Ave also made things awesome. There is always so much going on around us that it was hard to choose what we were going to do every night,



Whyte Ave can definitely be a crazy place to be, but to better prepare us for anything (and everything!) Emily and Louis gave us an amazing tour. From living in residence for her first few years of university, Emily really knew her way around and could tell us about the cool stores and what restaurants had good food and stuff like that. The amount time that we spent on Whyte Ave this summer is insane. Whenever we were bored or had nothing to do we went for a walk down Whyte and always amused ourselves. We went to some places so often that the people who worked there started to recognize us.

A: Like Cargo & James – laughs –
S: Exactly! And remember when we went to paint pottery at Crankpots? That was so much fun!
A: Yeah, and they thought we were all Art Faculty students because we were so creative.
S: Especially Dan.
A: Its funny how we just kind of "adopted" Dan and Arvin. I'm sure that by the end they thought of themselves as "one of the girls."

The thing about residence is that everyone grew really close with the other people we were living with. Inside jokes and funny stories were developed very quickly. Other people in the WISEST program actually thought we were like a cult. In a way, I guess we suort of were. We even ordered identical T-shirts (that we designed) that had our resident motto: uber nerd!
A: We should say something about all the great stuff that Emily and Louis organized for us.
S: Yeah, they definitely had some awesome ideas for us. Even when it was thundering outside we weren't bored.

One of the first things that we did as a group was go see Shakespeare in the Park. We went to see Henry V and our reaction was...less than thrilled. Maybe if we had been able to understand what exactly was going on it would have been exciting. However, being the troopers that we are, we gave the festival another chance with A Midsummer Night's Dream. I must say, we were certainly impressed. The performance was absolutely amazing.

Being that there are several different types of interests in residence we did some not so artsy activities as well. Between baseball, mini-golf and football we had satisfied everybody, especially those of us who are extremely competitive (DAN!).

A: We have to talk about the res. formal and our gala.
S: Those were definitely funny times. Should we put names?
A: No. Roshini and Nicole would kill us.

One of the highlights of this summer was organized by two girls staying in residence. After performing a weeklong survey that asked opinion questions about the physical appearance of male celebrities, the girls tallied the results and announced them to all summer research program residents during a Gala held in their room.

A: It sounds so silly looking back on it, but it was hilarious at the time!
S: Yeah, it would have been nice if I hadn't have gotten kicked out.
A: Well, then you shouldn't have peaked at the results, now should you?

As a final gathering all the students in residence got together and went out for supper at a fancy Indian restaurant. The food was so good (even though it was a little spicy – and by a little we mean a lot.) The whole eveningwas really a cultural experience.

Louis Bezuidenhout, HYRS Resident Advisor (far left) and
Emily Krauss, WISEST Resident Advisor (far right)

A: Okay, now how do we wrap this up?
S: But there are still so many things that we haven't mentioned! Like our Big Brother evenings... and getting free tickets to the folk festival from perfect strangers...
A: Yeah, but we're way over our word count..
S: And the street poet and the Chinese supermarket and the CariWest festival...
A: One thousand one hundred fifty two...
S: And the Heritage Festival and Taste of Edmonton...

The greatest part about staying in residence was that we made our own fun. You really don't know how creative you can be until you're stuck in a strange city with a bunch of strangers...

A: Oh! We didn't talk about how great Emily and Louis were. How will they find out how much we loved spending our summer with them?
S: Trust me, I think they'll understand when we give them their presents tonight.

The WISEST Resident Advisor
Emily Krauss: a.k.a. The Rez Hippie

Welcome to the greatest 6 weeks of 2003! I would like to take this opportunity to give a shout-out to all the people that made this possible:

Hello Andrea, Shannah, Jane, Theresa, Nicole, Roshini, Amelia, and Cassie! And we can't forget Louis. Hey Louis!

Not only was this the greatest part of my summer, spending time with the WISEST summer students in rez was one of the best experiences of my University days. I am extremely fortunate to have been granted this position because I met all of you. Each of you taught me something about myself, whether you realize it or not, and I thank you for that. You are the kind of friends that others are lucky to have. Imagine my delight when 8 creative, mature, and intelligent students moved into St. John's and my job was to spend time with

them. I couldn't have been more excited if CBS had phoned and asked me to be a Big Brother contestant. As the Big Brother house proves to me every time I watch the show, it's the people that make the experience. And my WISEST experience was amazing thanks to all of you who are, simply put, amazing.

So enough with the gushing, my final thoughts are as follows:

1. I expect a phone call when reunion 2004 happens. I also expect phone calls when you all come to University. We can visit Whyte Ave :)
2. My mom started crying when I told her about the book you made me. That was really wonderful of you all.
3. I have a new-found appreciation for Tom Jones, Orlando Bloom, New Zealand film-makers, MSN, horses (Amelia, I was to come to a rodeo to see you barrel-ride), cows (Shannah, if you ever see one in the great North, take a picture and send it to me), and last but not least, the physics of roller-blades.
4. Andrea, good luck overseas. I'm sure it will be unforgettable. Save up your stories so we can hear all about it at the reunion next year.
5. Yesterday someone said they miss my purple hair. Looks like Andrea, Nicole, Theresa, and Jane need to come back to do it again!
6. Enjoy your grade 12 year. Enjoy high school for the fun of it. Study hard for your diplomas. Dress up and dance with your friends at grad. Have a pirate party. And remember that this summer was only a taste of what's to come.
7. And we stood here...and we waited...forever...because of Louis...

Have a good year and see you next summer. Email me or phone me whenever you feel like it. Thanks for giving me an experience I will never forget.

Life at the Meanook Biological Research Station

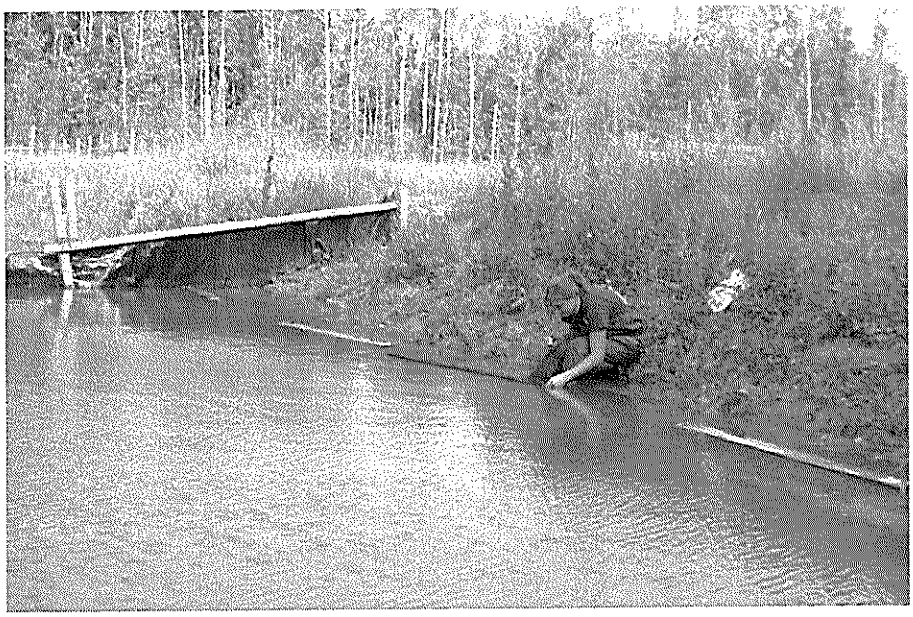
by Tara Booker

So you want to know what it's like to live at Meanook? Well, it can be summed up in one word, fabulous. Everything is great: the people, the place, and the experience. You can't even imagine it until you live there.

Okay, so living arrangements. You live in a trailer that has been split up into a couple of rooms. You get a room to yourself that includes a bed, a closet, a desk, and a chair. It's your own little sanctuary. The trailers are grouped into a little area called atco alley. The only problem is that the walls are paper thin, but that is the only bad thing about the place. There is a fully-equipped kitchen to serve you. You prepare your own breakfast and lunch, but there is a chef that cooks your supper on the weekdays. On the weekends, teams of people take turns cooking for everyone else. Team Sasquatch, the fish people, is one of the teams. There are always those late night cooking extravaganzas that you can indulge in, as well.

You are never bored out there. There is always some kind of activity going on that you can participate in. Many times movies are rented and you gather in the lounge to watch them, but don't make a fool of yourself by crying at almost all of the movies. You can also join in to a friendly game of soccer or Frisbee. When it's not wet a bonfire is lit and

smores are made and stories are told. There are also many board games that you can play with a friend. There are also those mid day trips to the lake that everyone looks forward to. You'll love it, the water at Narrow Lake is clean and cool and after a long day of working in the sun you'll be grateful for a nice, refreshing dip in the lake. Also, you can take a drive into Athabasca to go to the local restaurant for a going away party or to just stroll the river front. As well, there are millions of berries to be picked in the area. The berries range from blueberries, strawberries, raspberries, saskatoons, pin cherries, cranberries, and dew berries. The wonderful pies that you can make from those berries, mmmmm. If someone is having a wedding soon, it's always fun to have a stagette for them, but it has to be the right kind of guy. You can involve activities such as dress the bride, with toilet paper of course, and fishing for minnows, not real minnows of course, blue whales. It may be the best laugh you have there if the guy you get plays along with it.

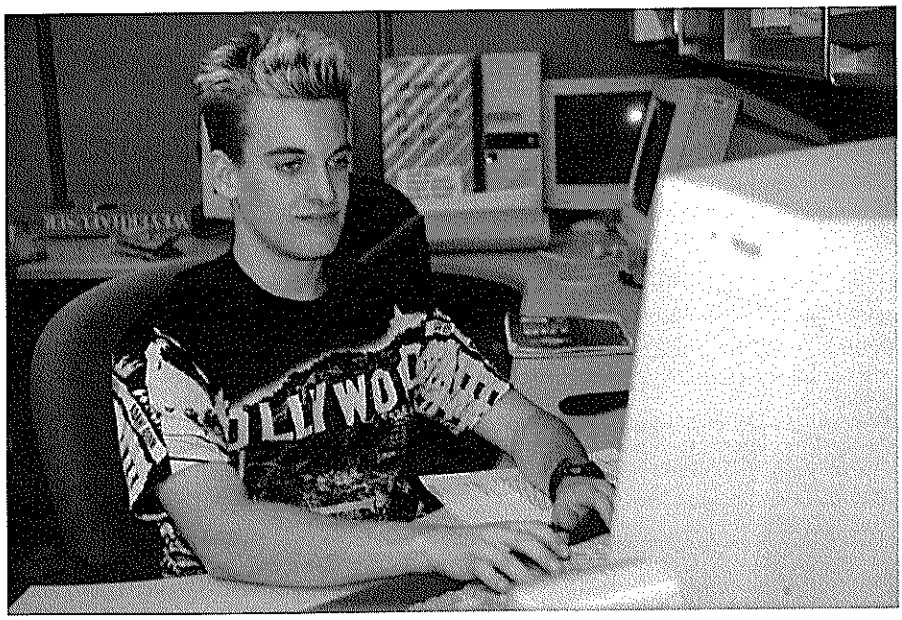


The best thing about Meanook is the people. On average there are about twenty people staying at Meanook. You make friendships that will last forever. There are people from all over the world staying there. There are people from all areas of Canada and the United States, as well as people from Germany, New Zealand, and China. At first there are a lot of names to remember and you feel bad when you forget a name, but by the end you know everyone and everyone knows you. You learn about what they are working on at Meanook and the things that their projects are focused on, such as peat moss and fathead minnows. You learn about everyone's life and what crazy things they've done in the past and what they plan on doing in the future. You get advice about the future and going to school. Sometimes there are intellectual conversations, while other times there are, well, not so smart conversations, it depends on your mood. The people are kind and always helpful. You hope you see these people in the future and you want to keep in contact with them.

If you ever get the chance to work at Meanook, take it. You may be in a secluded area, but it is the experience of a lifetime. You'll never want to leave.

Adam Gordon

WISEST Supervisor: Dr. Nicole Letourneau, Faculty of Nursing
Sponsor: Faculty of Nursing



Throughout the six weeks of the WISEST Summer Research Program, I worked for the Social Support Research Program, within the Faculty of Nursing, under the supervision of Dr. Nicole Letourneau. This program deals with an aspect of nursing that a couple months ago, I never even knew to exist: research. I had always viewed nursing with the stereotypical notion that it only ever involved dealing with patients in a hospital, and that it was a faster and cheaper, but ultimately inferior, route to becoming a doctor. Boy, was I ever wrong! I spent this summer working in an office, not using syringes and emptying bed pans, but working with photocopiers, printers, and the occasional, but incredibly exciting, paper jam. If there's one thing I learned during the past six weeks, it's to never judge or form an opinion about anything without first experiencing it for yourself.

I was directly involved in several projects this summer, making my contribution to the program less specific or tangible than that of my fellow WISEST students. The majority of my time was spent working on the Support Intervention for Homeless Youth study. After assessing the support needs and program preferences of homeless young people, this research project aimed to successfully pilot test a support program for this impoverished group. Known as the Homeless Youth Project, the program was designed to facilitate groups of youth, supported by volunteer mentors, each meeting weekly to engage in recreational activities and enjoy a free meal. My main contribution to this program was my assistance in the recruitment of the volunteer mentors. Utilizing various advertising methods, such as posting tear-off sheets on bulletin boards and placing boxes of candy cards in a variety of Edmonton businesses, my job regularly had me on my feet. At the moment, the recruitment process is finally wrapping up, for a project launch estimated sometime around the beginning of September.

Besides contributing to the Homeless Youth Project, I spent a fair amount of time working on the On-Line Support for Adolescents with Cerebral Palsy and Spina Bifida study. An innovative online intervention was developed and tested for teens with cerebral palsy and spina bifida, in order to provide opportunities for these youth to network with peers who share their disabilities. I was involved in the post-test phase of the project, managing and analyzing previously collected data using the statistical computer program SPSS, as well as pilot testing samples of the post-test participant surveys. This project is presently coming to a close, as final reflections from the adolescents are collected and conclusions are drawn from the extensive results.

While I certainly kept busy and benefited enormously from my time at the Social Support Research Program, I also gained a fantastic experience while participating in the other WISEST activities. The social events, such as Lunch with the Bunch and the Hawaiian Luau Barbeque, provided excellent opportunities for me to get to know many of my fellow WISEST students and exchange stories and experiences with them. The career-related afternoons, such as the Small Group Discussions and workshop hosted by IBM

Canada, gave me valuable insight into a variety of intriguing occupations and helped me narrow down my overwhelming list of potential career paths.

My most beneficial time spent during the past six weeks, though, was my introduction to and exploration of the University campus and its various facilities. Taking into account the fact that it took me over a month to finally become comfortable with the massive maze of complexes known as the U of A, I cannot even begin to imagine my first day of university had I not participated in the program. As well, I am now fully aware of and know how to use many of the crucial services offered on campus, such as the huge network of libraries, the thousands of online databases and e-journals, and a few of the impressive research laboratories. Finally, I am now fairly confident of which career path I am going to pursue, which university, faculty, and department I am going to enroll in, and most of the courses I am going to take. Considering that six weeks ago, I was considering becoming an astronaut, paleontologist, and every profession in between, the WISEST summer research program has truly profited in more ways that I ever thought probable, or even possible. Indeed, if were asked to sum up my experiences this summer in one word, I would exuberantly reply "Unbelievable!".

Agnes Lednicky

WISEST Supervisor: Mr. Rob Lake, Dept. Computing Science
Sponsor: Alberta Research Council

In the WISEST Summer Research Program, I worked in the Department of Computing Science at the University of Alberta under the supervision of Rob Lake. I applied for this program, hoping that it would facilitate my future decision of a career path. I found that my hope became a reality and there were several bonuses as well. Initially, I was unenthused to be placed in computing science as I was not even considering this field as a potential area of study. By the end of the program, however, my opinion changed. Although I did not resolve to pursue computer science as a career, it became a potential option. This experience helped expand my horizons. My project involved the creation of a database to which new entries could be added, data could be retrieved and existing entries could be modified or deleted. In order to perform such a task, I first needed to learn HTML, PHP scripts and several basic programming functions. During my first meeting with my supervisor, he gave me a simplified explanation on how computers function and outlined the type of work awaiting me that summer. Initially, I felt somewhat overwhelmed as there was much knowledge to be gained in what seemed a short period. Fortunately, however, I soon discovered that my worries were unwarranted. On my second day, I made a home-page, a fun preliminary project to help me learn HTML. Shortly after, my supervisor taught me how to employ a PHP function in my web-page. Gradually, through encouragement from my supervisor, I attained the tools necessary to commence creating a database. While working on the database, numerous problems arose, which my supervisor willingly and patiently helped me solve. Eventually, we accomplished our goal and created an efficient database to be used by the staff in the Department of Computing Science. The work

done in the lab was enjoyable, especially since the product was satisfying. I created my own hours and the work environment was lax. My supervisor was helpful and encouraging and I never felt daunted to seek his help. Through this program, I have gained a better understanding and interest in computing science.

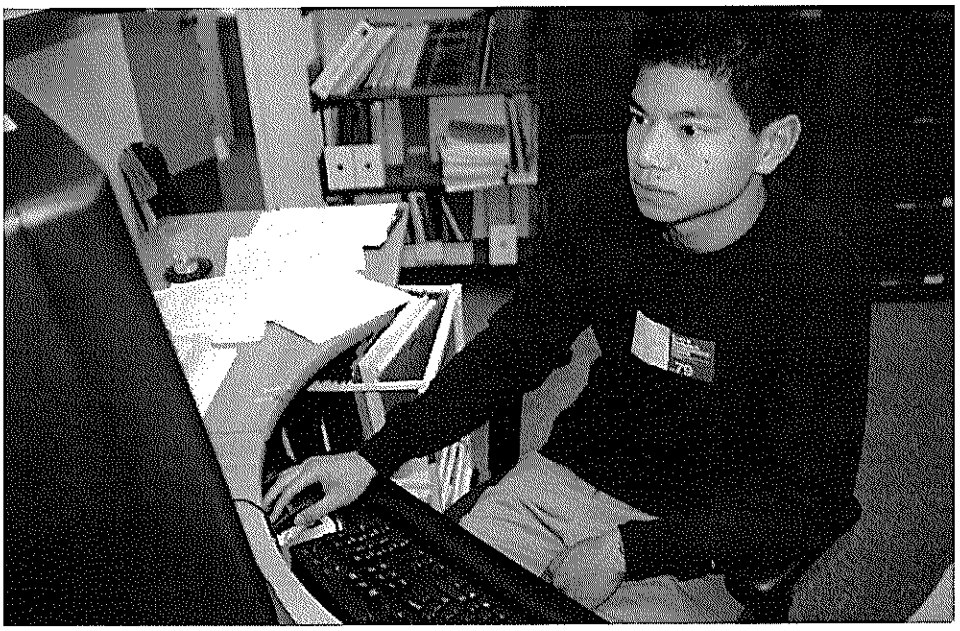
A second facet of the WISEST Summer Research Program involves the social aspect. This program allowed me to meet many people both from Edmonton and from other parts of the province. Once each week we engaged in educational activities allowing us to get to know one another better. Our first activity was a tour of the University of Alberta. Our first excursion involved visiting either the Edmonton Waste Management Facility or the Centre for Engineering Research (C-FER). Both trips were highly informative and interesting. Thirdly, we engaged in small group discussions with six volunteers involved in a variety of careers. This session was useful in helping one choose a future career. We also received an IBM workshop in which we were placed in a simulation of life in the world of computers. We learned several facts about the real world and were enlightened on the role of certain careers in computer technology. Finally, I was given a tour of an on-campus research lab of my choice. In addition to these educational activities, we had weekly group gatherings at lunch and fun activities after work. The wide range of activities allowed me to meet many people with whom I had much in common. In addition to developing new friendships, I learned about different careers through discussion with others about their projects. This program provides one with the opportunity to learn about various career options and to make lasting friendships.

The WISEST Summer Research program exposes one to a world outside of school that somewhat resembles the real world, preparing one for the future. Through the various activities organized by the WISEST coordinators and through discussions with other students, I was introduced to the existence of a multitude of careers. One also becomes more familiar with the University of Alberta campus, which could be useful in the future. Overall, I found this experience rewarding and worthwhile as it helped me in planning my future, I was enlightened in the field of computing science, met interesting people and made some lasting friendships.

Albert Woo

WISEST Supervisor: Dr. Priscilla Koop, Faculty of Nursing
Sponsor: Faculty of Nursing

Currently, in my WISEST summer research, I am working with Dr. Priscilla M Koop. Dr. Koop's interests are in researching home-based care giving; more specifically terminally ill patients who are being cared for by a loved one. One of her current studies is to find how the caregivers are affected in various ways, financially, physically and emotionally due to caring for a loved one. It also looks into demographics of caregivers to provide



evidence for their care-giving situation. Caregivers in the Edmonton and immediate surrounding rural areas were surveyed either in their home or on the telephone. Questions vary from income change, medical expenses, to caregiver burden, and changes in health.

The first task that I had to do is entering all the data into SPSS, a data analysis program. It was realized that the survey questions were in need of revision so Dr. Koop and I had to go to Ponoka to meet with the others that are involved in the study, and agree on the necessary revisions. This is when I realized that my job was more than just entering data because I had to give my ideas to input into the revised questionnaire. In Ponoka I also found out one of the best parts of my job is that there sometimes are "business trips", which really translates to sleeping in a car for one or two hours. I also had the chance to go on a trip to the small town of Nights-lake... or Daysland rather.

A kind lady by the name of Carmen Person, who is in charge of surveying the East Central health region, picked me up from the university campus and we were off to do an interview. In Daysland we interviewed an elderly gentleman for the family care giving study. I felt that this interview was good for me because I got the chance to see and experience the people side of the research rather than the data and scientific findings. The interview let me see first hand what the situation of the caregivers was through the accounts of their stories. It's like watching real life stories only you are actually there to experience it.

The current goal is to get around 200 questionnaires filled out before the next year. When all is said and done the evidence gathered will be correlated to find out whether older, sicker caregivers give the same or different care than younger, healthier caregivers. The study will also look at whether rural caregivers or caregivers of people with Alzheimer's Disease are the same or different from urban caregivers or those with cancer. The data can then be used to determine if care giving is too great of a burden on a caregiver's financial resource, emotional and physical health.

Another one of Dr. Koop's projects I am helping with is a systematic literature review. The review explores previously published research articles to draw new conclusions and findings. The articles reviewed are all based on scientific data and must have specific variables. The independent variable required is palliative care, which is the treatment of easing pain usually in patients who are terminally ill. The required dependant variable is bereavement outcome, which is the mourning after losing a loved one. About 200 article abstracts were obtained so we could each scan for the most suitable articles to review. Dr. Koop and I then had to use Kappa to determine our percentage of agreement. Where there is disagreement we need to analyze why there were differences of variable identification, so we could go ahead with the handful of papers left that will be used in the literature review. Then there was the troublesome duty of obtaining the full text versions of the articles. Only a few could be obtained on the internet and others had to be acquired at various libraries on campus.

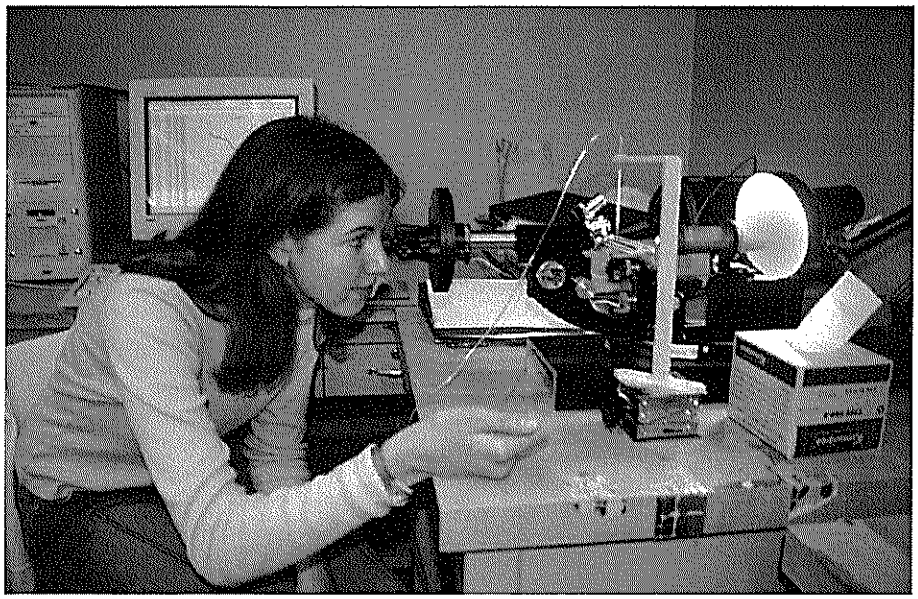
There were a few other activities outside of these projects that I attended. Dr. Koop teaches a summer graduate class on design and conduct of nursing research. At the class session I got to go to, Dr. Hegadoren was the guess speaker. Dr. Hegadoren spoke to the class about how she carried out a study on the affects of ecstasy and another on posttraumatic stress in woman.

Dr. Koop's husband, Dr. Belosevic is a professor in Biological Sciences. His main study is marine biology, specifically the study of fish and their diseases. I visited his lab, where I watched a progress presentation meeting of one his students to the rest of the class. Afterwards Dr. Belosevic's graduate students showed me each of their current projects. Some macrophage cell's that were of interest to the students' study were shown to me. I also got to see some of the fish that are kept to be bred and then tested on in the future.

"Overall I thoroughly enjoyed working for WISEST this summer. I really liked how I met so many new people who are very experienced in their field, and some new friends. It is really good work experience, and it let me learn a lot about myself in terms of what my interests are and where I want to go in life."

Amelia Bird

WISEST Supervisor: Dr. Tom Forest, Dept. Mechanical Engineering
Sponsors: Faculty of Engineering and Summer Career Placements Program



WISEST has definitely been one of the best experiences of my life. It has surpassed every expectation that I had and it is an event that will never be forgotten. At the commencement of the program, the university was an incredibly huge an intimidating place. Now, it is like a second home!

The Mechanical Engineering building is where I spent my six weeks. I was part of Dr. Forest's research team, studying physical properties of rubber. I helped with some fundamental experiments which will be needed to study other aspects of this unique material. Rubber is an interesting material because its molecules are long chain polymers that are all jumbled up when it in undeformed. When rubber is stretched, the chains align.

Molar density was the first physical property that we studied. Using a cathetometer, we measured the elongation of six rubber band samples. We were able to get a fairly accurate reading with the aid of the vernier scale, which measures to one thousandth of a centimeter! Many days were dedicated to measuring the stretch of those six samples! We measured the elongation of the samples by adding mass in twenty gram increments. Mass was continually added until the point of four hundred grams. Once at four hundred grams, mass was removed in the same intervals to check for hysteresis. The molar density was inferred from the force versus elongation measurements. Molar density determines the "stretchiness" of rubber, thus allowing for the prediction of the shape of deformed rubber.

The second physical property that was studied was the surface energy. To calculate the surface energy, contact angle data was needed. Measurements were done using various liquids including distilled water, ethylene glycol, and glycerol. A capillary attached to a syringe was used to control the size of the droplet dispersed onto the rubber sample. Once the droplet hit the surface of the material and started to move while maintaining its angle, a measurement could be taken. Surface energy was inferred from contact angle measurements. This property controls the wetting of liquids and determines how well adhesives stick together. Our particular sample had a relatively low surface energy.

In order to measure contact angle as accurately as possible, a camera was set up to the microscope to get a close up of the droplet. Once the pictures were taken, I learned how to develop film. It was a really fun process! Getting the film out of the case has to be done in complete darkness and after initial fumbling I became somewhat proficient at the procedure!

The Mechanical Engineering building is an exciting place to be because, not only are there a lot of really interesting labs, there is also a gigantic machine shop that consumes the first floor. The second year co-op student had a contest in the shop and it was really interesting to watch as each machine was tested for height, speed and strength.

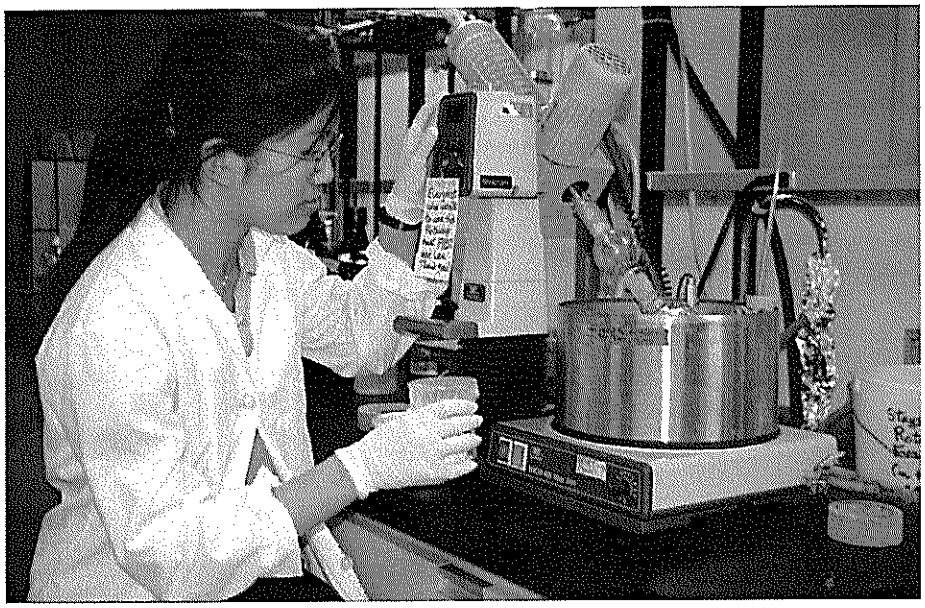
I have gained a lot of knowledge on various instruments and programs such as microscopes, a voltmeter, Microsoft Excel and MS-DOS. Of course, I would not have had a clue what to do if it weren't for Dr. Forest as well everyone in the Durable Material Research Lab and the machine shop. I really appreciate all of the patience and helpfulness that I received.

Another very beneficial aspect of my WISEST experience was the Wednesday afternoon activities. The tours, Small Group Discussions, and workshops were the icing on the cake. Also, living in residence was an experience in itself! I met some awesome people and did a lot of fun things.

Before WISEST, I had a vague idea about university and research. Now I feel much more prepared to make decisions regarding the future. Having hands on experience at the University of Alberta has been an amazing opportunity. It is astounding to discover the variety of careers that are as far from tradition as possible. The possibilities are literally endless and there and there is nothing better than to be passionate about a career.

Amy Loo

WISEST Supervisor: Dr. Thava Vasanthan, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Ministry of Innovation and Science



During my six weeks in the WISEST Summer Research Program, I have been working in a lab run by Dr. Thavaratanam Vasanthan in the Department of Agricultural, Food and Nutritional Sciences. Most of my work was done under the guidance of Baljit Ghotra, a PhD student.

The research done in the lab deals with the fractionation of barley grain into its different components, such as proteins and starches, and more specifically with one particular component: beta-glucan. And what is beta-glucan? A type of soluble dietary fibre with great potential in the food industry. Studies have shown that it can reduce cholesterol in blood serum and lower the risk of cardiovascular disease. It can also help manage diabetes by reducing glucose present in the blood after eating.

There are many different aspects to this research: extraction and purification of beta-glucan using different methods, testing the contents of grain samples as well as purified samples, examining the effects of the structure of beta-glucan on its function, and so much more.

The work that I have been doing focuses mainly on the purification of beta-glucan using the alkaline aqueous process. This purification process, which uses a centrifuge and *a lot* of ethanol, can be quite time consuming. And after purification, the product must be tested for things such as beta-glucan content and moisture content. The beta-glucan test was definitely the most interesting test. It involved using several

enzymes to cut different linkages in the beta-glucan, breaking it down into glucose molecules. Then I added a glucose indicator to the different samples and used a spectrophotometer to measure their light absorbance. This indicated the amount of glucose, which was used to determine the amount of beta-glucan present.

Along the way, I discovered that in research, sometimes things just refuse to go the way they are supposed to. After soaking our purified beta-glucan sample in ethanol to remove the water, we let it dry only to discover that apparently there had still been water in it. This water had made the sample nearly rock-hard and very difficult to grind. We had to give it another ethanol bath and filter it again before we got a nice fluffy powder when it dried. Unfortunately, some of the ethanol was dried along with the sample. This resulted in a moisture content that did not make sense when we analysed it.

One thing I definitely learned while working in the lab was that research can involve a lot of waiting. Waiting for solids to precipitate; waiting for the sample to be centrifuged; waiting for the sample to dry. But while I was waiting I had the chance to talk to some of the graduate students and technicians in the lab and to watch them at work. Talking to them, I realized how broad a field Food Sciences really is. They made me see that so much work goes into developing and manufacturing the food products that we eat every day – something I normally take for granted.

Working in a Food Sciences lab was not exactly what I expected. For one thing, hardly anything in the lab is recognizable as what many people would consider food and for another thing, since it is not food-grade, most of it is not edible either, even if one happens to like eating uncooked flour or grain. And when people think of Food Sciences, what generally comes to mind is a nutritionist; I was no different. But this notion was quickly dispelled. The work that was being done in the lab more closely resembled my chemistry classes than anything else.

The WISEST program offered a glimpse into the world of research and what it is like to work in a lab. Overall, I would have to say that it was a wonderful experience that will help me make some decisions about my future career and goals. It has made me aware that there are so many possibilities out there, including ones that I may not have considered before. I would recommend this program to anyone considering a career in science.

Andrea Boehm

WISEST Supervisor: Dr. Michael Kouritzin, Dept. Mathematical Science
Sponsors: IONCMASTE and Summer Career Placements Program

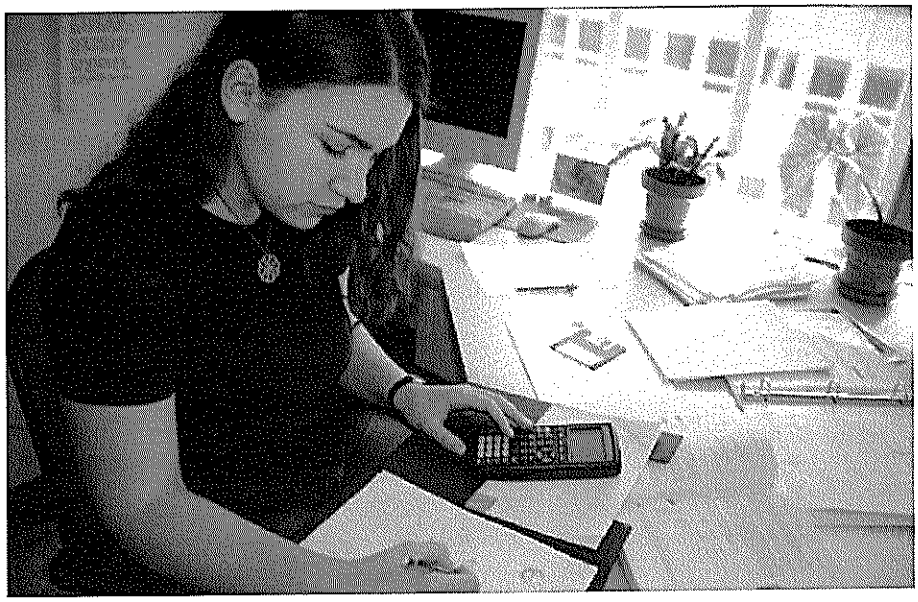
The Sum of Summer 2003

"Try to learn something about everything and everything about something."
Thomas H. Huxley

My name is Andrea Boehm and I attend Ecole Maurice-Lavallee. This summer, I have been working in the Department of Mathematical Sciences under the supervision of Dr. Michael Kouritzin and Jarett Hailes. My research group is entitled PINTS, which stands for Prediction in Interacting Systems. They use filtering techniques to solve real-world problems. "Mathematical filtering is a process that estimates the past, current, future state (or some combination thereof) of some signal based on noisy, partial, distorted, or corrupted observations."[1]

My main assignment has been to create a program that will automatically position a virtual camera (using complex algorithms). This program will be used in the visualization software being developed by PINTS.

My first day, I was presented with a book called "Teach Yourself C++ in 21 Days" (I highly recommend this book to anyone interested in programming). C++ is a computer language used in programming. Over the



weeks, I became more familiar with computers in general as well as many of their applications. As I followed the book and completed the exercises, I gained a greater understanding and appreciation of the work of programmers. When I was advanced enough in the book, I was given my project and began the mathematical calculations.

The problem was separated into two sections, depending on whether the domain of the space the camera was supposed to be looking at was 2 or 3 dimensional. I began with the 2-dimensional domain. Once I had completed my calculations, I entered my equations into the test program created by Jarett Hailes. With a few minor adjustments, it worked beautifully. This gave me a taste of the joy of research: results. And so, I proceeded to work on the 3-dimensional domain. This proved to be a slightly more difficult task.

I worked on the equations for the 3-dimensional domain for some time. Using the test program, I worked out many bugs and with help from my supervisor, realized that there were two options within the 3-dimensional domain problem. I had been trying to combine the two, which made the program all the more complex and bug-prone. And so, I used this knowledge to amend my equations and simplify the code. Finally, I was able to enter the equations into the test program and see the results. The next step was combining 2-D and 3-D.

Jarett provided me with three files; two interface files that described what my objects should do and the implementation file for one of the objects. I used these to begin writing a file that would combine the equations for a 2-dimensional domain and a 3-dimensional domain. With help from Jarett and another team member (Thank you Liam!), I was able to create a file that would compile (actually make it into the binary world).

Then, I had to insert the files into the visualization software. In this section of my project, I worked with Jesse McCrosky. I had to alter certain sections of code in order to insert the files. Jesse helped me through the process step by step. We finally fixed all the bugs and I was able to compile. After that, we had to put it through another test program in order to be certain that the visualization indeed worked and you could see the entire domain.

While I was working at PINTS, I had the opportunity to talk to many interesting people. Jarett and Dr. Kouritzin arranged several meetings for me. Everyone was very kind and informative. Each person helped me see university life and career planning from a different point of view. These interviews, in turn, have been proving invaluable for my current career preparations. Also, the other WISEST students were very interesting and friendly. I had fun with old friends and made some new ones. The people in my research group were very patient and helpful. In all, I greatly enjoyed the social aspects of the WISEST program.

In conclusion, my WISEST experience has been extraordinary. I have met new people, learnt about my career options, familiarized myself with the stunning University of Alberta campus, and gained greater insight about myself. I believe now I can say for certain, that a career in mathematics would be a dream come true for me. Finally, this has been more than just a summer job; it has been an adventure.

(Footnotes)

[1] Jarett Hailes, *Introduction to Filtering*, June 23, 2003

Andrea Boehm

WISEST Supervisor: Dr. Michael Kouritzin, Dept. Mathematical Science
Sponsors: IONCMASTE and Summer Career Placements Program

Il n'y a qu'une façon d'**apprendre**, [...]. C'est par l'action.
Paulo Coelho

Je m'appelle Andrea Boehm et j'etudie a l'Ecole Maurice-Lavallee. Cet ete, j'ai travaille au Departement des Sciences Mathematiques sous la supervision de Dr Michael Kouritzin et Jarett Hailes. Mon groupe de recherche est nomme PINTS, ce qui signifie "Prediction in Interacting Systems" (Prediction dans les Systemes Interactifs). Ils utilisent des techniques de filtrage afin de resoudre des problemes reels.

Mon projet a ete la creation d'un programme qui positionnerait automatiquement
une camera virtuelle (en utilisant des algorithmes complexes). Ce programme va etre utilise dans le logiciel de visualisation qui est en train d'etre developpe par PINTS.

Ma premiere journee, j'ai ete presentee avec un livre appelle "Teach Yourself C++ in 21 Days" (Apprend C++ en 21 Jours). Je le suggere fortement a n'importe qui s'interesse a la programmation d'ordinateurs. C++ est un langage d'ordinateur utilise dans la programmation. A travers des semaines, je me suis familiarisee avec les ordinateurs en general en plus de leurs applications diverses. A mesure que j'ai suivi le livre et j'ai complete les exercices, j'ai mieux compris et apprecie le travail de programmeurs. Lorsque je me suis avancee assez dans le livre, j'ai recu mon projet et j'ai commence les calculs mathematiques.

Le probleme a ete separe en deux sections : un domaine de 2-dimensions et un domaine de 3-dimensions. J'ai commence avec le domaine de 2-dimensions. Apres que j'avais complete mes calculs, j'ai introduit mes equations dans un programme experimental cree par Jarett Hailes. Avec quelques ajustements, il fonctionnait parfaitement. Ceci m'a donne un gout de la joie de la recherche : les resultats. Et alors, j'ai procede avec le domaine de 3-dimensions. Ceci c'est prouve a etre plus difficile.

J'ai travaille avec les equations pour le domaine de 3-dimensions pendant quelque temps. En utilisant le programme experimental, j'ai enleve plusieurs erreurs et avec l'aide de mon superviseur, j'ai realise qu'il y avait deux options dans le probleme du domaine de 3-dimensions. J'essayais de combiner les deux, ce qui causait plusieurs problemes avec le programme. Alors, j'ai utilise cette information pour changer mes equations afin de simplifier le code. Finalement, j'ai ete capable d'introduire les equations dans le programme experimental et en voir les resultats. La prochaine etape etait de combiner 2-D avec 3-D.

Jarett a ecrit trois programmes pour m'aider : CameraDomain.hh, CameraDomain.cc, et Camera.hh. Je les ai utilises pour commencer l'ecriture d'un programme qui combinerait les equations pour un domaine de 2-dimensions et un domaine de 3-dimensions. Avec l'aide de Jarett et un autre membre du groupe (Merci Liam!), j'ai ete capable de créer un programme qui pouvait etre compile.

Maintenant, j'avais besoin d'entrer les programmes dans le logiciel de visualisation. Dans cette section de mon projet, j'ai travaille avec Jesse McCrosky. Il etait necessaire que je change quelques sections du code afin d'ajouter mon programme. Jesse m'a aide, etape par etape. Finalement, nous avons reussi a tout compiler. Apres cela, nous l'avons entre dans un nouveau programme experimental.

Pendant mes travaux a PINTS, j'ai eu l'opportunite de parler avec plusieurs personnes tres interessantes. Jarett et Dr Kouritzin ont arrange plusieurs rendez-vous pour moi. Tout le monde etait tres gentil et informatif. Chaque personne m'a aide a voir d'une perspective differente. Ceci prouve a etre tres utile pour mes preparations de carriere. De plus, les autres etudiants de WISEST etaient tres interessants et amicals. J'ai eu beaucoup de plaisir avec des anciens amis et j'ai fait plusieurs nouveaux amis. Les personnes dans mon groupe de recherche etaient tous tres patientes et supportives. En tout, j'ai tres bien aime les aspects sociaux du programme WISEST.

En conclusion, mon experience WISEST a ete extraordinaire. J'ai rencontre de nouvelles personnes, j'ai appris au sujet de mes options de carriere, je suis devenu plus a l'aise avec le campus superbe de l'Universite de l'Alberta, et j'ai aqui plus de connaissances de moi-meme. Je crois que maintenant, je peux dire avec certitude que, pour moi, une carriere dans le domaine des mathematiques serait un reve realise. De plus, j'aimerais dire que ceci a ete beaucoup plus qu'un emploi d'ete; c'etait une aventure.

Andrea Marston

WISEST Supervisor: Dr. Suresh Narine, Dept. Agricultural, Food & Nutritional Science
Sponsors: CIBC and Summer Career Placements Program

When I first heard that I was going to be spending my summer studying the structure of lipids, I had this vision of myself sampling various types of ice cream and saying things like, "Excellent texture! Now these are high-quality lipids!" Although I knew that this idea was pretty far-fetched, I really hadn't the faintest clue as to how my six-week sojourn into the land of Agri-food Materials Science would turn out.

Under the guidance of Dr. Suresh Narine and other students in the lab, I learnt that the study of fats has a lot more applications than ice cream and hamburgers. The project I was assigned dealt with the comparison of emulsifiers. Emulsifiers are products that are added to any mixture of water and oil (or other lipid-based material.) They prevent the two substances from separating into their different components as they do in salad dressing, for example. Maintaining a suspension is desirable in many products, from mayonnaise to plastic. Unfortunately, the scale on which the efficacy of emulsifiers is measured is rather debatable. Called the Hydrophillic-Lipophillic Balance (HLB), this scale only takes into consideration the emulsifier's affinity for all things water based compared to all things oil-based. Many emulsifiers with completely different physical and chemical properties share the same HLB. I was charged with proving whether or not this was an accurate reflection of their emulsifying abilities. In addition to this, I was asked to perform my procedures on two different batches of the same emulsifier, since it was rumored to have a different structure from one sample to the next.

I began my experiments by preparing the necessary emulsions out of water and canola oil. One emulsion I kept blank, and to the other three I added 0.1% of different types of emulsifiers. Each emulsion had to be put through the sonicator and the homogenizer before it could be used, as these two machines worked to break the oil down into tiny particles and distribute them evenly throughout the water. Looking now more like milk than oil and water, my emulsions were ready for experimentation.

My experiment was designed to test three properties of the emulsions: viscosity, resistance to separation (creaming) and particle size. To measure viscosity, I used a machine called a rheometer. I was a bit wary of machine, as the stories I kept hearing from the other people in the lab implied that it was unreliable and prone to crashing. The poor thing had been terrible maligned, and didn't give me any trouble the entire

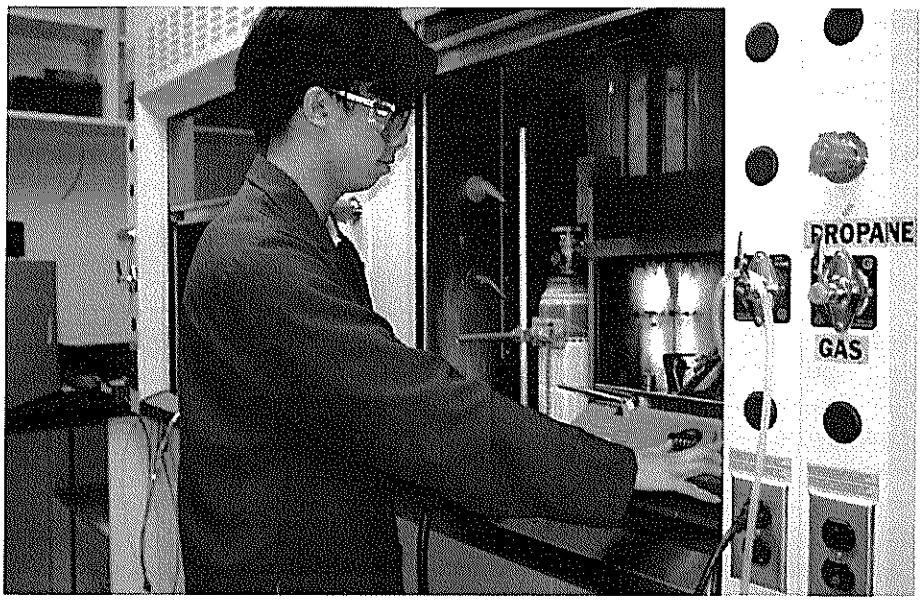
time I was using it. I measured creaming by taking pictures of the emulsions every day with a digital camera and then using a computer program to measure the amount of separation that was occurring over time. Particle size was determined using the microscope. I was to dye a small amount of each emulsion with Nile Blue, a compound that would make the lipids visible under the light. Once dyed, the samples could be seen and photos of the magnified image could be taken with the computer. The same computer program was used to density slice the pictures and determine the approximate size of the fat globules in the emulsion. Like all the procedures, this had to be done every day to see how quickly the fat particles were flocculating – in other words, how well the emulsifier was preventing them from getting together and forming larger particles.

Andrew Wong

WISEST Supervisors: Dr. Betty Crown & Dr. Nancy Kerr, Dept. Human Ecology
Sponsors: Edmonton Glenora Rotary Club & Summer Career Placements Program

Throughout the six weeks that I spent participating in the WISEST summer, I worked in the department of Human Ecology under Dr. Betty Crown. I directly worked with two textile technologists and an undergraduate student. Dr. Crown's lab is used primary as Textile Analyze Service (TAS), where they investigate various problems with clothing brought in by dry cleaning companies, clothing companies, and individuals. In spite of the large amounts of fabrics coming in, Dr. Crown's lab is large enough to accommodate both the Textile Analyze Service and textile research. During this time, I was involved in one major project for Dr. Crown.

The project that I was involved in was to investigate what effect do fabric softeners have on the flammability of children's sleepwear. This experiment had to subject two different fabrics to a wide range of trials. For the experiment, we used two different brands (Downy and fleece) and types (liquid and dryer sheets) of fabric softeners. Each fabric was put through a different number of washes: 1, 10, 50 washes. Although I only finished the first 10 washes during my participation in the WISEST program, I still had enough data to answer the problem. After the wash treatments, I cut out specimens from the specific fabric and mounted them in special holders. Then I had to brush the fabric to bring all the fibers on the surface and then I placed the specimens into an oven to bake for half an hour to remove all the moisture in the specimens. Following this, I had to place the specimens in a dessicator, which is a special apparatus that allows the samples to cool and prevents them from absorbing moisture from the ambient. Once the samples had cooled for a minimum of 15 minutes to a maximum of 2 hours in the dessicator, I was able to take them out and I began to test them for flammability. The test method that I used was *CAN/CGSB-4.2 No. 27.5-94*, which is basically an apparatus that holds the specimen at a 45° angle and applies a flame for one second. If the fabric ignites it will crawl its way up the fabric and may break a string that holds a weight up. When the flame breaks the string and drops the weight, the timer on the apparatus stops. After the timer had stopped I had to record the time that was indicated on the apparatus. This was basically what I did in the lab during my participation in the WISEST summer research program.



Apart from being in the lab for the entire time of the WISEST program, I was fortunate enough to see other interesting things outside of my lab. For instance, I was able to accompany two professors and their WISEST students from the department of Mechanical Engineering to observe a house burning in North Edmonton. This was extremely interesting to see what preparation is required to conduct such an experiment. There were many different groups that can participate in one investigation. On that day people from the University of Alberta, the University of Saskatoon, the Canadian army, and the forensic unit of the RCMP came together to investigate what happened to dead pigs in a house fire. Furthermore, the Wednesday afternoon activities that the WISEST coordinators setup for us were very enlightening about the various careers in the real world and it was interesting to learn about what the various employees did at the locations that we visited, such as C-FER and IBM.

Before my experience in this lab, I would never have imagined that textile science would be so fascinating and in-depth. It has allowed me to explore and gain a new prospective at looking at the scientific method that could not have done without my experiences in the WISEST summer research program. In addition, WISEST has helped me to have a better understanding about my future goals and interests. I am very pleased to have gotten the position within the WISEST program and the experiences that I have gained are priceless.

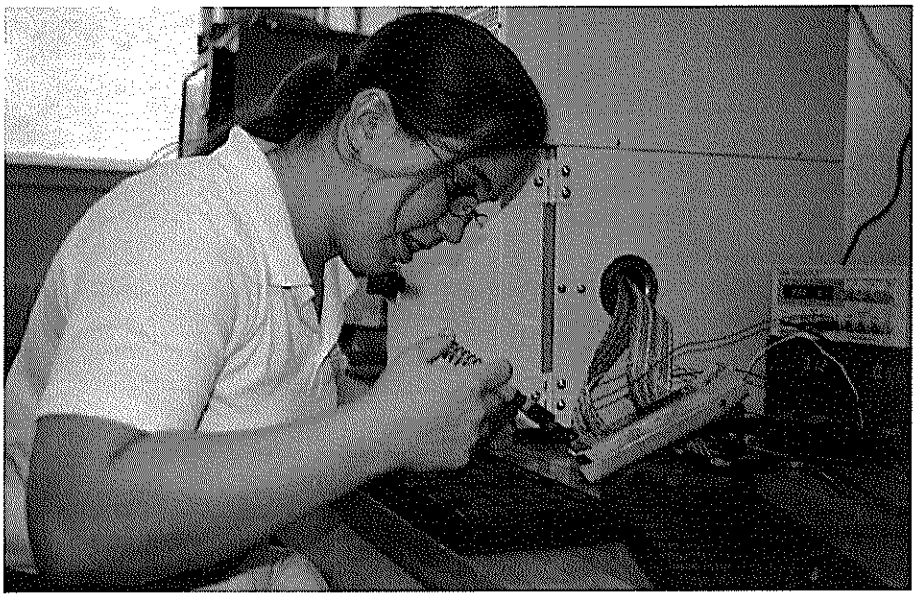
"The experiences that I have gained are priceless."

Becky Gilday

WISEST Supervisor: Dr. Douglas Gingrich, Dept. Physics
Sponsor: Epsilon Chemicals Ltd.

During the six weeks that I passed as a student in the WISEST Summer Research Program, I worked in the Centre for Subatomic Research under Dr. Douglas Gingrich. The project that I was primarily involved was the testing of the engineering run SCA Controller chips designed by Dr. Gingrich for use as a component of the ATLAS Experiment, a new high energy physics accelerator currently being constructed in Switzerland.

For my project, I was responsible for testing the new engineering run SCA Controller chips that had just arrived at the University. It was necessary to test these chips so that the physicists involved in the ATLAS project at the CSR would be sure that these chips functioned properly before beginning the production run of the chips. This testing began with initial bench tests that determined which chips had major errors that might have occurred during the manufacturing process and the magnitude of current that was drawn by all of the other functioning chips at that standard frequency of 40 MHz by connecting the chip to a computer and running a computer program designed to simulate the normal running conditions of the chip and then recording the readings provided by an attached multi-meter. This involved entering commands into the computer program, recording results, and replacing the chip with another after the test was complete (approximately 3 minutes). It required about three days of repeating these tests in order for myself, and Doug Gish, the undergraduate Physics Engineering student that I was working directly with, to complete these tests on all 375 chips. A later test found the maximum frequency at which each part would function within normal parameters, and the corresponding current it drew at this frequency, by manipulating an external clock frequency generator and, again, recording the current that registered on the multi-meter. This involved inserting a chip, entering the appropriate commands into the computer to start it running, and then manually increasing the frequency provided by the external clock generator until errors began to appear on the computer screen. This test was expanded to record the current each chip drew at a variety of frequencies until reaching its maximum frequency, establishing the relationship between the two conditions. Using a temperature chamber, it was also possible to show how changes in a chip's temperature affected the its maximum frequency and the amount of current it drew at a particular frequency. The purpose of these tests was to ensure that those chips that were correctly manufactured would function properly within the accelerator even if there were any fluctuations of temperature or



frequency. These were, by far, the longest tests that I completed. They involved setting the chip up to run inside the controlled environment of the temperature chamber and then dropping the temperature down to –10.0°C. The current of the chip at 40 MHz, the maximum frequency, and the current at this frequency were all recorded at intervals of 10.0 degrees Celsius up to 90.0°C. However, it takes anywhere from 10 to 30 minutes for the temperature in the chamber to stabilize at the exact temperature that you require by repeatedly heating and cooling itself to narrow in on the set temperature. This caused it to take up to 6 hours to complete the testing of one chip – and 11 parts in total were tested in this manner! By graphing the data that I collected in these tests, general relationships between different variables were established. These graphs illustrated the fact that increases in temperature lowered the maximum frequency of the chip and caused it to draw a lower current. These relationships were compared with those found using the previous prototype to determine if these chips behave in the same way as the others had. In addition to the tests that I was running, Doug also irradiated a number of them with x-rays to measure the rate at which the chips changed due to exposure to radiation.

The time that I spent in the Centre for Subatomic Research was also rewarding in that I was given the opportunity to meet and associate with a number of people who were highly educated, advanced in their fields, and incredible individuals. Both Dr. Gingrich and Doug Gish worked hard to find a variety of different things for me to do in order to escape the monotony of chip testing. Other electronics technicians working in the lab also took the time to explain different equipment uses, give demonstrations, elaborate on different concepts, and offer me options to work with electrical components not directly involved in my particular project, such as learning the difference between a "surface mount" and a "thru-hole" in chips and examining the photo-multiplier tube of another CSR project. On one occasion, I was even allowed to attend a meeting between all of those who are working on a part of the ATLAS project in the CSR. Although most of these concepts were very advanced, and, thus, were foreign to me, the experience was nonetheless fascinating.

As a result of the tests that were conducted, I was able to draw a number of conclusions. First, that each chip was completely unique from the others, yet, the behavior of the working chips as a whole was contained within a limited range that included all acceptable behavior. In addition, I found that, due to the complexity of electronics and the chips involved in them, there exists a set of intertwining relationships of current, frequency, and temperature that influence a functional chip's behavior in a specific situation. Finally, the behavior of the chips proved to be in accordance with the expectations that the physicists involved had for this run and the project will move forward to the production run of the SCA Controller chips.

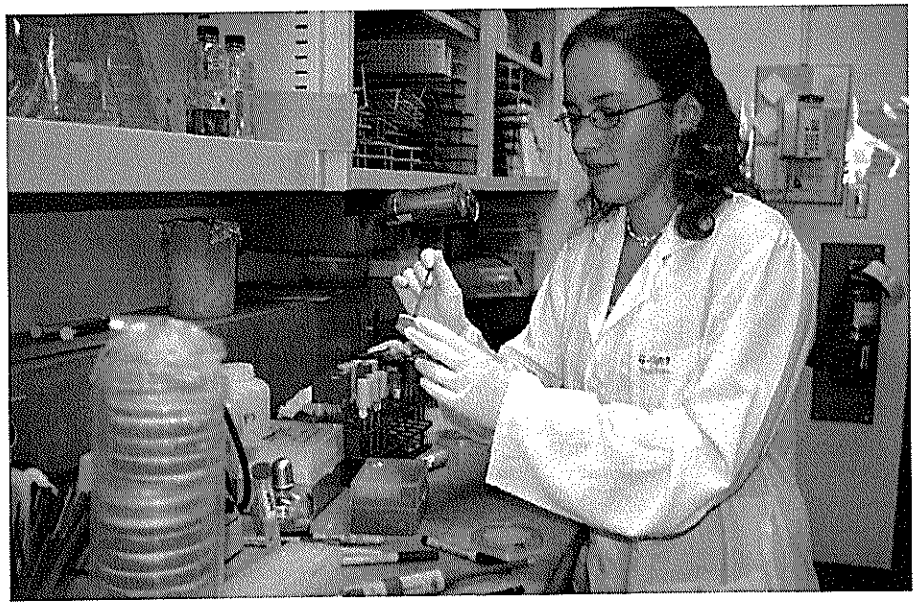
"However, I feel that the most rewarding part of my experience in the WISEST Summer Research Program was being able to meet interesting people and being immersed in a project that was of such a different scope and media than I would usually choose for myself."

Carly Rumley

WISEST Supervisor: Dr. Linda Reha-Krantz, Dept. Biological Sciences
Sponsors: Edmonton Glenora Rotary Club & Summer Career Placements Program

When I first heard about the summer research programs for grade 11 students, I was in grade 10. I thought, "For sure I'll do that next year." So when April, 2003 came, I realized that this opportunity was one that could not be passed up. I applied to the WISEST Program with Genetics listed as my number one choice. I applied for this program to get a look at science up close and personal. This program has turned out to be more than science, though. I met amazing people, some my own age who have the same interests and goals as me. A special thanks goes to Heather Archibald, the HYRS student working in my lab. Heather, it definitely would not have been the same without you!! The WISEST coordinators, Tara, Grace, and Celia, are some of the nicest and most supportive people I know. Thanks to Kelly, Dr. Reha Krantz, Amy, and everyone else in the lab. I have learned so much over the past five weeks thanks to you helping me and answering my questions. This program has also helped me become familiar with the University of Alberta Campus and it was my first taste of working in the "real world."

About my project, I have been working in a Genetics lab in the Biological Sciences Building for the past five weeks. The first day, I learned that I would be working with a mutant strain of yeast that no one had ever worked with before. The hypothesis for my project is that this strain of yeast, pol3-758, has an antimutator phenotype. An antimutator phenotype means that the DNA is replicated more accurately (with fewer errors) than in normal yeast cells. Accurate DNA replication is important because errors in DNA replication leads to mutations. In case you do not already know, mutations are a bad thing. In order to be able to measure mutations at the end of the six weeks, I first had to be able to grow yeast. At this point, the growth curves started. For a growth curve, I had to count the yeast at 5 different time points over a period of about seven hours. At each of the timepoints, I counted the yeast under a microscope, I plated them so I could count colonies two days later, and I used the spectrophotometer to measure the density of the solution of cells. All in all, growth curve = busy day. After three growth curves for the mutant yeast and two for the normal (wild type) yeast, I finally had information accurate enough to use on my poster.



Polymerase carries out DNA replication and mismatch repair goes after the polymerase to fix any mistakes. In order to measure the accuracy of the mutant polymerase, the mismatch repair gene had to be removed. This was done by mating my mutant strain of yeast with another strain whose mismatch repair had already been removed. After mating, the diploid cell (containing genetic material from both yeast strains) had to undergo meiosis. One of the four products from meiosis was the mutant yeast but without mismatch repair, just as I wanted. This strain of yeast is called a double mutant. Next, I measured the mutation frequencies of the double mutant by growing the yeast on plates lacking in an amino acid. If a yeast cell mutated, it would be able to make its own amino acids and grow on these plates. So, I counted the colonies that grew on these plates and figured out the mutation frequency and rate. I have not yet gathered all of my results data, but so far the double mutant seems like a mutator for one type

of mutation. This is not what I expected, but I've learned that experiments take time and you do not always get the results that you expected or hoped for. I think it is a mutator because more mutations occured in the double mutant than in the normal strain of yeast.

In between all of my work, I greatly enjoyed lunch with the bunch, the Silly-impics, and especially the visit to another lab. My group went to a Surgical Medical Research Lab. I thought this placement was PERFECT because I want to go to medical school and become a surgeon. This lab had a swimming pool, a workout center, and a movie theater. It was very cool and even without the theater and pool it looked like a very interesting lab to work in. My WISEST experience was one that I would not trade for anything because I learned so much, met great people, and became a stronger person.

Carmen Hon

WISEST Supervisor: Dr. John Feddes, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Ministry of Innovation and Science

Before going into the WISEST program, I had no idea of what I wanted to study in university or what career I wanted to pursue. I realized that my strengths were in the sciences and that I enjoyed these topics, but I still had no idea what field or study I wanted to dive into. This summer has given me an opportunity to find out about the different job opportunities available to me and has opened me up to new careers that I would have never realized even existed.

During my six weeks with WISEST, I was placed at the Edmonton Research Station, also known as the U of A farm. Although I was told I would be working with chickens on an animal welfare project, I had no idea of what was really in store for me. Although I knew I was going to be working on the farm, I thought there would still be a standard lab, with test tubes and beakers. But there was nothing of the sort, only over a thousand chickens and some computers.

I was placed under Dr. John Feddes, in the Department of Agriculture, Food, and Nutritional Science. I was directly working with Michelle Jendral, a masters student who is carrying out an animal welfare project. I also worked with two others, Allison O'Kell, a university student; and Korinna Schultz, a German exchange student. These three women made my experience at the farm more enjoyable than I ever thought it could be.

The research project concerns leghorn layer hens and studying whether or not enriching the cage environment will benefit the hens, yet still give the producer the same profits, so everyone will benefit. There are three types of cages: the conventional or control cage, the modified cages which contained a nest box, and the colony cages that contain both a nest box and dustbath. The first two types of cages holds three chickens, and the colony cage holds 26 chickens. My duties include daily checks on their health, entering data on past tests including feed consumption and egg quality, feeding, and carrying out the current tests on egg quality and chicken health.

While I didn't expect to be doing any of this kind of work this summer, I learned more than I thought I would. I now realize how repetitive and sometimes boring, research can be, but also that university research can be applied to some very current and controversial situations such as the fair treatment of animals.

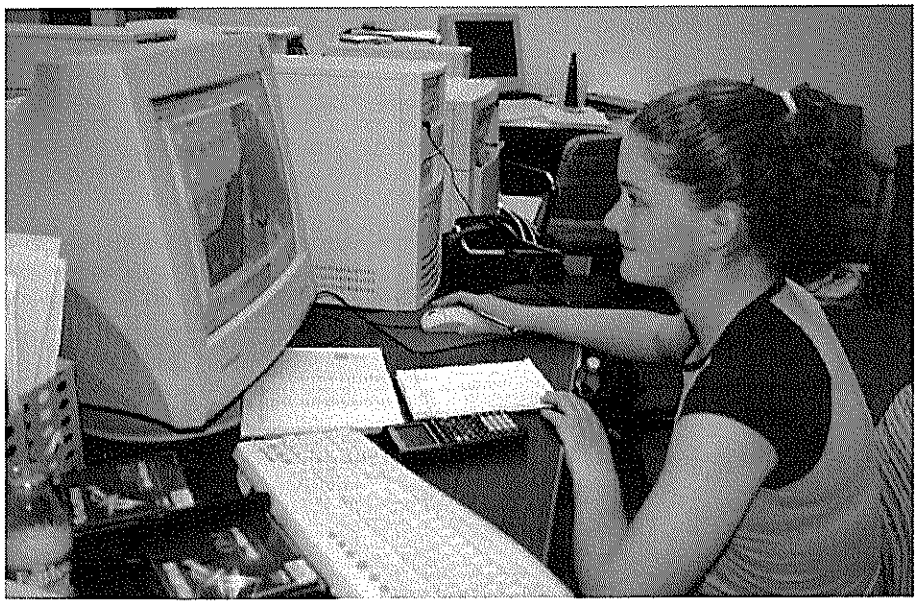
In addition to my work on the farm, I also had a lot of fun and learned more about my different career options during the Wednesday afternoon sessions. These sessions gave me a glimpse of what careers were out there in the science fields, some of which I had no idea existed. The small group discussions also made me realize that there are many people that did not know what they wanted to do with their lives when they were in high school, yet have still managed to find what they loved. The on-campus lab tour was also very beneficial to me as I am somewhat interested in the human body and how it works. I visited the sensorimotor lab where research was being done on the central nervous system and how it relates to balance. This research was very appealing to me, and has shown me some of the different options available to me in the field of occupational therapy research. This research was also very cutting edge and relevant to today's aging society, as it will benefit seniors with deteriorating balance.

All in all, I had one of the best, and most productive summers of my life. Even though I still have not chosen a definite career path, I believe that no matter what I do in the future the WISEST program will have helped to show me the way.

Cassandra Tesche

WISEST Supervisor: Dr. Paul Myers, Dept. Earth & Atmospheric Sciences
Sponsor: Suncor Energy Foundation

I spent my six weeks in the WISEST program working in the Geophysical Fluid Dynamics Modelling Laboratory under Dr. Paul Myers in the Department of Earth and Atmospheric Sciences; more specifically, I was in oceanography. Dr. Myers and his grad students are working on creating a computer-generated model of the North Atlantic Ocean in order to better understand it. They have been working on this model for four years and are constantly improving it, finding new and better ways to run the programs and making it more accurate. A model of this type has a number of applications. As they discover superior methods or improve the model, they pass this on to people doing larger scale models of climate, as the ocean plays such a major role in climate. The model also has commercial uses, offshore drilling, for example. In order to make the model more accurate, they are including the factors of temperature, salinity, ocean depth, water density, waves, currents, and ice movement. This is where I come in.



My project for the six-week period was to analyze and record data regarding ice content in the North Atlantic that would later be compared to the theoretical data of the computer model, so that changes and adjustments could be made to the model. The data that I was working with was in the form of a map, collected and published by the Canadian Ice Service, a branch of Environment Canada. The maps contain

the median ice concentration from data that has been collected over the past 30 years. The data is collected every week throughout the year; however, because there is no ice in the region from about the middle of July to the middle of November, I had 34 maps to work with. The maps are color coded to illustrate the ice concentration, with each color representing a given range of concentrations. My job was to convert these color maps into data that can be organized into tables with the longitude and latitude. As these maps are available online, my "lab" was a computer lab.

My first task was to divide the lines of latitude and longitude on the maps into thirds so that the data is more specific. I created a grid on the computer that I could simply lay over top of each map instead of creating a new one each time. I also put the maps into a simple slide show so that it was easier to see the ice formation and break up.

Next I began working with the data. The different colors were assigned a given value, the median of the range of concentrations. Some rectangles on the grid were easy – all one color. Others had up to three or four colors, usually in different combinations. To calculate the concentration in these rectangles I used simple calculations involving percentages. For example, if about 50% was red (9.5/10), 25% was brown (7.5/10), and 25% was yellow (5/10), the calculations would be:

$.50 \times 9.5/10 + .25 \times 7.5/10 + .25 \times 5/10 = 7.9/10$

I would record this value in a table, along with the longitude and latitude of the top left corner of the grid rectangle. There were lots of maps to go through, and lots of data to work with. As I went along I did some reading, both from a textbook and online, to further my knowledge about oceanography.

I have learned a lot through my WISEST experience. I have gained a better idea of what scientific research is like, both in my lab and through visiting and learning about the labs of other WISEST participants. I now have a better idea of my interests and career goals for my post-secondary education and beyond. The WISEST program has also given me a head start in adjusting to the "city-life" and getting to know the campus. I had the opportunity to stay in Residence so I met lots of great new friends and had a blast. The WISEST Summer Research Program was a great experience and I would do it all again in an instant!

Cecilia Lee

WISEST Supervisor: Dr. Imran Mirza, Dept. Laboratory Medicine & Pathology
Sponsors: Faculty of Medicine & Dentistry and Summer Career Placements Program

As a participant of the WISEST Summer Research Program of 2003, I worked in the Department of Laboratory Medicine and Pathology at the University of Alberta Hospital for my six-week period. Under the guidance of Dr. Imran Mirza and Siow Fong Lee, I began my research in a field to which I had not previously been exposed, blood-related cancers.

The two projects that I had been assigned focused on different types and aspects of cancer. My first task involved the design and development of a relational database for acute leukemia. By gathering information from Northern Alberta patients diagnosed with acute leukemia in the past seven years at the University of Alberta Hospital, the objective of the project was to aid future studies in acute leukemia, having one large resource of patient information where trends and patterns could be generated. Though my work seemed very straightforward, I realized that creating the design of the relational database was quite challenging, especially since I had never undertaken such a project before. Learning about the Microsoft Access program through textbooks, I began to devise tables including demographics, flow cytometry, cytogenetics, molecular studies, and diagnosis. In each table, different criteria were identified and developed so that all of the patients' medical tests and results could be entered in the future. Once the tables were created, forms were made to ease the process of entering data. When the basic design of the database was complete, I applied patient information, obtained from flow cytometry reports and the hospital

network system, Sunquest, into the tables. After becoming more familiar with the program, Dr. Mirza and I attended a course at the University of Alberta's Technology Training Centre to better understand Microsoft Access. As a result of this training, I improved the database by employing queries and reports, and linked various tables with relationships. Although creating the database became overwhelming at times, I recognized the amount of knowledge I had gained, not only about computer sciences, but also about the intricacies of acute leukemia.

The second assignment I was given involved follicular lymphoma, another blood-related cancer. In this illness, exchange of material occurs between the chromosomes 14 and 18, involving the IgH gene on chromosome 14 and the BCL-2 gene on chromosome 18. Though three different types of breakpoint can occur in a follicular lymphoma patient, only one type, major breakpoint, can currently be tested for in the clinical laboratory. Consequently, with the guidance of Siow Fong Lee, I attempted to optimize the testing conditions for detecting the minor breakpoint t(14;18) chromosomal translocation, which could then be used for routine testing in a clinical setting. The processes involved with detecting such translocations included the polymerase chain reaction (PCR) and polyacrylamide gel electrophoresis (PAGE). In the polymerase chain reaction, DNA samples were combined with enzymes, nucleotides and primers, and amplified in the thermocycler, a machine which cycles DNA samples at high temperatures. Then the samples underwent polyacrylamide gel electrophoresis, where the nucleic acids were separated by size in a gel. Stained with ethidium bromide for visualization of the PCR products, the gel was photographed under ultraviolet light. Even though these experiments took two days each to complete and sometimes may have had disappointing results, my increasing familiarity with the machinery and lab techniques, as well as the skill and knowledge which I gained from working in not only a research but also a clinical laboratory made my WISEST stay all the more gratifying and worthwhile. During my down time, I posed many questions to the clinical workers, learning about the complementary relationship between the clinical and research lab. From this lab, I received a clearer idea of what laboratory work entailed, while enjoying the "hands-on" experience as well.

In having an opportunity to work in an area of science, I was given a taste of research, clinical laboratory work, and different fields of science all at the same time. Since I have a strong desire to pursue the sciences in the future, the WISEST program has allowed me to nurture my interests. By working in an area of research for the summer, I realized that, although research might take a long time to accomplish, the rewarding sense of gratification and satisfaction acquired at the end make research much more meaningful. In addition, from talking to other researchers and clinical workers in my laboratory, I gained insight into university life.

"Fortunately, because of WISEST, I obtained a unique view of science.
Without a doubt, the WISEST Program
has provided me with an amazing and unforgettable experience."

Courtney Calahoo

WISEST Supervisor: Dr. Rina Freed, Dept. Biological Sciences
Sponsor: Alberta Ministry of Environment

My Summer Bloomed

On the second day of July, I was assigned to the lab group of Dr. Rina Freed, on the 8th floor of the biological sciences building. Do not attempt to find this floor because you may notice as I often have that if you try to go up to the 8th floor in the wrong wing, you will end up on the roof. The botany wing only has 6 floors and you must pass through the middle wing before proceeding up the stairs. Daunting a feat as this is, the building also happened to be on Saskatchewan drive and that's a fair walk from the bus station if you intend to make your bus on time. But, honestly, once I actually was at work, it didn't seem like a job at all.

My lab group was studying the water quality of Lac La Biche, the 7th largest lake in Alberta, located about 2 and a half hours northwest of Edmonton. In recent years, the residents of the lake and scientists alike have noticed an increase in algae blooms on the lake. Eutrophication(covering of lake surface with algae blooms) of the lake can lead to problems such as low dissolved oxygen, increased amount of fish kills and most importantly a significant amount of microtoxin present. The surrounding communities of Lac la Biche and Plamondon obtain their drinking water from the lake, so it is important that Alberta Environment and the local government discover why the lake is eutrophicating.

Algae Blooms can be caused by a number of factors, such as a low amount of silica, a high amount of phosphates and nitrates or even something as simple as over fishing. In order to test all these factors, Sarah, a fellow WISEST student and I spent much of our time at the lake collecting samples in the different basins of the lake as well as the surrounding streams. We also collected information at each of the sites. We would measure the dissolved oxygen, the turbidity, conductivity, pH, and temperature of each stream and lake site. We also collected microorganisms such as zooplankton, phytoplankton and diatoms from the sites in the lake and Macroinvertebrates such as snails, dragonfly larvae, leeches and waterboatmen from each of the stream sites. The work was always fun, bushwhacking into the middle of nowhere to collect a pristine sample of water upstream. I really only worked in one pair of pants the entire summer. There was no point in ruining two pairs. I tried to wear shorts, but the mosquitoes got me. We sometimes ended up wading through swamp water up to our waist. But for a girl who said, "I like swamps" on her application form, nothing could be closer to heaven. The evenings were full of what the local nightlife had to offer. So, usually we went to bed around 10 because we were exhausted and well, we were camped out in tents away from all civilization. Sarah and I did go swimming once in awhile, but I will never look at a lake the same way after studying one.

Once back at the lab, we conducted a variety of tests on the water samples. We tested the amount of phosphates, nitrates and silica in the water. The method of testing was more time consuming then difficult. It involved using the photosprectrometer, which measures the amount of an ion contained in a sample, by

measuring the amount of a certain shade of light produced by that ion only. Most of our time was spent in the field, or in preparation of going out into the field.

There were also other jobs we got to help with, such as breaking a fish's backbone and finding the two bones in its spinal fluid that can tell the age of the fish by the amount of rings on it. I also had the pleasure of measuring 100 mg of dirt to determine the amount of cladocerons and diatoms in the sample. Overall, I had an awesome summer, and despite missing many of the events on Wednesday, I got to know a lot of people I enjoy. It just makes going back to school all that much harder.

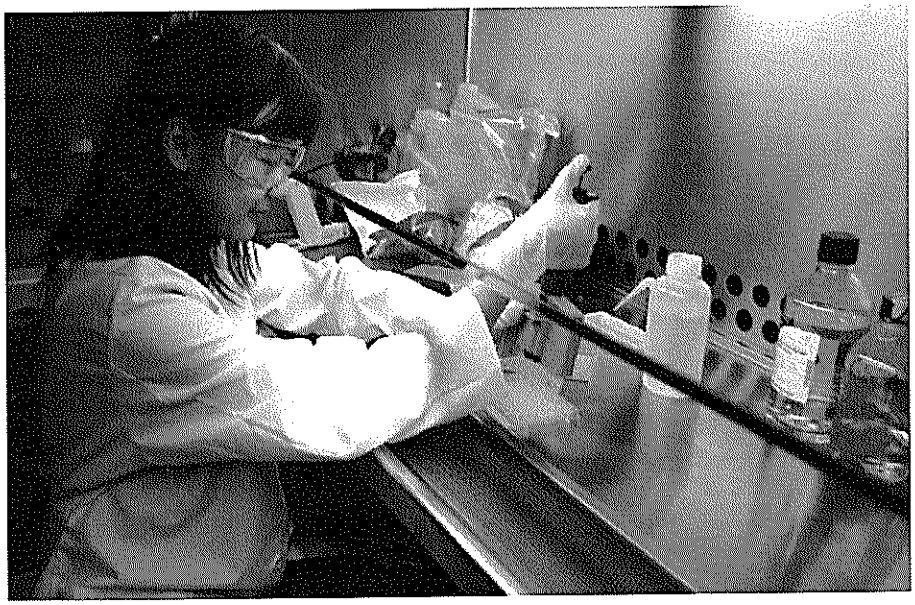
Diane Woo

WISEST Supervisor: Dr. Ayman El-Kadi, Faculty of Pharmacy
Sponsor: Merck Frosst Canada Ltd.

For the six unforgettable weeks of participating in the WISEST Summer Research Program, I have been working in the Department of Pharmacy and Pharmaceutical Sciences under Dr. Ayman Elkadi at the University of Alberta. In Dr. Elkadi's lab, I met several students who have devoted their summer to pharmaceutical research. From them, I have received guidance, encouragement, and many memories that I will remember for a long time to come.

During my stay, I was to do research in the field of drug interactions, and more specifically, I was to do research on what effect inflammation has on the metabolism of drugs. The cells that I tested on were called murine hepatoma cells (cells from rats' liver). The importance of the study of drug interactions and drug metabolism is that more and more people are ingesting drugs every day. What happens when it enters our body? Well, of course it first carries out its assigned task, but then where does the drug go? The body must get rid of it somehow, and I'm sure most of you know how the body gets rid of waste, but if the drug is not water soluble (it does not mix with water), it cannot be washed out of the body by means of urine, and so it accumulates in the body, causing harmful effects instead. So, we are to study how we can convert fat soluble drugs into water soluble substances, and also how inflammation, which occurs quite often, affects this process.

For my first lab, I pre-treated half of the cells of a 96 spot well plate with N-Acetyl-$_L$-Cysteine (NAC), and left the other half without. This was the first step in testing whether or not NAC had any effects in inhibiting or inducing enzyme activity. Then I added TNF in three different doses to their respective columns, to see if the concentration of TNF affects the enzyme activity. BNF and LPS is also added to their respective columns to see what happens when the body encounters invaders. Although it may sound easy to just add stuff to cells in a 96 spot well plate, I learned from experience and from watching the other researchers around me that patience really is a virtue, especially when it comes to research. There are times (actually, make that many times) the results don't come out matching expectations,



and the hardest task is to figure out what went wrong, and how am I going to improve the lab the next time I do it again. This is the huge difference between high school labs and labs in a university laboratory.

Finally, after several trials, I finally got the results I expected and all that work and repeated trials paid off. Near the beginning of the summer research program, I was doubtful that research would be the thing for me, especially since I had the results from a failed lab in my hand. I mean, why would someone spent days, and even weeks performing a lab, just to discover that he/she would have to repeat it several times before the right results would come? Well, the answer came to me when I got my first set of successful results. It's the thrill of knowing that you've done everything exactly right, and that with some careful manipulation, things turned out the way you wanted it to! Yes! I have the power! Several times over the summer, cries of success can be heard in our lab as researchers finally found the results they were looking for. This feeling of accomplishment and pride is the thing that makes research a lot worthwhile.

Overall, the WISEST Summer Research Program was a great experience that taught me more than and beyond just the lab research procedures and processes, but it also taught me to be patient, that sometimes working slowly will get me the results faster. This experience taught me that the harder you work, the better the reward. Also, this experience allowed me to meet all sorts of people, from the WISEST staff and students to the people in my lab and on campus. WISEST certainly broaden my view of career choices and my view of this world. Thank you WISEST!

Emily Pawluik

WISEST Supervisor: Dr. Margaret-Ann Armour, Dept. Chemistry
Sponsor: Suncor Energy Foundation

The six weeks of my summer with the WISEST program were filled with some interesting smells, lots of chemicals and many unique experiences. I worked in the Department of Chemistry in Dr. Margaret-Ann Armour's lab, under the direct supervision of Dr. Willy Hunter. The work that goes on in this particular lab deals with the disposal of hazardous chemicals. Another WISEST student and I were researching together.

My job was to find a way to safely destroy three commonly used pesticides. The process involved reacting the pesticide with easy to obtain chemicals – either bleach or a potassium permanganate solution – for varying amounts of time. I would go through a process of stopping the reaction and then extracting the pesticide back out to test if anything had happened. We used the exact same procedure every time we tried a new experiment. This got a little boring at times, but that's all a part of the research experience.

The summer wasn't all work though; there were some fun times. My two supervisors put on chemistry demonstrations for different groups throughout the year. Two of those happened to be while I was working with them. The first one was for an after school care group who were very lively and exited about going on a field trip. Dr. Armour explained a little bit of chemistry in very simple terms for the kids. We all helped them mix some chemicals together to create nylon that they could take home with them, which they were more than happy to do. They then watched Dr. Armour pour water into a huge cylinder. As she added different ingredients the water turned from green to yellow and then to purple. They especially liked when it started to bubble and smoke and they oohed and ahhed when the color changed. The kids were fascinated by the magnetic stirrer used in the experiments. Dr. Hunter did a reaction in which two solids were mixed together and then drops of sulfuric acid were added. This resulted in lots of flames and popping sounds. All in all, the kids had a great time learning about science.

The next group that came was an adult "English as a Second Language" class from Metro Community College. The demonstration was fascinating for the students, some of whom were from war torn countries like Afghanistan. We did all of the same things as with the other group, but with two extra experiments. We made the plastic called bakelite by mixing together three substances, which slowly turned from liquid to solid and turned orange/red from the clear that it had been. We also put a penny inside while it was still liquid so that it would be stuck. We demonstrated another reaction. Three colorless solutions mixed together turned yellow and then slowly turned dark blue, then back to yellow, then blue, etc. Their science based visit was sure to enhance their language skills.

Aside from these educational events there were activities that the WISEST administrators set up. Every Thursday we met together for lunch and sometimes we would get together after work for events such as the Silly-impics and a pizza party. I had fun at these events after a long day of work. This all was on top of a unique session every Wednesday afternoon that included IBM and C-FER tours. We also did a campus tour and a lab tour of our choice. I found that talking with the other WISEST students and some of the women working in scientific fields gave me information about different branches of science and tips about university life in general. I learned some valuable lessons while participating in the WISEST program.

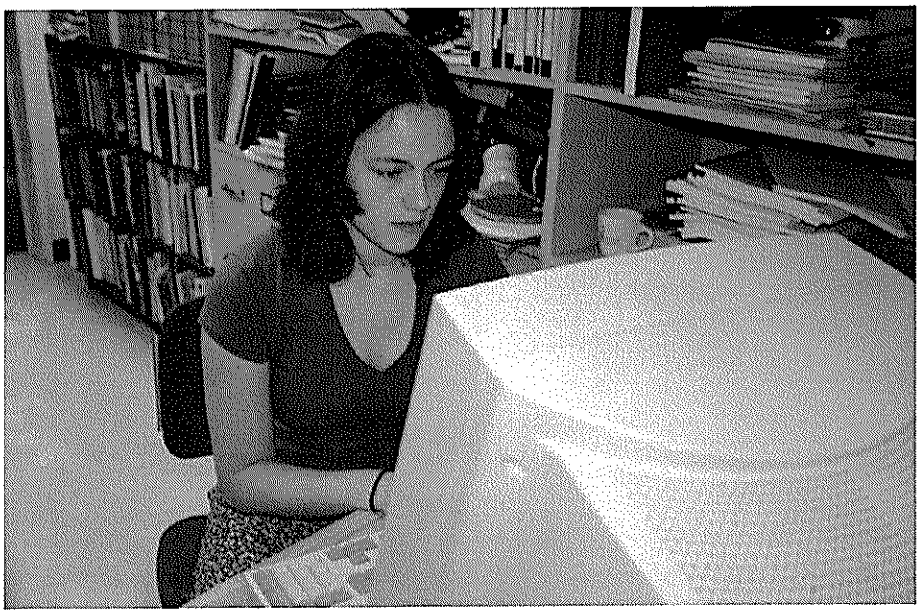
Learning about the different paths that my future could take and meeting lots of new and interesting people who could guide me along the way defiantly made this summer worthwhile. However, the absolute best part of the entire summer was that I got PAID for doing something that was fun!

Heather MacDonald

WISEST Supervisors: Dr. Gordon Rostoker & Dr. Clare Watt, Dept. Physics
Sponsor: Edmonton Glenora Rotary Club

Did you know that we only ever see a part of the aurora borealis? Or that the aurora is shaped like an oval centered over the North Pole? I certainly didn't know this until the WISEST Summer Research Program gave me the opportunity to spend six weeks of my summer working with Dr. Gordon Rostoker and Dr. Clare Watt in the Department of Physics.

My first task this summer was to look at data taken from a meridian scanning photometer, an instrument that scans the sky from north to south and records the brightness of the sky. I looked at each day between the fall equinox through the winter solstice to the spring equinox from 1997 to 2001, looking for good examples of substorms in which the double oval characteristic was clearly present. Once I identified a good event, I played around with the plot by changing the color and time scales so that specific details such as the exact time of the onset of the storm, the magnitude of the brightening, the branch that caused the brightening, how much of the sky was lit up and the latitude where the brightening occurred could be determined. After the event and time were identified, I looked at data taken from instruments in space. I looked at geosynchronous satellites such as GOES 8 and GOES 10 as well as other satellites such as Polar. These instruments recorded the brightness of the sky and changes in the earth's magnetic field as



well as took pictures of the earth's brightness and weather. My last task was to piece together the data I found on the event with what others found and help prove or disprove any existing theories about aurora activity and substorms. Working in the cold basement of the Biological Sciences building sitting at a computer for seven hours every day looking at data may sound boring however it actually was quite fun. I got to work with a lot interesting people as well as learn a lot about the aurora borealis, something I am very interested in. I even found an event that played a big part in the research, which was quite satisfying.

One of the biggest lessons I learned during my six weeks at WISEST was that research is based on luck. Sometimes you find what you want and sometimes you don't. On one particular event I found, everything seemed to go right. The storm occurred in the midnight sector, had the double oval characteristic, and even had satellites perfectly positioned to record the activity. In the case of a satellite known as Interball, its position that day happened to be right in the magnetic tail. And it is because of its position, that we were able to suggest that there was a collapse in the tail current. It was great. However, that was only one event. I did find a few other events, though not as great as the first because valuable information could not be obtained due to a faulty or broken instrument or a badly positioned satellite. Nevertheless, finding a great event made my time and effort worth is.

I also learned that research requires teamwork. I learned that it is possible to do it alone but that it is much more efficient in a group. In the case of my lab, I found a good event and a few other pieces of data but lacked the background knowledge on the aurora borealis and the instruments to obtain more data. Due to that, my data alone could not prove or disprove any theories but it is because everyone in my lab pitched in with their knowledge and data that the event I found turned out to be a great event for the research. And although we could not prove or disprove any theories, we were one step closer that we would have been if we hadn't worked together.

WISEST was an awesome experience. I worked with some amazing people as well as met many interesting people. It is because of WISEST that I now know what opportunities there are in the field of science waiting for me.

Heather Stewart

WISEST Supervisor: Samuel Shen, Dept. Mathematical Sciences
Sponsors: IONCMASTE & Summer Career Placements Program

I first heard news of the WISEST program through a supportive teacher who thought the experience might be beneficial for me. I became interested, started my application and began considering what this experience would be like and how it would help me. When the phone call came and I was accepted my first reaction was excitement that quickly evolved into fear and nervousness. The only building I knew in

the university was the SUB and only because it had a theatre I had visited. Now I had to maneuver myself around campus on my own. As the days counted down to orientation day, I contacted my professor and asked him about my work and what his expectations were. He arranged a meeting for me to meet him and his students that I would be working directly with.

The WISEST program placed me in the department of Mathematical and Statistical Sciences, under the supervision of Dr. Shen and two of his summer students, one graduate and an under-graduate. I was introduced to the goals of his research and what he would like me to contribute to that research. My project included researching the effect of climate changes on Alberta's agriculture. My first objective was to learn and understand corn-heat-units and how to apply them to the current crops and agricultural regions around Alberta. I produced many tables and graphs to demonstrate current data trends and comparisons that allowed me to make predictions and conclusions. This information was then used for analysis of my results, I showed this to my supervisor and he expanded the project to include more elaborate findings. He asked that I continue my report and add more length and depth and incorporate all my graphs and charts directly into the report. When he first explained what he wanted I was a little unsure of my abilities to do such a project. In high school, the most a student will ever write is about a 5 paragraph essay at size 36 font just to make the minimum amount of pages allotted. Now I'm supposed to expand a three-page essay into a thirty to forty page report. After wasting a lot of time stressing and worrying about how this project could come together and not really getting anywhere, I finally buckled down and just started to do what I could. As I continued the project became easier, I learnt how to include graphs and tables into my work as well as what details to be included and how to format the work to make it look as professional as possible. Using a specific layout made it easier to incorporate all the information necessary. Eventually through many snags along the way I have written a lengthy report that may be sent to Alberta Agriculture and used as a reference. Before this happens the report must be edited and reviewed to remove all the errors.

While working on that project, I was also asked to review data being used in another report that his research team had recently written. The data was very subjective; it was attempting to add a value to different degrees of drought similar to the grading of a tornado or hurricane. Using the given information I reviewed the values and made necessary changes.

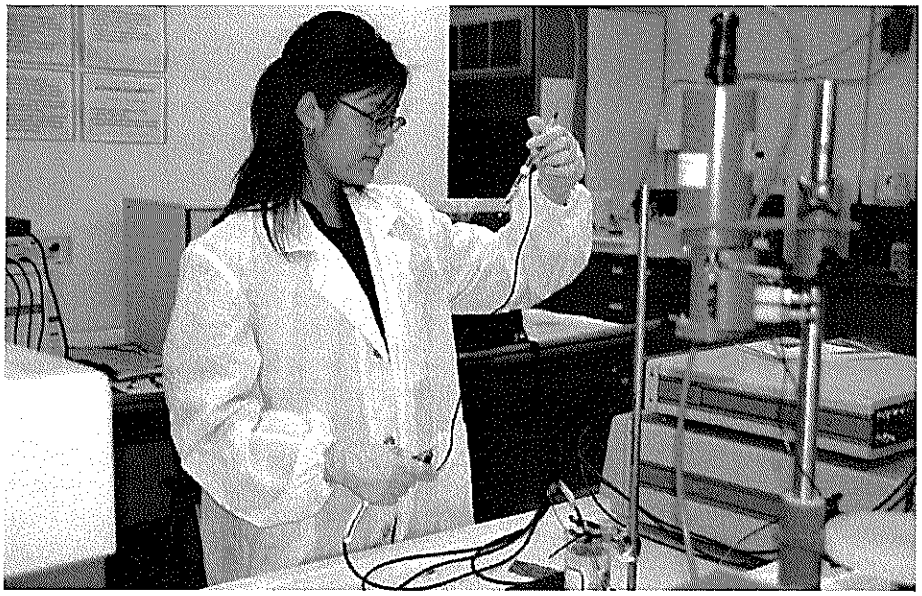
My expectations for this summer were nothing similar to what I have done. I believed I would be helping someone with their own research, I would do all the little tedious work that would lead to the important results that the researcher would do. Instead of following someone else's research, I was given my own that required all the tedious work and the important data analyzing. At first, this situation was very overwhelming as I had never had to create my own results my own way, there was always specific instruction as to how to do something. I quickly learned that if I didn't do it on my own, right or wrong, I was never going to get anything done. This gave me much needed confidence in my work abilities, which is an excellent skill to have.

The WISEST program has given me experience in matters that will help me throughout my lifetime, from my own university studies to future jobs and career. Even next year I will be able to use much of the information and skills I've learned to help me through my final year.

Huixian Liew

WISEST Supervisor: Dr. Jingli Luo, Dept. Chemical & Materials Engineering
Sponsor: Dow Chemical Canada Inc., Western Canada Division

I worked in the Chemical and Materials Engineering building under the supervision of Dr. Jingli Luo for the six weeks that I was in the WISEST program. The lab that I worked in dealt mainly with corrosion and ways of stopping or slowing down the corrosion process. I worked on one project the majority of the time, which focused on the inhibition of corrosion.



The many defects found on the surfaces of metals are one of the causes of corrosion. Some solutions help form passive films on the surfaces of metals, which may decrease the number of defects. An example of a passive film is $Ce(NO_3)_2$ solution and that was the main solution that I tested while in the lab. The goal of the lab was to confirm the fact that Cerium solution actually does slow down or inhibit corrosion.

Tests were done on two different types of electrodes, one being Cr and the other being Al. In every test, the same solution, reference electrode and counter electrode were used. The solution that was used in each case was 0.1M Na_2SO_4. The reference electrode was saturated calomel and the counter electrode was platinum net.

There were different types of experiments done on the metals while they were treated and untreated with $Ce(NO_3)_2$ to be able to compare the results. All of the tests that were done were electrochemical tests. The basic theory of every electrochemical test is that there is an object known as a "black box" and a signal has to be put into it and the results are observed. In our case, we do two types of electrochemical tests, either AC (alternating current) or DC (direct current). The difference between the two is AC refers to a current that may change and DC refers to a current that moves in only one direction.

The major AC experiment that I did was Mott-Schottky. The results have many uses as they tell us whether the semi-conductor is n-type (donor) or p-type (acceptor). The formula for Mott-Schottky is:

$$1/C_{SC}^2 = + 2/E_o E_e N_D (E-E_{fb}-kT/E)$$

Most of the values in the equation are constant except for the value of potential (which is E). The Mott-Schottky plots compare the capacity of metal to the potential and if N_D decreases, we know the number of defects is also decreased.

Another AC experiment that was done was a change in frequency experiment. It shows the relationship between capacity and resistance and its formula is:

$$Z = 1/2pfc$$

The formula shows us that frequency changes with resistance in this test. Mott-Schottky and change in frequency experiments are two of the AC experiments that I did.

The major DC experiment that I did was Potentiodynamic. It showed us the relationship between the current and potential in a sample. We also use the graph it generates to analyze why specific changes occur.

Two other DC experiments that I did were Polarization Resistance and Potentiostatic. Polarization Resistance shows us the difference in resistance to corrosion between treated and untreated metals. A Potentiostatic test is when the potential is kept constant and it compares current with time.

For my results for my Mott- Schottky plots, the graphs were both p-type and in both cases the slope of the treated electrode was smaller than that of the untreated. This shows that the number of defects in the metal decreased after the treatment was applied.

The conclusion that I have come up with from my results that I obtained is that $Ce(NO_3)_2$ treatment does help in either slowing down or possibly inhibiting the corrosion process.

I was glad to be able to learn so much information about corrosion and the effects it has on our world today. It is a bigger deal than some people may think and research must be done to stop it as soon as possible because corrosion does not just affect objects we normally think of such as cars, but pipelines in oil industries and hydrogen storage tanks as well. Researching to find a possibility to stop corrosion is more crucial some individuals might suppose.

I learned to use different electrodes, machinery, and how to prepare solutions while I was working in the lab. I mainly worked with two pieces of machinery called Electrochemical Interface and Frequency Response Analyzer. These two machines were vital in the experiments that I had to run because they are what I used to do both the AC and DC tests. The way they were work is I attach them to the electrodes that I am using and the equipment reads the data I need.

The WISEST program was truly one of the best learning experiences I have ever had. I was able confirm my courses that I want to take in university and my career goal because WISEST helped me in doing so. The program allowed us to realize how many career opportunities there are out in the world if we want to go into a science related field. Since this program is all hands-on, I was able to learn so much more as compared to sitting in a classroom and listening to a teacher teach. Throughout my six weeks in the program, I made many new friends and met many wonderful people and I would just like to say that it was definitely a worthwhile experience.

Jane Hilderman

WISEST Supervisor: Dr. Vadim Bulitko, Dept. Computing Science
Sponsors: Faculty of Science & Summer Career Placements Program

"Six weeks. Six long weeks in computing science." That was my intial thought upon beginning my research project dealing with machine learning under Dr. Vadim Bulitko and graduate student, Greg Lee. Needless to say, I was very wrong when I look back at one of the most valuable experiences a high school student can be offered. Artificial intelligence is one of the most groundbreaking, rapidly expanding fields of science at present especially at the University of Alberta, and I am proud to have been a part of it.

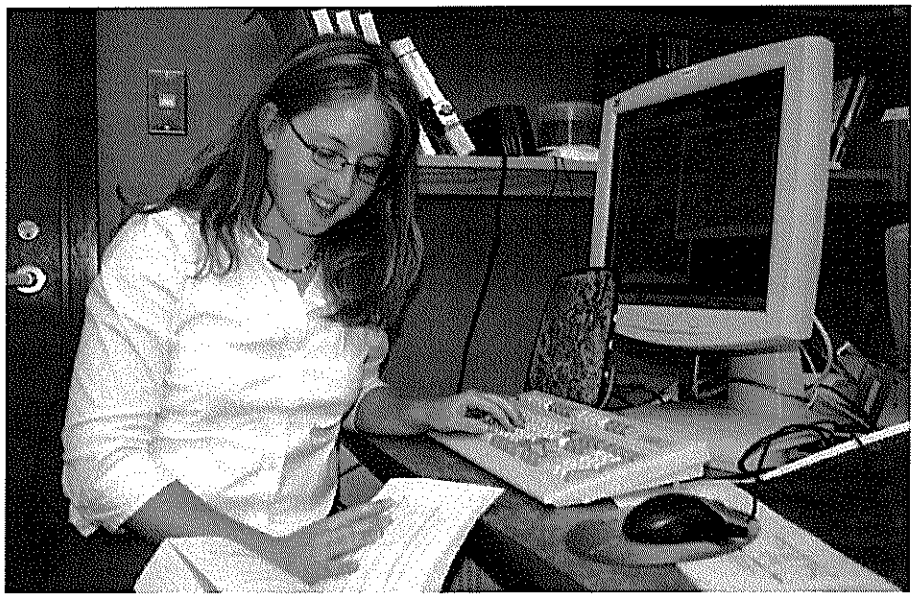
As part of the IRCL research group (Intelligent Reasoning Critiquing and Learning), my 6 weeks (which didn't feel like 6 weeks at all!) was focused primarily on the MR ADORE computer program, an acronym for Multi Resolution Adaptive Object Recognition. Developed originally as ADORE, the research here has taken on the task of improving the program for the past two years with the ultimate goal of a highly robust

program able to identify a specific target class. Currently, visionary systems are designed for one purpose and one domain. With A.I., it is hoped MR ADORE will be able to be "taught", to "learn", and to adapt for optimal performance with minimal human intervention.

My part in this research was to develop training images from aerial photos of Alberta forests and to test MR ADORE's accuracy with its current library of operators in this more complex domain, a step up from past tree plantation photographs. The operators are functions the program performs on the image, such as blurring or thresholding, in order to isolate features resembling the template. As there are about 100 operators, the program must run every combination and find the top five results. Typically, depth 4 or 5 is used, where one image may undergo the work 4 or 5 applications of operators. This takes less than 10 minutes to explore every possible pathway.

Materials given to me on arrival included a labeling of tree stands for a 10km x 10km section, their classification by species composition by a forestry expert, 17 grayscale aerial shots, and one overview poster. From this point it was up to me to devise a way to apply the desired labeling as green pixels to the aerial images, which I scanned into the computer. It was a bit like a mystery to solve, as no lab members had ever performed this task. From ArcExplorer, to Gimp, to PhotoShop, I used several different programs to get the results I wanted and figured out the most efficient way to create training images and templates of the target compatible for MR ADORE.

Then came the exciting part – the experiments. And yes, they are called experiments even on computers. Here I gained valuable exposure to the UNIX computer programming language, something high school does not offer. Finally I was able to have output in numbers for all of my input effort. These results are calculated by the number of corresponding pixels MR ADORE labels, how many it misses, and how many excess ones compared to the training image based on the template (fragment of target tree stand type). The independence I was given enabled me to choose what direction to take: I looked at how template selection and size versus the library of operators used affected the results. In this way, I was able to contribute to the knowledge of the program's performance, and where more improvements should be applied.



I could not have gained this experience any other way, but through WISEST; it is truly unique and proved more worthwhile than I ever imagined, or have yet to imagine for its true value will undoubtedly be revealed over time in university and beyond. It opened my eyes to the world of research, to an array of careers I had no idea about, and has inspired future direction for myself.

"The people one has the privilege to meet, to converse with, from scientists to fellow WISEST students, are reason alone to come and leave much more insightful, and much more aware of the world around oneself."

Jennifer Lee

WISEST Supervisor: Dr. Cindy Paszkowski, Dept. Biological Sciences
Sponsor: NSERC (PromoScience)

Hi! My name is Jennifer Lee and I was 1 out of 60 students accepted to take part in the WISEST Summer Research Program of 2003. I have experienced a lot over six weeks of the program. My first project was to help out a student who is working on Sage Grouse. The Sage Grouse is a type of bird with its population depleting very quickly. The project that the student is working on is to answer the question of why they are depleting so rapidly. I started out by working on the eggshells of the Sage Grouse. Taking samples from the eggshell membrane is used to receive DNA from the bird that hatched or came from that egg. The second step was to use the feathers to receive DNA. When all of the samples were collected and ready it was then time to do the DNA extractions. This is where you must really be aware of what is going on and what is going to happen next. Each sample is moved from tube to tube to tube and put into an n incubator and a spinner. It is a job that needs a lot of concentration and patience. Well it turned out that there are lots more females then males.

Not only did I work on getting DNA but I also did a lot of work on the computer typing up data that was found with the Sage Grouse. I also did data on the computer for a few other things. I organized birds that were not numbered in any specific way, I learned how to make up a reference page, and I also learned how to make a power point presentation. My supervisor, Dr. Cindy Paszkowski, will be using this power point presentation in the future when she gives her lectures to the class. Knowing that she is going to use the power point that I set up makes me feel really good about myself. It goes to show that anything is possible and that you can do anything if you put your mind to it.

The WISEST Summer Research Program is not only work and work and more work, but WISEST has a lot of great field trips for each of the students to attend. I have been to the Edmonton Waste Management and seen how Edmonton does such a great job on recycling and decomposing its waste. From there I learned that the concrete that we use in the city is mostly from the concrete that was purchased twenty years ago. The Edmonton Waste Management team is also going to, in the next 5 years, build a place to break apart mixed materials so that they could be sent to the places which only recycle one type of material. For example, a VCR has plastic and metal components. One place recycles plastic only and another place recycles metal only. After the VCR is broken down the plastic can be sent one way and the metal can be sent the other way. This is done because the one who recycles plastic does not want the metal attached to it when they receive it. With the new building more things can be recycled that were never before because of the other materials attached to it.

With WISEST there are many things to be done. There are many field trips to go on, games to be played, work to be done, and the lunch with the bunch. Lunch with the bunch gives all of the WISEST students the opportunity to talk about their experiences so far and to hear of the others experiences. Every Friday I meet

with my group for the lunch with the bunch. This gives the students the opportunity to find out more about what the others are doing and it is also a great learning experience for everyone. Each student has the chance to speak and to teach others of what they have learned so far in their research project. All of the WISEST students kind of get to experience all of the other types of Science related work out there just by listening to what other WISEST students have to say.

Every Wednesday afternoon there are activities that are set up for the students. The first activity was a tour of campus. It was not one of those regular tours when a guide says this is this and that is that. It was a game where each student was given a timetable and was put into a group with students who were given the same timetable. The group had to work together to find each classroom and take a piece of the puzzle. It was very fun and it did give me more information about the campus of where some buildings were and how they looked inside. It showed me how complicating it can be to find your way around, especially on the first day. It was great that the WISEST coordinators had put a note on one of the classroom doors to say a change in classroom because it showed us that you have to be ready and prepared at all times when going to school for the first day. From this experience I have decided to come to campus a week before my classes start at the U of A to find all of my classrooms.

I have learned a lot from taking part in the WISEST Program. I am very glad that I was given the opportunity to take part in this type of work. If I could I would do this every summer. The WISEST Coordinators sure know how to have a great time and I really appreciate everything that they have done for us. I had a great time here and I think that anyone who takes part in this any time in the future will feel the same way. WISEST is made up of a lot of things from work to play. I would just like to say to everyone best luck in the future and have a great three weeks left of summer.

Jennifer Reid

WISEST Supervisor: Ms. Kate Murie, Meanook Biological Research Station
Sponsor: Edmonton Glenora Rotary Club

My Post at the Meanook Biological Research Station

My name is Jennifer Reid and I am a sixteen-year-old WISEST student situated at the Meanook Biological Research Station (MBRS). I work in the lab at MBRS analyzing water samples from the FORWARD project (Forest Watershed and Riparian Disturbance). FORWARD examines the effects of logging and forest fires on nutrient export from boreal stream catchments. The final objective is to determine whether or not fires and forest harvesting have similar effects on soil and water. FORWARD may, one day, render the effects of forestry predictable, allowing models to be constructed, aiding planners in determining how an ecosystem will respond to logging.

At the Meanook lab, I analyze and prepare for samples, only a few of which I will explain here. Some of the more important tests are non-filterable residue, total phosphorus and, total dissolved phosphorus concentrations. These tests are all poured during different stages of filtering; for example, total phosphorus is poured with whole sample, sample that has not been altered in any way. After the total phosphorus is poured, the original sample is poured through a Gelman filter that has been previously weighed. Once enough residue has collected on the filter, it is removed, dried and re-weighed to determine the volume of residue that cannot pass through filtering. This figure is multiplied out to determine the quality of the water source. Next, the Gelman sample is poured through a Millipore filter and the total dissolved phosphorus is poured with the resulting portion. After all of the phosphorus is poured, potassium persulphate is added and the samples are put into an autoclave where the phosphorus breaks down and sterilization occurs. When the cycle is complete and the tubes are back to room temperature, mixed reagent is added and the samples are left to develop for twenty minutes. As soon as the segments are ready, they are run in the spectrophotometer, which passes light through them determining their phosphorus content. The above explanations are a summary; many of the smaller steps have been left

out, however, as you can imagine, days where the lab receives samples can be very long and tiring. On one day in particular, the samples arrived late and I ended up working past midnight!

My shift is unlike many of my fellow students'; I work a ten-day on, four day off stretch. Working in a lab means that you do not work regular hours; if you are in the middle of an analysis you cannot leave until you have finished. None-the-less, no matter what time you finish your day, there is always something to do. At night, there are movies, bon fires and games of soccer or basketball. The inhabitants are easy to get along with and you make many friends. The people at MBRS are always willing to lend a helping hand. For example, my supervisor Kate Murie is always there when I need her. She never shows frustration, even after the thousandth question of the day and she is always looking out for the health and happiness of Meanook employees. She tries her best to make adjustments where requested and assures that everyone has a place to sleep.

Due to the location of MBRS I am required to live on site. All employees are supplied with living space and nourishment for their stay. During the weekdays, my hero, Patje, cooks mouth-watering meals for all those present. Everyday we are presented with a warm batch of cookies or other homemade pasties that one cannot turn down and when people are asked whether or not they are going to return, quite often their answer is "only if Patje does!" Life at Meanook is amazing! I have made what I hope to be lasting connections with people such as Joanne, my running partner and fellow lab employee, and Celeste who on one occasion I sat up talking with until four in the morning! Among these and many other acquaintances I have at Meanook, my fellow Meanook students Tara Booker and Rhiannon Edwards are closer to me than many of my friends back home. And to think, without WISEST I would have never had the opportunity to work in a chemistry lab nor to meet such a remarkable group of people!

Jessalyn King

WISEST Supervisor: Dr. David Sego, Dept. Civil & Environmental Engineering
Sponsor: NSERC (PromoScience)

Je suis élève de Maurice-Lavallée (une école francophone à Edmonton), intéressée en physiques et les mathématiques. J'ai voulu participer à WISEST pour avoir l'expérience de travailler en laboratoire universitaire avec d'autres personnes intéressées aux sciences.

J'ai été placée dans un laboratoire d'ingénierie civile et environnementale avec une autre élève de WISEST sous la direction du professeur David Sego. J'ai travaillé avec des étudiants de l'université à trouver le mélange idéal de béton au souffre. Le béton est composé de souffre, coke, et cendres en proportions variées. Ces matériaux sont produits par les compagnies pétrolières comme Suncor dans le nord de l'Alberta. Les compagnies veulent se débarrasser du souffre qu'ils doivent enlever de l'essence et l'utiliser pour fabriquer leurs propres routes est idéale.

En plus du projet de béton, j'ai eu la chance de travailler avec plusieurs autres projets. J'ai pris des données pour un projet ou ils veulent découvrir si c'est dangereux pour l'environnement d'enfouir les sels enlevés des sables bitumineuses en les revêtant de souffre. J'ai opéré le lecteur d'oxygène dissoute, mais on a aussi pris des données de pH et de conductivité électrique pour trouver le montant de solutés dissous dans l'eau au dessus du souffre.

J'ai aussi travaillé quelques jours dans un laboratoire de sols, lors desquels j'ai été donnée un tour des autres laboratoires dans l'édifice de l'ingénierie environnementale et électrique dans laquelle de travaille. J'ai vu comment ils fabriquent l'asphalte et à quoi a l'air le bitume. Finalement, j'ai passé près d'une semaine en arrière de l'enseigne de bienvenue à Devon sur une colline avec des machines et lecteurs de toutes sortes qui n'ont pas été touchés depuis 20 ans. Nous analysons le degré d'affaissement de la colline.

Ces six semaines dans le laboratoire de Dr. Sego ont été instructives. Je peux rentrer à l'école et certainement être la seule a connaître qu'on peut ingérer 10 g de souffre avant sans se sentir malade, et que le béton au souffre peut résister entre 20 et 30 MPa de pression. J'vas pouvoir me coucher beaucoup moins niaiseuse à soir!

In addition to the normal work-related day-to-day action, WISEST organized several other activities. A tour of campus was given, as well as an introduction to GATE (the university's computer system), which were both useful tools, considering we were to be spending six weeks at the U of A.

We were taken on tours to research facilities. I visited Edmonton Waste Management. I came home with awareness of the waste disposal process. I found out about how Edmonton has one of the best waste disposal centres in the world and that soon 90% of edmontonian waste will be funnelled away from the dump. That's pretty impressive!

We got the chance to participate in group discussions with other women in scientific careers. That was probably one of the best WISEST activities, since it gave me, insight into what can be done to accommodate my artistic and scientific interests in my future career. It was a more direct approach to finding out the jobs that are available. The opposite was done through a workshop hosted by IBM. My job decision list became one shorter.

We were taken on a tour of another lab at the University near the end of the program. I decided a genetics lab should be interesting because it's a theoretically interesting subject. Unfortunately for me, genetics labs use mostly flies. It was an interesting, but gross tour. And now I know : je travaillerai là lors de la semaine des quatre jeudis!

The WISEST coordinators also tried their darndest to make the experience good for everyone. They organised several meal-type activities like a Hawaiian Luau BBQ and a meet-the-HYRS-students lunch (HYRS is another summer research program). They also organised a challenge for us, where we got to build towers out of six straws, fifty toothpicks, a Styrofoam cup and a Styrofoam cup's worth of men's

shaving cream. That was an interesting experience. My team managed to build a steady 119 cm tower. However, the strangest activity was the "1st ever Silly-mpics". And they were, well, silly. The WISEST students were fed and amused for an evening in Hawrelak Park.

With all this activity, I hardly had time to prepare my poster for the 13th, although I'm sure I managed well enough.

WISEST a été un expérience inoubliable and pretty useful, too. J'ai découvert une tonne de choses, not only about sulphur concrete and civil engineering, mais à propos de l'Université et la vie étudiante. I definitely agree with whoever said on n'a jamais fini d'apprendre!

Jill McDonald

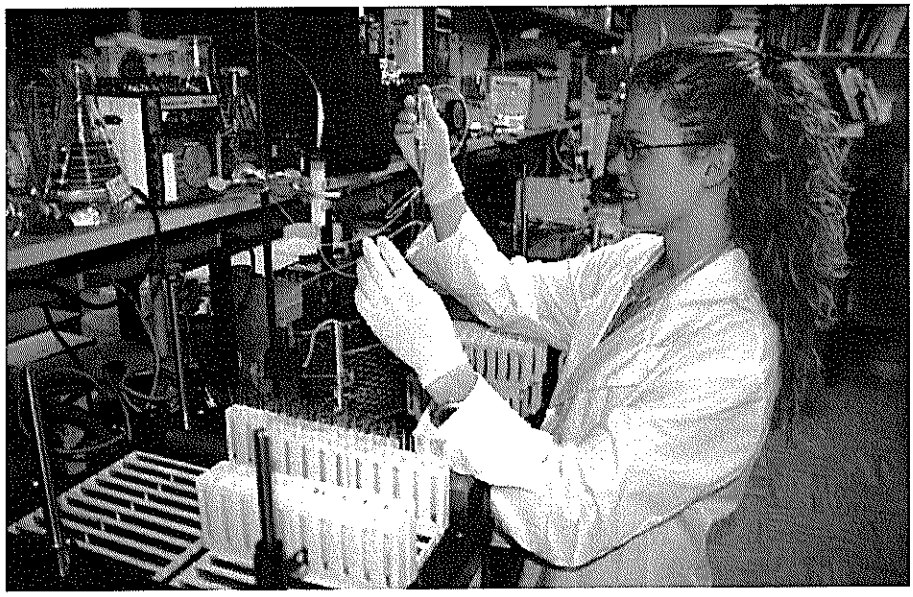
WISEST Supervisor: Eryck Silva, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Ministry of Innovation and Science

Six weeks ago, I would have stared, feeling lost and unknowledgeable, if someone had started discussing glycomacropeptide-depleted whey or wanted me to perform a chromatography or asked me what is needed to create acidic water. But, thanks to WISEST, I can confidently say that I now have an understanding of these topics, along with a host of others.

Working alongside Eryck Silva, my project was to take skim cow milk and reduce it into GMP-depleted whey (glycomacropeptide-depleted whey). After a few days of feeling somewhat unprepared for the mass flood of information I was receiving, I began understanding what was happening and started my project...

The process we followed to obtain GMP-depleted whey from milk and determine its sialic acid content was long and fairly complex, so I won't bore you all with the details, but rather give you a quick overview. First, we had to separate the milk into curd (what cheese is made of) and whey using an enzyme, and centrifuge and filter to ensure it was completely divided. The whey was dialyzed, and then we performed ion exchange chromatography. This is where the protein GMP is removed. Next, we headed downstairs to use the freeze drier. The freezer is approximately -90°C!

The most exciting part of my research project was the final analysis. Here we combined multiple solutions with each sample (I was surprised when my samples turned a vivid shade of pink!) and then used the spectrophotometer to determine the sialic acid content of each. My final results indicate that my samples of GMP-depleted whey contained 3.9 µg of sialic acid per mg. This is a much lower amount than the 19.8µg/mg contained in whey. Eryck is hopeful that GMP-depleted whey may be used to make baby formulas in the future.



As well as working on Eryck's milk project, I worked with Sylvia Chan. She is researching lactic acid bacteria and its correlation to colon cancer prevention. Because we were working with bacteria, we had to

make sure we were always doing things in a sterile manner to avoid contaminating our samples. This meant we had to work under a hood (a special work surface), and had to make sure our equipment was either autoclaved or flamed before use. Waiting was the name of Sylvia's game. It seemed as if we were always waiting for our cultures to incubate - sometimes only an hour, but often 24. In the end, we learned that all of the strains of lactic acid bacteria we tested were both acid and bile tolerant. In other words, they can survive through your digestion tract and are still alive when they reach your colon. These are very positive results!

I didn't just 'hang out' in the lab with Eryck and Sylvia for six weeks. WISEST had some wonderful activities planned for us, all of which were lots of fun and very useful. One of the highlights was touring the lab that developed the Edmonton Protocol, successfully transplanting islets from a pancreas to help a person with diabetes.

Eryck took me to the Mennonite Center for Newcomers that is located downtown a few times. There we taught teenagers who have recently moved to Canada some computer skills. It was challenging because not all of them spoke perfect English, and some had never even turned a computer on, but I loved this experience!

Near the end of WISEST, another food lab asked if I would help them, so I also spent some time working with Kenton Delisle (who Saleem has been working with). I assisted with a few taste perception surveys. Here I learned that not all labs are the same, and got to see a totally different way to apply knowledge gained from taking food sciences/nutrition.

All in all, I had a great time here. WISEST gave me a chance to see and do new things that will be really useful in the future. I had an opportunity to find out about many new career options, as well as explored the university campus and met new friends.

Jonathan Chin

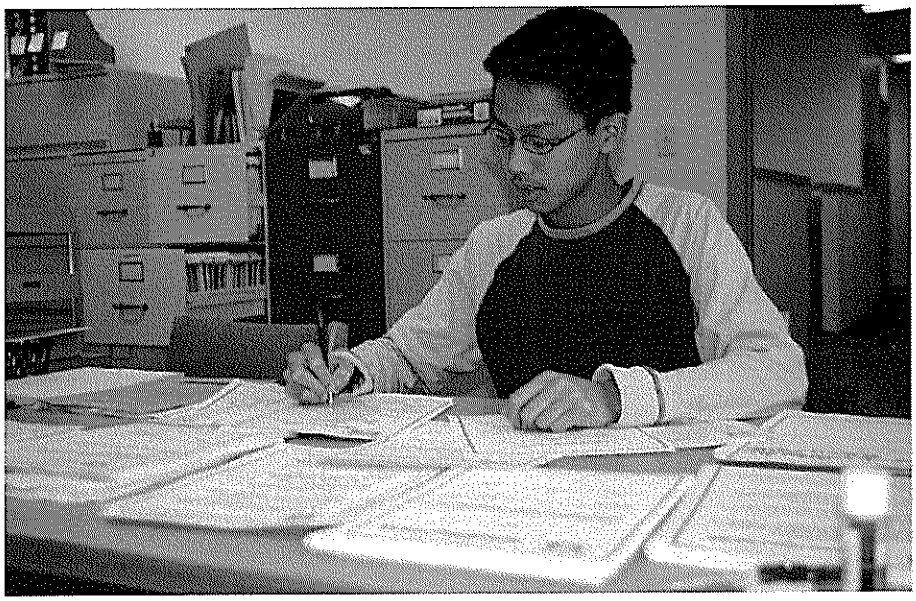
WISEST Supervisor: Dr. Linda Ogilvie, Faculty of Nursing
Sponsor: Faculty of Nursing

During my participation in the WISEST Summer Research Program, I worked in the Faculty of Nursing with Dr. Linda Ogilvie on the New Canadian Children and Youth Study. It is a national study which examines health and development of immigrant and refugee youth. Working with helpful members of the research team, I quickly discovered that this particular project was neither lab-based, nor based in a clinical setting—it was a research project!

For a brief introduction, I should start at the very top. This project is part of the larger international Metropolis Project, which is a forum that deals with immigration and integration (into society) of people around the world. Within this international forum is this particular Canadian study. It falls under the Health Domain area of research of Canada's four Centres of Excellence, one for each research site in Canada: Montréal, Toronto, Vancouver and the Prairies; Edmonton, Calgary and Winnipeg form the Prairie site to match the sampling populations of the other three cities/sites.

This study is survey-based, so it involves a lot of questionnaires. Immigrants and refugee families from different ethnic groups who have been in Canada for ten years or less are interviewed about family, children and cultural identity, focusing on health and developmental factors. Nationally, the Filipino, Mainland Chinese and Hong Kong Chinese groups are interviewed, while the Prairie site-specific groups are Kurdish, Polish, Vietnamese and Salvadorian. I'm glad that there were Chinese groups because I was able to make use of my abilities and help with community centre advertisements and consent forms. I also attended a Chinese ethnocultural committee meeting and learned even more about the study's purpose and goals. An interesting point during my work with this study was formatting a Kurdish questionnaire.

(Note: "format," not "type" or "write.") It was somewhat difficult, because I couldn't read it at first—actually I still can't read it at all! What I did was format translated questions to match the already completed English questionnaire. I also spent some time creating poster presentations and slideshows relating to Dr. Ogilvie's projects and I learned a lot about this study while preparing them.



As of August 2003 the New Canadian Children and Youth Study is in the data collection stage of the first cycle. This study is longitudinal, meaning that there will be follow up interviews two years later and four years later. Data entry for the Prairie site is done in Edmonton, and I coded the Mainland Chinese questionnaires and performed other data entry tasks. What I learned from the research team was that the questionnaires are formatted so that any particular response, regardless of language, has a corresponding number which can be entered into the computer program SPSS (an impressive statistical analysis program). After the information has been coded and entered, the data sets can be analyzed to reveal any trends in the information. For example I did some frequency tests to see the breakdown of the data for a certain variable, and cross-tabulation to identify relationships or trends found *between* several variables.

The New Canadian Children and Youth Study has an objective to identify child health and development issues in immigrant and refugee populations. With the comprehensive database of information that will emerge at the completion of this study, we will be able to make comparisons between the immigrant and refugee group, and between the immigrant/refugee group and the general population. In addition, findings will be communicated to all levels of government to influence policy and decision-making which will improve the lives of immigrant and refugee families in Canada.

Looking back on the last six weeks, I'm glad that I participated in the WISEST Summer Research Program. I have thoroughly enjoyed working in my lab—well, office—and it has broadened my view of the different types of opportunities available for people in non-traditional fields.

"Not only did my work give me insight
to what types of research takes place in a university setting,
it has definitely encouraged me to enter a field of science
involving similar types of research work.

Thanks to WISEST and the research team for such a great experience!"

Justine Goodkey

WISEST Supervisor: Dr. John Shaw, Dept. Chemical & Materials Engineering
Sponsor: Syncrude Canada Ltd.

During the six-week work term with the WISEST Summer Research program, I worked with Dr. John Shaw's thermodynamics research group in the Chemical Engineering department of the University of Alberta and was supervised more by Dr. Maham. The research that I contributed to dealt with understanding how heavy oil and asphaltenes behave. This is very important research because it contributes to the understanding of the petroleum industry since, asphaltenes are found in crude oil. One example of this is how asphaltenes interact with different solvents; temperature affects how and whether they can be transported through pipelines.

My role in research this summer was to find the densities of two different asphaltenes, ABVB and MAYA, in various solvents, for example toluene and toluene-dodecane solutions. I would dissolve different masses of asphaltenes into the solvent to form a set of solutions of various mass percents. After letting the solutions sit for a while, I would begin testing them at four different temperatures: 25, 40, 60, and 80 degrees Celsius. To test, I would insert one to two milliliter sample of each solution into the vibrating tube of the Anton Paar DMA45 Density Meter to test the densities. After comparing the density values to the daily water and air values at each temperature, we would plot the values to study how the densities would change as the concentration increased. This method would help us to understand how the compound is interacting with the solvent and to see if it is truly dissolving within the solvent or if it is a suspended particle.

The WISEST Summer Research Program not only taught me the specific procedures of working in a Thermodynamics Laboratory but it allowed me to see how some parts of the University of Alberta life operates. This summer I experienced first hand what a research career would be like; this involves not only research but attending group meetings, ordering supplies, writing reports on research, and sometimes giving presentations. It is vital in a research position that one has personal organization, time management, and communication skills. I had the opportunity to meet many amazing people this summer for example graduate students, professors, and research team members. Their experiences and regrets shared with me will assist me in making decisions in the future.

During my WISEST experience I was fortunate enough to meet representatives from the company that sponsored me – Syncrude. I had the opportunity to go and tour Syncrude's Edmonton research facilities. I found that research in industry is different than research at post secondary institutions. It was a great experience for me to go meet Engineers at a company since their role is a bit different than the researchers on campus. I was able to tour most of the labs there and discovered that a lot of the work there is done by different pieces of technology not by traditional testing methods done by people. This experience also helped me to meet again some amazing people and future contacts.

Before my six-week discovery I was only vaguely aware of what a chemical engineer in research would do. I learnt this summer that one could do anything if the mind is focused on achieving the goal; it is important to fulfill the role assigned to you with confidence. WISEST has definitely confirmed my decision of enrolling in an engineering program at the post secondary level. I am now able to share the information that I have gathered with others, especially with those who may be future WISEST participants.

Katey Blewett

WISEST Supervisor: Dr. Alidad Amirfazli, Dept. Mechanical Engineering
Sponsors: Faculty of Engineering & Summer Career Placements Program

For the past 6 weeks I have been working in a research lab in the Department of Mechanical Engineering. I have been studying superhydrophobic surfaces under Dr. Alidad Amirfazli. Not only has the direct lab work been a fantastic experience, but I have also gained valuable knowledge through other WISEST activities.

The project I was assisting with was studying superhydrophobic surfaces. A surface is superhydrophobic if it produces a contact angle greater than 150 degrees. The long-term applications for these surfaces are for things such as satellites, glasses or windshields pretty much anywhere where the repelling of a liquid would be useful. The high contact angles which occur on the surfaces causes liquid to tend to roll down rather than smear. Therefore, for example on satellite, any precipitation would be more easily cleared with less interference to the satellite.

The First step in this experiment was to prepare the surfaces. First the AKD was melted then poured into a metal mould. The mould was then set in a tank of nitrogen gas for 30 minutes to solidify. When removed, holes were made in the surface using a heated needle. The surfaces were then left for 72 hours. Over the three days there is a drastic change in the roughness of the surface and it is this roughness that causes the surfaces to be superhydrophobic. When a liquid is dropped onto a superhydrophobic surface it sits on top of air that has been caught in the surface. Since most liquids repel air this causes the liquid to remain a more spherical shape giving a greater contact angle.

The next step was to measure the contact angles. Using a motorized syringe a small drop of liquid is pumped upwards onto one of the surfaces through one of the holes. A run of pictures is taken at one pictures every two seconds for thirty seconds as the drop of liquid slowly grows. The process is then reversed and pictures are taken as the drop recedes. The pictures are then analyzed and the advancing and receding contact angles are then measured. The process was repeated for four different solutions using various holes and surfaces. The solution I measured was hexadecyl. We measured 7 various concentrations of the solution from 0.00015M to 0.0012M. The other liquids were solutions of SDS, Sodium Acetate and N-Decanoyl.

The results of the experiments were very interesting. They

showed that liquids with similar surface tensions act differently. For example a pure liquid would have a very low contact angle yet a solution with a similar surface tension would yield a very high contact angle. This shows that there is hope in developing superhydrophobic surfaces with practical applications.

Not only was the lab work a great experience, but I also really enjoyed the various activities and tours arranged by WISEST. The group sessions with the mentors were very helpful and motivating. It was very interesting to hear about the different paths these people had taken to get to where they now are. Many of them could relate to the career decisions we will soon be making and had very helpful advice to offer. It was also very encouraging to see such successful men and women in non-traditional careers which is what WISEST is all about. I also enjoyed the tour of IBM. I found the role-playing exercise to be very interesting. I was not aware of all the different positions available.

I would definitely recommend WISEST to other students. It was a great program. I gained a lot of valuable skills and knowledge. I learned that sometimes you have to try different techniques to get something to work, that you have to explore all areas of any problem and not give up when things don't go quite as you planned. This program has really encouraged me to not be apprehensive about entering non-traditional careers. I would like to especially thank Grace, Tara and Celia for all there hard work in making WISEST such a success. And also thank you to all the sponsors who, without your help, such a rewarding program would not be possible.

Katherine Bounds

WISEST Supervisor: Dr. Gaylene Fasenko, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Ministry of Innovation and Science

During my six weeks of WISEST this summer, I worked at the Edmonton Research Station, also known as the U of A farm. It's a whole little farm hidden in the middle of Edmonton that I never knew existed. I spent my time, working at the poultry unit, under Dr. Gaylene Fasenko. They have hundreds of chickens living there, and there is always lots of work to do, whether it's weighing birds, collecting eggs, weighing feed, cleaning, or something else. Everyone who works there is really friendly and it was a great atmosphere to work in.

My project dealt with the incubation of chicken eggs, and it was done in the hatchery. We were looking to improve methods of incubation by changing the duration of time which the eggs are held in the different turning positions. We used an incubator with an altered turning mechanism that instead of turning eggs the standard way (spending one hour tilted 45 degrees to the left and then one hour tilted 45 degrees to the right, rotating every hour), it held the eggs 45 degrees left for 10 minutes, horizontal for 40 minutes, 45 degrees right for 10 minutes, and back to horizontal for 40 minutes, repeating this cycle. The reasoning behind trying this new tilting was that the air flow in the incubator is better when the egg flats are

horizontal, so we changed the turning device to incorporate some horizontal time while still tilting the eggs, as tilting is essential for proper embryo development and growth. At the end of the experiment, our hatchability was much lower in the experimental group, with many of the eggs hatching too slowly. However, we aren't even sure if this was caused by the different turning treatment because after the experiment we discovered that the incubator was actually at a lower temperature than we set it for. This was quite a frustrating thing to find out after the experiment, since eggs require a very specific temperature for the best results. The experiment needs to be redone, but at least I learned an important lesson about research, everything doesn't always go as planned.

Working at the farm this summer and being involved in research was such a great experience. I would have never thought that chickens and eggs would be so interesting or that there is so much research going on in agriculture fields. People don't usually think about it, but it is truly amazing how a chick develops inside an egg in only 21 days. Working on the farm really shows you the bigger picture of the research and its practical applications. It was fun for me to work in a non traditional lab setting, since I enjoy hands-on work and I love being around animals. (Newly hatched chicks are extremely cute.) I got to work with undergrad and grad students as well as Dr. Fasenko, and I learned a lot about university and agricultural sciences from them, not to mention they're really fun people.

The WISEST program turned out to be a really great summer job. I got the opportunity to meet a lot of interesting people and to learn a lot. Over the summer, I learned so much about all of the different career paths that are available in science, and got a bit of a glimpse into what scientists really do. Now, when it comes time for me to have to decide on programs and courses, I'll know more about the different options available. I am very glad that I could participate in this program since it turned out to be a very valuable and enjoyable experience.

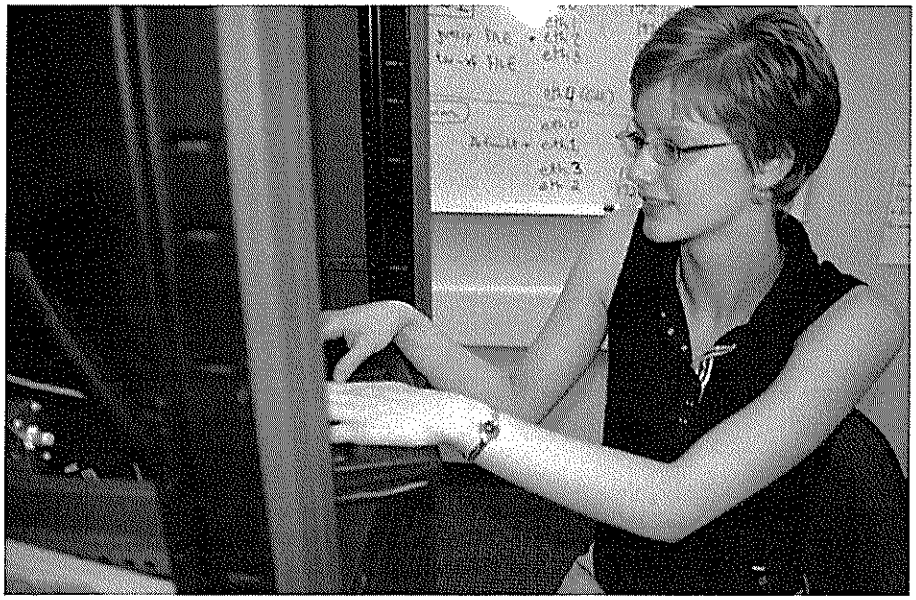
Keely Sullivan

WISEST Supervisor: Dr. Mike MacGregor, Dept. Computing Science
Sponsor: CIBC

Have you ever looked at the time on one clock in your home, only to have it say that it's five minutes earlier than another clock? In the computer networking world, what you shrug off at home as a mere inconvenience soon becomes a severe one. Say, for instance, you are monitoring the length of time it takes for information to get to one end of the network to the other to get an idea of the average delay. If one clock says that the information leave one computer at 5:06, but the receiver's clock says that it gets the information at 5:04, how do you know how long it took – time can't travel backwards after all!

This summer, along with Dr. Mike MacGregor and several very talented computing science graduate students, I was able to explore some of the deepest (and darkest!) secrets of computer networking. Throughout the summer, we worked on finding (useable) ways to synchronize the clocks of different computers so as to accurately measure delay times between computers. The first attempt involved using the Network Time Protocol (NTP), which is a program that accesses an atomic clock through the internet and periodically adjusts any clock that requests updates. (Atomic clocks run on cesium and are supposedly the only accurate way to measure time.) Unfortunately, PC clocks are generally thought of as 'evil' in the networking world because they have the tendency to run at different rates and make completely random leaps in time. Because of this, NTP is not altogether reliable because in between the times at which it adjusts the clocks, the clocks are still running at different rates.

Another problem with NTP was that since the University of Alberta does not have its own atomic clock, we had to access one in Ottawa. Fortunately, this isn't the lab's only option. Once the lab gets the right equipment, we hope to place a GPS receiver on the roof so that we can have access to the satellite signal that also runs off of an atomic clock. Though this still would leave us with a bit of the same problem, it would decrease the overall skew, or difference, between our clocks and that of the atomic clock.



In an attempt to remove this skew through the use of algorithms, I got a severe crash course in computer programming. It turns out that although I was reasonably experienced in the methods of home computing, when it came down to actually getting down into the 'nitty gritty' sort of stuff that computing science people do every day, I was an untried novice. I can remember being more than a little worried at the fact that I would be working not with a user-friendly Mac or Windows machine, but one that ran on Linux - something of which I had never heard of before this summer. Fortunately, I was teamed up with an extremely patient graduate student who never hesitated in giving me a hand when I was desperately in need of one.

Though I don't think that I'll ever have any great inclination towards getting involved in computers as deeply as I have this summer, I can't say anything less than that I had a great experience, and not only in the lab. The chance to meet new friends that have the same interests and motivations as myself was invaluable, and I hope to keep it touch with many of them in the years to come. Also, being able to talk with people who are in university and the routes that they took to get them to where they are today was extremely helpful in terms of choosing my own way when I do get into university. Thanks so much for a summer well spent WISEST!

Kelly MacGregor

WISEST Supervisors: Dr. Heather Prior & Dr. Hank Bestman

Sponsor: Allard Foundation

My Time at The King's University College

My involvement in the WISEST Summer Research Program allowed me the excellent opportunity to work at the King's University College in the department of Biology under the supervision of Dr. Heather Prior. It was a great experience to work with professors and along side university students and other professors as they shared their knowledge with me. I was exposed not only to the field of Biology but also a variety of other areas, which broadened my horizons regarding the opportunities science provides.

During my six-week internship at The King's University College I had the exciting opportunity to do some research of my own. This research mainly consisted of one project in which I was responsible for the locating and mapping of a specific gene called *foxc1a* on a Radiation Hybrid Panel containing 94 different DNA samples. The gene *foxc1a* is thought to be important in early eye development within zebra fish. The purpose of locating and mapping this specific gene is that one day the information gathered may be helpful in understanding ocular diseases such as glaucoma and cataracts.

In the beginning I was flooded with information regarding the workings of DNA and my project. I read many papers regarding eye development, zebra fish, genetics and a variety of other topics, which gave me a

basis on which I could begin working in the lab. My vocabulary and lab skills expanded quickly as everyday I learned a plethora of new and exciting skills. I also came to the conclusion that some of the stuff you learn in school does prove to be very helpful!

After I had gained a basic understanding of my project, I found that my days consisted of running many PCR reactions and a variety of other preparatory practices. PCR, which stands for polymerize chain reaction, was responsible for amplifying the gene central to my project. PCR consists of a variety of temperature-sensitive steps all designed to reproduce the section of the gene needed for my project. A typical PCR reaction took about and hour and a half and required a fair amount of preparation.

Following the completion of my PCR reactions, I ran these samples on an agarose gel. This gel, which was placed in an electrophoresis apparatus, allowed me to view the DNA samples with my naked eye with the help of an ultraviolet light box. In doing this I was able to determine if the gene I was searching for was or was not present in the DNA samples I was working with. In the end I probably ran about 300 individual samples!

In doing all of this, I learned the importance of patience and thorough lab practices. Many things such as outside contamination, incorrect temperatures, and pipetting errors could have caused my experiments to be faulty or not to work at all. Fortunately this was not a major problem for myself, which was very helpful as these problems had the potential of causing major delays and much frustration.

In the end, my project proved to be a success! I completed the mapping of the *foxc1a* gene on a Radiation Hybrid Panel. This testing consumed the bulk of my 6 weeks at King's, but proved to be very rewarding in the end. After all the samples had been tested, I was able to electronically transmit the results to a database where they were analyzed according to a complex computer algorithm. This comparison allowed me to determine the genetic location of the *foxcla* gene-which proved to be located in linkage group 2 of the zebra fish genome.

My time at King's College was incredible. My supervisor Dr. Heather Prior was fun to work with and very helpful; she taught me a lot. It was a once in a lifetime experience to work with such gifted, talented and dedicated people. I am very thankful for the time I spent at King's College and enjoyed working on and completing my project. It was an experience I shall never forget.

"My involvement in the program allowed me to see a part of the 'everyday' side of science, which has been very helpful in enabling me to form a clearer picture of what I want for my future educational and career goals."

Kristine Abana

WISEST Supervisor: Dr. Michael Brett, Dept. Electrical & Computer Engineering
Sponsor: Alberta Ingenuity Fund

Six weeks of my summer was spent productively participating in the Wisest Summer Research Program. I worked in the Department of Electrical and Computer Engineering under Dr. Michael Brett. The GLAD Research Team, as they call themselves, focuses their research on nanostructured thin films developed by a patented process known as Glancing Angle Deposition (GLAD). Throughout this period, I gained a valuable laboratory experience under the guidance of Andy van Popta, a graduate student in the University of Alberta.

I was involved with a materials science based project studying the effect of annealing or baking titanium dioxide films on its optical properties. I am looking at how much light is transmitted through the film before and after annealing. Firstly, we made titanium dioxide films using the Deposition machine. Silicon wafer, ITO and glass were used as substrates where the thin layer of titanium dioxide film will grow. The structure of the film is composed of right-handed helical or spring-like columns. The thin films were used as samples for the research.

One of the machines that I used was the spectrophotometer. The thin film sample is placed in a circular plastic holder that is inserted in a circular part inside the machine. A beam of left- and right- circulatory polarized light is shoot through the film and a computer program named UV Winlab generates a percent transmission versus wavelength of light graph for both polarized light. The wavelength range that is being measured is from 850 to 320 nanometers. The percent transmission of polarized light through the film is measured at different film orientation or angles from 0^0 to 180^0 with twenty degrees interval. The spectrophotometer is also used after annealing the thin film samples to measure the percent transmission of light again.

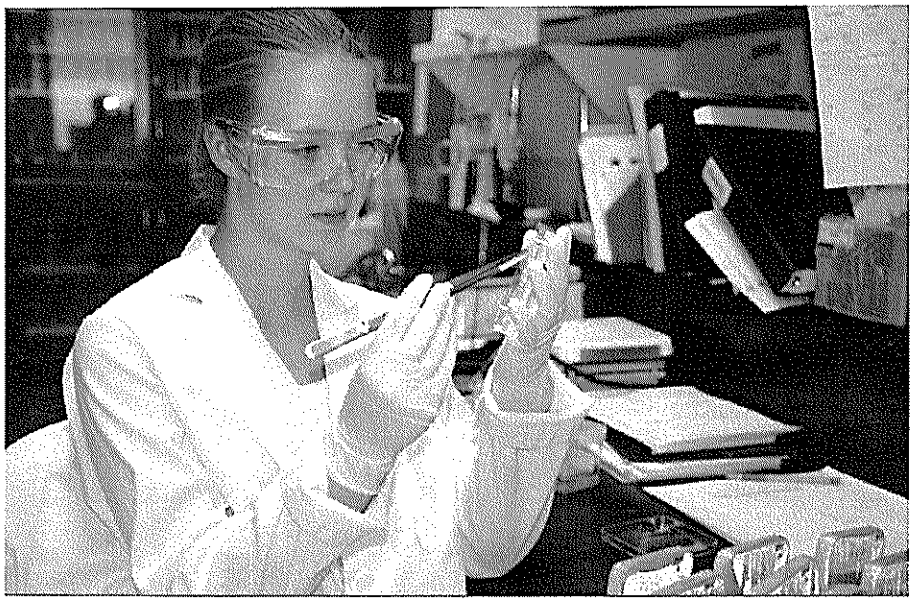
Another equipment that I frequently used was the furnace. The annealing of the thin films is done in this machine. There are two annealing schemes that we used – Scheme A, constant annealing time at variable temperatures and Scheme B, constant annealing temperature at different lengths of time. Also, Scanning Electron Microscope was used to take SEM images of the samples before and after annealing to compare any changes in the films' structure.

Throughout the program, each week did not pass by without any fun-filled activity. It is always highlighted by a Wednesday afternoon event, social activity or lunch with the bunch. One of the most informative sessions was the Small Group Discussion. It was an opportunity for us, the Wisest students to meet people in nontraditional areas and hear about their stories. They told us about the long path they've taken and all the turns they've made before arriving to their present profession. They also gave us wonderful advices that would surely be of help to us when we will make the biggest decision in our lives – our own path.

Participating in the Wisest Summer Research Program is a one-in-a-million experience that one could ever have. It gave me a sense of fulfillment by giving me the opportunity to work in a laboratory and get a glimpse of what is research life all about. The first few days was somewhat intimidating as I try to read and understand the journals intended for professors and graduate students. But doing the actual work – operating the machines and handling of the samples is very interesting and enjoyable. I was fortunate enough to see the future technology unfolding before my eyes. The whole experience provided me learning not only on running the machines but it also taught me the traits of patience as research takes time and organization especially when you have hundreds of samples at hand. The program not only gave me a summer job but it also opened my eyes to the numerous career paths waiting for me in the disciplines of science and engineering.

Laura Lockau

WISEST Supervisors: Dr. Gregory Taylor & Julie Stephens, Dept. Biological Sciences
Sponsor: Petro-Canada Community Investment Program



For the six weeks of the WISEST program this summer, I worked in the botany lab of Dr. Gregory Taylor. The project I was involved in dealt with Aluminum (Al) toxicity in plants, more specifically in Arabidopsis. Basically, I was helping to investigate the role of vacuolar ATPase (V-ATPase), an enzyme localized to the vacuolar membrane, in the Al tolerance of the plants. The theory is that the V-ATPase helps to sequester amounts of toxic Al in the vacuole of each plant cell. This way, the toxic Al is kept safely away from the sensitive cellular components of the cytoplasm which would be most affected by the Al. This mechanism would be especially important and useful in roots, as that is the part of the plant that first comes into actual contact with the Al as well as with other potentially harmful soil components. The roots are also important because one of the major effects of Al toxicity is stunted growth, especially in the roots region.

In order to determine the role of the V-ATPase, we had to downregulate its activity. To be able to do this, we had to use a chemical called Dexamethasone (Dex). The Dex activates what is called an antisense approach, which involves the inhibition of RNA. This in turn inhibits the formation of vital proteins, and so decreases V-ATPase activity levels. With decreased activity, an increased sensitivity to Al should be evident if sequestration in the vacuole is in fact important in tolerance. All of the plants we used in our experiments belonged to one of three lines. We used two transgenic lines of plants as well as one wild type line. The difference between them is that the transgenic lines carry the antisense gene and the wild type line doesn't, meaning that the wild type shouldn't be affected by Dex. My project involved evaluating root growth to determine the effects of Al with and without Dex on each of the different lines. I germinated Arabidopsis plants onto germination plates. After a week, I transferred the seedlings to square root elongation plates. Each of these plates contained an agar media with different concentrations of both Al

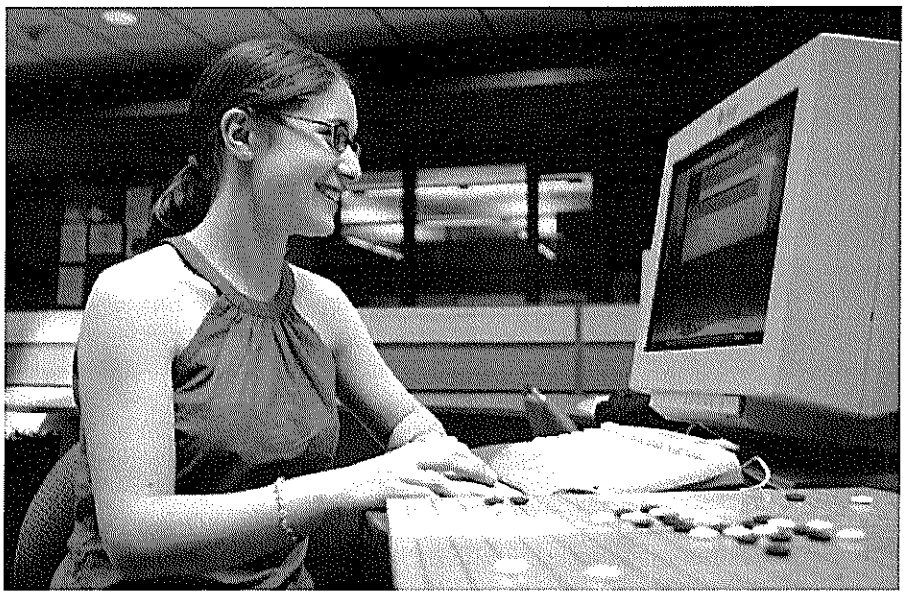
and Dex. After the plants had been transferred, I marked the root length on the back of each plate. The root length was marked again after 24, 48, and 72 hours, then the measurements were recorded and graphed.

Besides doing root elongation experiments, I assisted with other parts of the project being done by graduate students. I assisted with the optimization of assays for measuring V-ATPase activity through phosphate concentration. I also helped harvest roots from plants grown in different Al and Dex solutions. These were then ground, mixed with an extraction buffer, and used in assays.

I really enjoyed working in the lab and getting to know more about what real research is all about. It was a valuable experience and a wonderful chance to experience research and learn about a field in which I had little knowledge. The whole experience served to reinforce my desire to pursue a career in a scientific field. As much fun as working in the lab could be (and usually was), the social events and Wednesday afternoon sessions were also a big part of the reason WISEST turned out to be such a positive experience for me. I met so many new people who were chosen for the program for the same reasons that I was; they share my interest in science. It was so interesting being able to learn about the projects that the other students were working on and their lab experiences, as well as having the opportunity to talk to role models about their career paths. WISEST also really improved my knowledge of the University campus, which I'm sure will turn out to be very useful! My lab experience has, I feel, done a great deal to prepare me for University and for whatever field of work I decide to pursue, scientific or not.

Leah Hackman

WISEST Supervisor: Dr. Ryan Hayward, Dept. Computing Science
Sponsor: Epsilon Chemicals Ltd.



Not since invading my best friend's brother's clubhouse had I witnessed a boy point and stare with an aghast look of shock while shouting "girl!" Chalking the previous experience up to the age difference between myself and the boys part of the elite childhood club they'd form, I'd not expected to face such a peculiar reaction so soon again under new circustances. Of course at the time I'd never anticipated coming to work in a computing science lab with WISEST in a few months.

Within my first week, many introductions were preceded by students working with the lab wearing startled expressions and jokingly asking my mentor like undergrad students, "how'd you lure a girl into the CS building guys?" Within less than a week though, the novelty wore off and I became absorbed in this fantastic network of people. Daily, after taking a couple hours to explain the details that are so trivial contrasting to their vast knowledge, yet elusive to my inexperienced mind, they'd announce it was lunchtime and time for another field trip. My labmates were teachers and com-padres alternatingly, cramming me with knowledge of the academic and the slightly more flavoured aspects of university life. By week three, our lunch hour escapades had already allowed us to cover most campus joints, buy me my first donair, and teach me how to properly throw a Frisbee.

Working in a large atrium area, over flowing with undergrad students from diferent research teams, I managed to glean a diverse collection of ideas and information. One day, Mike, a student working under my supervisor Dr. Ryan Hayward, would teach me the rules and history to the game Hex, both a mathematician and a gamer's delight. The next day, a grad student named Jim would pop up from the depths of the grad offices, and teach me graph theory, with a story and a crazy mathematician behind each concept. The delightful Magda, a woman adding a degree in computing science to her physics degree, would come and patiently guide me through her papers so I could understand the work I was doing, or Mark, Morgan, and Nolan would pop their head over the plastic partitions between computers to answer queries and impart wisdom of unix comands, C++ functions, and which bands truly do put on great live shows. I think the day I realized that I was actually catching on to all that was being shown to me was the day the lab burst out laughing when I asked for help with an error message. When I asked why, the best they could offer was, "Leah, you wrote a program to finish your work faster? You know you're in Comp Sci. when..."

To pinpoint the research I did is near impossible because I did more than research a single project, I learned about every project going on in the building, learning the history of the concepts these people put into practice each day. I learned about the people around me, and the buildings, and scholarships and the frustrations of registration as those around me scurried off to sign up and cancel classes. I suppose I not only spent the summer learning the history of Euler and famous mathematicians, but also the lives of Mike or Morgan or Nolan, or any other student at the university. Now with my tenure in the Computing Science building coming to a close I only find myself with one negative in mind, and that is the year long wait for my own arival at the university, so I too can discover the zany math professors of legendary lunch time discussions, and the equally zany math of legendary large textbooks.

Marta Korz

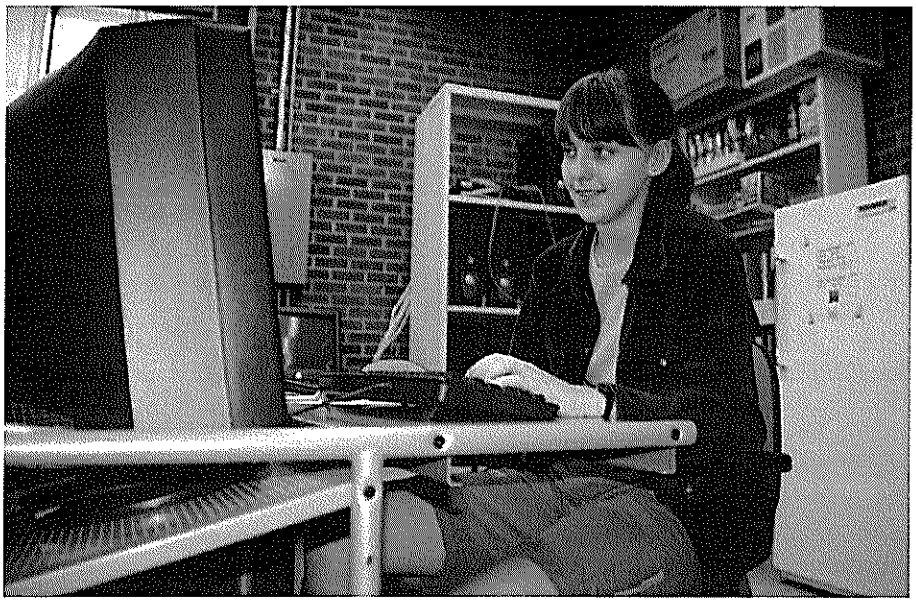
WISEST Supervisor: Dr. Walied Moussa, Dept. Mechanical Engineering
Sponsors: Faculty of Engineering & Summer Career Placements Program

Throughout the six week period of the WISEST Summer Research Program, I worked in the Mechanical Engineering Department under Dr. Walied Moussa. With the help of Shawn Lywood and Jon Lueke, I worked in the Micro Electro Mechanical Systems (MEMS) lab on a project that involved making an animation that would educate potential clients about the use radio frequency switches in "smart pills", which would be inhaled by the patient.

MEMS are a collection of micro-sensors and actuators that can sense their environment and have the ability to react to changes in that setting. The sensing and actuation occur as a result of exciting a special layer by the application of an electric field, for instance by the use of a switch. In the project that I was involved in, a Radio Frequency MEMS Switch was used to act as a smart pill that would target an infected area to deliver medication. With this method, treatment that may be harmful to other parts of the body can be delivered to a specific region and thus would not damage the surrounding healthy environment. With this information in mind, I learned how to use the computer program Blender for the animation and began to understand my part in the overall project.

The animation that my partner, Mihaela Carpo, and I created depicts a Radio Frequency Microelectromechanical System Switch that would travel through passages to reach the lung in order to deliver medication. To get a better idea of what the animation should look like we visited Dr. Hennig at the Cross Cancer Institute and looked at pictures of lungs. After the visit we discussed the path of the "pill" for the animation. First the pill would travel down through the trachea, would go through some bronchial tubes, and would then reach the alveoli searching for the infected region. After some practice with the program, I started creating the environments and the animation was slowly being put together. It was exciting to see the end product of the pill being inhaled, going through different tubes to reach an inner area of the lung,

being activated by radio waves, exploding and delivering the medication, and then having the infected part of the area disappear. I would have never expected to create an animation from my first trials with the computer program but with a little patience, imagination, and a very helpful tutorial from Nathanael Law, my partner and I managed to create a video that can be used to represent the technology that is being researched in our lab.



During my time in the lab I also had to opportunity to talk with the university students about their experiences and the different paths that are available to me in the Mechanical Engineering field. My time in the program however was not restricted to only my lab. I got to attend several lectures that gave me a better idea of what attending university is really like. A lecture that interested me was Engineering Design where I learned about different kinds of springs, the forces that act on them, and the formulas needed to calculate the proper dimensions so that excess stress is not created in a specific area. Even though I was situated in an engineering field, I also got to visit a physics lab and got to play with liquid nitrogen which was very fun and not something I could do at school. The highlight of my adventures was going to Banff for the International Conference on MEMS, NANO, and Smart Systems. I was the photographer so I was always in and out of rooms but I also got to sit in on many lectures on micro-needles or the difference between MEMS and NANO. While volunteering at the conference, I got to meet many professors from places like South Korea, United States of America, Japan, and Canada. They gave me further insight into what the future can hold for me if I go into engineering and it was exciting to see how MEMS can be applied in different areas along with the many opportunities that can be available to me all over the world.

Before my experience in the MEMS lab I did not even know that smart pills and RF MEMS switches existed. The time spent there gave me a new perspective on mechanical engineering and verified my decision of going into this field. I have enjoyed working in the lab over the summer and I would recommend the WISEST Program to anyone who is interested in science. I am glad that I was able to participate in the WISEST program and hope that everyone learned and had as much fun as I did.

Martha Lednicky

WISEST Supervisor: Dr. Ryan Hayward, Dept. Computing Science
Sponsor: Canadian Information Processing Society (CIPS)

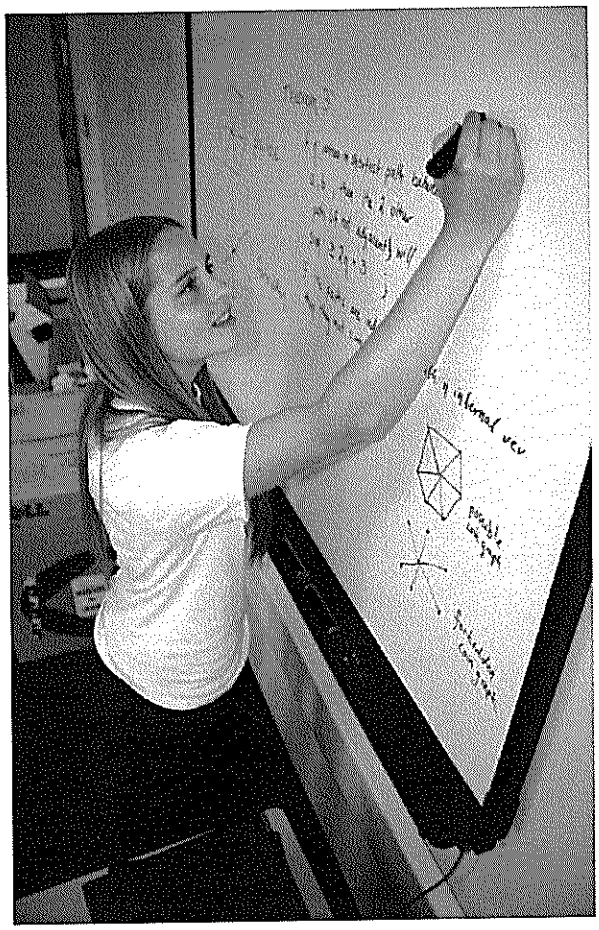
I would like to begin by advising any who wish to participate in this program to do so. Being part of the WISEST Summer Research Program has expanded not only my researching experience but also caused me to meet interesting people and even change my future career plans! You may be saying, "The usual, someone trying to sell this program to us," but that is definitely not the case. I truly believe that the WISEST program is a worthwhile experience, involving both work and a variety of activities.

At first, I was unenthusiastic. I had been chosen to work with a research team in computing science. I was not too thrilled to have to spend a whole summer at a computer. I was hoping to perform experiments and

learn about living things. However, I quickly learned how wrong I was. Not only was it great working in the algorithms lab and an atrium filled with interesting people, but I also had flexible hours and no restricting dress code. My first project was to help Artificial Intelligence play the game of hex, a strategy game, almost as well as a human. The first few days were spent acquainting myself with hex and playing against opponents. Next I started an additional project about and-or trees. In this project, I was able to use my math skills and learn about algorithms. I also used a computer to further research these pathway problems with more ease and simultaneously learned several basics in programming. Furthermore, as if I did not have enough variety, I was given another project about coin-graphs, graphs with tangent vertices. Again, I was able to apply my math skills and learn about a variety of graphs from my supervisor. Both the and-or trees and the coin-graphs have been little researched so the information I gathered was of actual importance. Rather than discovering known facts, I was finding new information and making a real contribution!

In addition to work, there are many fun elements involved in this program. We visited sites in the city not related specifically to our field but based around research, science and engineering. First, we toured the University of Alberta, which I know will be helpful for trying to find my way there in the future. Then we got to see research in action by either visiting the Edmonton Waste Management Facility or the Centre for Engineering Research (C-FER). Although I chose the Waste Management Facility, from first hand information and from others I heard that both tours were interesting. Then I had a chance to personally talk to many women in science, technology and engineering in the small group discussions. It was interesting to see the variety of advice given by the volunteers, not only encompassing the jobs within these fields but also about life in general. In addition, IBM set up a workshop where we not only got complimentary food, free pens and got to colour, but also worked with women in technology designing a web site. Finally, we received an on-campus tour of research labs and I observed experienced workers etch using nanotechnology!

Then there were the interactive activities outside of work hours. Probably one of the best parts of WISEST is the many students you meet whose interests are similar to yours. I have met so many interesting people in this program and solidified some developing friendships. The lunches with the bunch introduced me to many people and I learned about not only what research is like in computing science but also in other fields of interest. From them I saw that as long as you have a good research team, research is interesting and satisfactory in any field. The many graduates I worked with and who contributed their time to helping me with my projects and my supervisors, Dr. Ryan Hayward, Jim Nastos, Magdalena Jankowska and Micheal Malloy all created a fun atmosphere. Magda and Micheal were so helpful and Ryan and Jim made me feel at ease with their limitless supply of jokes. These people made the WISEST Summer Research Program worthwhile. Though I enjoyed the program for the knowledge I gained, I feel that it is not what you do or contribute that is the most important but whom you meet. In WISEST, I made many valuable connections and met amazing people.



"This program has been a great experience and I feel I have spent my summer well."

Mary Hudson

WISEST Supervisor: Dr. James Cahill, Dept. Biological Sciences
Sponsor: Alberta Ministry of Innovation and Science

Of all the things I thought I would gain from my experience in the 2003 WISEST Summer Research Program, recurring nightmares were not included. This was before I learnt what the term 'vegetation sorting' meant.

Upon orientation day at the beginning of July, I was surprised to find out what I would really be doing for the majority of my summer. At first I was intimidated by the thought of working in a University research lab, but after arriving, I felt quite relieved. Dr. James Cahill (JC), my supervisor, showed me to his botany lab in the Biological Sciences building. JC briefly explained a possible research topic he thought would be suitable for my project. At this point, I understood only half the words he said, but was quick to agree with everything. I soon learnt this was not the best method to truly understanding a subject.

At the end of the first day, I was put to work at nothing less than 'vegetation sorting'. Vegetation sorting, also known as hell, involves a paper bag full of grassland clippings and a pair of tweezers. The process is this: you sort through the bag of vegetation, primarily grasses, separating the litter (brown, dead matter) from the living (green). If you are really lucky, as I was, you may then sort the living matter into each individual species. All of these species must then be put into their own envelopes, which you have previously labelled according to the species' Latin name. These samples will later be weighed for biomass data, or any number of other fun processes.

This is when I was introduced to Bryon, an undergraduate student working with JC for the summer, and Malcolm, a grad student, working on his Master's degree. To some, such as Malcolm, the process of veg. sorting can be quite meditative. To others, however, who shall remain nameless, the task is the 'grunt' work that nobody wants to do, but which needs to be done. I soon found much of the work taking place in the lab was of this variety and really looked forward to my first trip into the field.

Field work for JC's lab is set up at the University of Alberta Ranch, Kinsella, Alberta. Working and living in the field is not always what people expect it to be. We did not sleep under the stars, with the deer and grasshoppers; instead we slept in trailers with the mice and black flies. It is hard to work out in the field with only one DVD player to entertain you. I do not overlook the fact that exhaustion happens easily, especially for some members of my lab team who would work twelve hour days in 36°C weather. Rain pouring down on their heads was a great relief (I hated it). Out in the field, I met more of JC's team. I was able to help Eric and Angela with their data collection, and I met Danielle, as well as Nadeesha, with whom I spent much of my time working with this summer. The remaining members of JC's lab team, who I met the next week, were Steve, a PhD student, and Kelley, an undergrad working in the lab for the summer.

Soon I was able to collect my own samples in the field

– not just the grad students' – to help with my research. My topic was to find out why *Chenopodium album*, a weedy plant was heterogeneously distributed around the Kinsella fields. This meant to find out why the plant only grew in patches. I examined two fields, looking at the amount of cover of the *Chenopodium*, as well as at the plant species diversity, and seed bank soil samples. I was able to count the number of species found within a 50x50 cm plot in relation to the *C. album* density. I also took seed bank samples by digging up a 10 cm diameter soil core using a knife. My conclusions were interesting, long, and wordy.

I loved working in a lab for the summer of 2003, the environment was relaxed and positive, and I appreciate the help of all my co-workers. I now can find my way to many campus buildings, and understand many new, helpful computer programs. Each person in my lab helped me along the way, and special thanks to James Cahill, with everything, Steve Kembel and Eric Lamb, without whom, my research poster would never have been finished, and Nadeesha Fernando, and Kelley Dunfield, who made working in the lab so much fun. I never broke a single piece of glassware, only one industrial blender.

Meaghan McKenzie

WISEST Supervisor: Dr. William McCaffrey, Dept. Chemical & Materials Engineering
Sponsor: Weyerhaeuser

When I first applied for the WISEST Summer Research Program, I thought that I'd be doing all the work that the other researchers didn't have time to do, or didn't want to do. You know, the odd job here and there, nothing that would really contribute to actual research. Little did I know, the project would be one in which I could actively participate, producing results that would help the researchers in their work. I was placed in a lab in the Chemical and Materials Engineering building. Although the work started off slow, my new supervisors, Dr. W. McCaffrey and Andrée Koenig always made sure that I had enough to do.

The main project that I worked on during the summer involved the long process of preparing and setting up a bioreactor, and measuring certain values produced during the reaction. Immobilized yeast cells (entrapped in a calcium alginate gel) were used as the catalyst, and a dextrose solution as the substrate. The reaction itself, taking place in an anaerobic environment, converted the sugar into more yeast cells (biomass), ethanol and carbon dioxide.

Although the cells were held in a bead like form, many cells escaped into the circulating broth in the bioreactor, and it was one of my jobs to measure the amount of cells lost to this liquid. After sampling the growth medium at the beginning and at several times throughout reaction, I formed a dilution series (a succession of samples that are gradually more dilute in yeast cell concentration) for each sample. I tested each of these dilutions by spreading 1 mL of the fluid onto agar plates, then waited for the individual cell colonies to grow. After a few days, I chose the plates that contained between 50 to 200 colonies, and proceeded to count those colonies. I used this number to determine the number of

colony forming units (CFUs) in that dilution. By extrapolation, this number can in turn be used to calculate the number of CFUs in the original sample taken from the broth, and in turn the number of viable cells in the broth circulating in the bioreactor[1]. This was valuable in determining the effectiveness of using calcium alginate as an immobilization medium for yeast, and might also bring about new methods to improve its efficiency in this type of reaction.

To determine the efficiency of the reaction itself, we measured the amount of ethanol produced, and the amount of sugar left in the circulating liquid. We took samples of the solution at different times during the reaction, and measured the ethanol level using a gas chromatograph. To measure the sugar concentration, we took the same samples and made a dilute solution of the liquid. Then taking 0.5 mL of the dilution, we added phenol and sulfuric acid to react with the sugar to produce a change in color of the solution to red. Using a spectrophotometer, we measured the absorbance of the mixture at 488nm. Using the calibration, we were able to tell how much sugar was present in the solution at the time the sample was taken, therefore determining how much sugar the yeast cells had consumed.

Even though at the moment this was just "inquisitive" research (reasons, quantities, limiting factors etc.), in the future it might be used as a basis to determine different ways of producing ethanol that would amount to quantities that could be used industrially, such as an alternate fuel source. As well, the values we gained in the research will be used to complete a lab guide that students and other researchers can use to practice or improve this method.

Although the weeks I spent of my summer were very short, I learnt a lot about research through the WISEST Summer Research Program. Even though research itself proved to be almost exactly opposite of what I expected, being often a lot of work for very few results, I enjoyed the experience nonetheless. I was exposed to many areas of science through e-journals, and through friendships established in the other WISEST students. I met professors and students who were as enthusiastic about science as I am, and whose experiences I learnt from, and might eventually base my future decisions on regarding a scientific career. I am extremely grateful for my time on campus, and hopefully I can share my experiences in way that will motivate other people towards more scientific careers.

(Endnotes)

[1] BIOL 230 MICROBIOLOGY LABORATORY MANUAL, Dr. Gary E. Kaiser

Megan Courtney

WISEST Supervisor: Dr. David Sego, Dept. Civil & Environmental Engineering
Sponsors: Faculty of Engineering & Summer Career Placements Program

For the duration of the six weeks I worked on a project within the geo-technical area of civil and environmental engineering with Jessalyn King, another WISEST participant, under Dr. Sego's supervision. I was lucky enough to see more than just one aspect of civil engineering, since we were able to help a few different grad students on projects that they were working on as well as our main project.

My main project, the one that I was most involved in, included working with a new material called sulphur concrete. We were not able to work on this project at first, but after the first week of working on a different project we began helping with the sulphur concrete project. Basically we mixed up different percentages of the three, or sometimes only two, of the compounds sulphur, coke, and flyash; the flyash being the compound that was not always included. After a minimum of 24 hours we would test the strength of the various samples. The first test we did was seismic testing which determined the strength and stiffness of the samples. After the seismic testing was complete we capped the samples with a mixture of sulphur and bottom ash to make sure that all the samples were level before we put them under the hydraulic press. This second test was to help determine the compressive strength of the sulphur concrete. There are hopes that this new compound will be used for a road surface up near Fort MacMurray for use by the oil company Suncor.

For that first week since there was still some uncertainties as to what project we should work on first, we ended up helping grad student, Yuhai Ding, with a sulphur and salt disposal experiment. Basically my job was to test the pH of 24 different samples and record them so that he could try to collect all the data and then decide what the results meant later. Afterwards we helped Dawit Abraha, a grad student, on the sulphur concrete project.

For the lulls in work of our main projects, when we were waiting for samples to harden or if there were some changes that needed to be settled for the process of executing the experiment, we would sometimes go and see if any other grad students needed our help. We were lucky when safety guy, Gerry Cyre, invited us to go out on the field near Devon where we helped clean instruments with Saman, another grad student, for his project on a test site nearly twenty years old. It was definitely interesting to leave the university at nine in the morning and arrive at the Devon site just before ten, where we would soon break off into two groups. I was working with an undergrad, Mathieu Johnson, testing the shifting of the soil using an inclinometer.

Everyone at the labs were very helpful in making sure that we always had all our safety equipment and any other equipment that we needed for the projects that we were working on. It was a great experience to be able to see what kind of research is currently taking place The best feeling was knowing that we were the first people to have tested the particular type of sulphur concrete making it more exciting to be working with a substance that's behaviours was not yet determined. The fact that there was a purpose in helping with the Albertan economy was fascinating to know that the work we were helping with might be used in the future.

The six weeks that I worked in the diverse labs did not actually feel all that much like work. This was mainly because the projects were so interesting to work with and we had the chance to do a variety of different experiments. Similar to most aspects of life what make an experience truly memorable are the people that you meet. In our lab we had a great time working together, although there were those few times when we had a break and laughter was sounded.

Megan Wagner

WISEST Supervisor: Dr. Fiona Bamforth, Dept. Laboratory Medicine & Pathology
Sponsors: Faculty of Medicine & Dentistry and Summer Career Placements Program

The plan for the summer had been to complete Physics 30 in summer school, but that all changed when I was accepted into the WISEST Summer Research Program. I have always been interested in science, especially in areas related to biology. I hoped the WISEST Program would expose me to different careers in the field of science, and maybe I would even find something I really enjoyed. The program has definitely broadened my awareness of future opportunities, but there is such a wide range of choices that I am more confused than ever.

For the duration of the six-weeks, I was situated in the Department of Laboratory Medicine and Pathology, in the University of Alberta Hospital, under the supervision of Dr. Fiona Bamforth. The project I was involved with was the analysis of amino acids using HPLC (High Performance Liquid Chromatography). From what I had recalled from Biology 20, amino acids form proteins, and they did not seem very interesting. At least that was what I thought until I learned why the presence and quantity of amino acids in humans are tested. If a child has an unexplained disease, it could have a metabolic genetic cause, usually an error in the metabolism of small molecules like amino acids. If not diagnosed, these metabolic diseases can cause chronic, usually degenerative, diseases, and can even lead to death. If a young child has unexplained symptoms of illness, a blood or urine sample will be sent to a lab for testing. The sample is run through an HPLC, producing a chromatogram, where the amino acids are displayed by the peaks of the graph. If there is too much or too little of a certain amino acid, then preventative measures can be taken, such as a change in diet, so the child can live a healthy life. I now have a greater appreciation for studies on amino acids.

High Performance Liquid Chromatography is quite complex, but basically involves the separation of the components of a mixture by the transfer between a stationary phase, and a liquid mobile phase. The sample to be tested is dissolved in a solvent, and under high pressure is forced through a column, which contains the stationary phase. Different amino acid are removed from the stationary phase at different times, resulting in different resolutions. The mobile phase carries the amino acids to be derivatized by a chemical, for example, OPA, and then passed through a detector (in this case fluorescence). A chromatogram is produced on the computer, and the amino acids are identified based on their resolution times. The hospital lab uses ion-exchange chromatography, but they are having problems with the baseline and the concentration of amino acids in the chromatogram. For my project, I was aiding Siew Bang Cheng of Research and Development to test out a reversed-phase column, which will be faster at processing samples, and should be more reliable. My first task was to prepare the stock solutions of amino acids by first calculating the mass of each one needed using the desired concentration, known solvent volume, and the molar mass of each amino acid. The exact mass of twenty-two amino acids were measured using a balance, placed into test tubes, and then 10mL of water was added into each test tube using a pipet, to create the solutions. Seven amino acids were randomly selected for analysis, and diluted. The seven samples were run through the HPLC one at a time, so their resolution times could be determined. Then, a mixture of the seven amino acids was analyzed by HPLC. The peaks on the chromatogram were then identified by the similar resolution times that had previously been determined for each amino acid. The experiment is not as simple as it may sound, and is far from complete. Several obstacles were encountered, especially involving the derivatizing agent OPA (o-phthaladehyde). Originally, the amino acids were being derivatized after passing through the column. However, amino acids will not be labeled for detection unless they are charged, and for this to happen, they must be at the proper pH level. When the amino acids entered the detector, they were neutral, and therefore not detected properly. To help correct this problem, Siew Bang decided to use pre-column derivatization, where the OPA is added to the sample three minutes before injection into the HPLC. Results were produced, but Siew Bang will continue to experiment with different derivatizing agents. The project was a great deal of trial and error, but when produced, results are quite rewarding.

The experience I gained from working in a university lab could not be gained from any other job I could get at my age. The first thing I learned when doing research is that there is a lot of waiting, for both equipment to arrive, and then for results. I also got used to doing a fair bit of paper work and data entry into the computer, as well as learning how to conduct a literature search at the Cameron Library. All of the people I have met in the lab were great to work with, and extremely helpful. It was so exciting to work in a hospital environment.

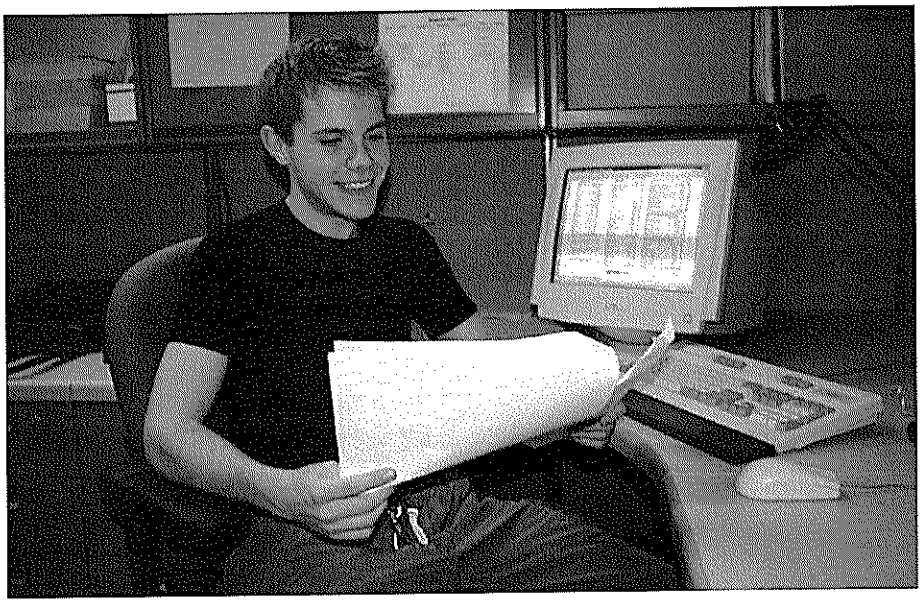
Outside of the laboratory work, the experience with the WISEST Program as a whole was rewarding and fun. The program is so well organized, and included many planned activities that would broaden our knowledge of opportunities available. The Small Group Discussions gave me an idea of what education routes to follow, and what life is like in the "working world". For the On-Campus Research Tours, I was pleased to have visited a Zoology lab, especially since the tour guide has dealt with both human and animal forensic cases, an interest of mine. I have met so many amazing people through the program, and I hope I will see them on campus when I attend university.

The program has been a positive experience that I will not forget. Not only has it exposed me to many career choices, but it has also familiarized me with the university campus.

"Demosthenes, a Greek politician said,
'small opportunities are often the beginning of great enterprises',
and the WISEST Program is certainly one such opportunity that can lead
its participants to remarkable futures."

Michael Woolley

WISEST Supervisor: Dr. Nicole Letourneau, Faculty of Nursing
Sponsor: Alberta Ministry of Innovation and Science



When I first applied for the WISEST Summer Research Program, I was simply looking for a summer job, and though I was excited to be able to work on the university campus, I had absolutely no idea what to expect, or what my job would entail. I arrived on the first day, promptly at 8:45 and walked into the Central Academic Building to find a whole host of other grade eleven-going-on-twelve students. We talked. We mingled. We learned about each other, and our schools, and the cities in which we all live and grew up. As I made my way through the group of people, recognizing only the faces of the two other students from my school who had been accepted into the program, I was only able to address people by their names because of the name tags we all wore around our necks. In addition to our names, however, these tags also proudly displayed which department or faculty each student would be working in.

Civil Engineering. Computing Sciences. Microbiology. Nursing. *Wait a second,* I thought. Nursing?? All these girls get cool and exciting jobs, and I get stuck with nursing? How fair is that? I wanna be able to blow stuff up, or work with robots, or mix chemicals! Even though I had known I would be working in the faculty of nursing for weeks now, it had only just hit me, and I was sorely disappointed.

But the day progressed, ever so slowly, and eventually the time came when I would meet my new coworkers. Rachel and Krista had come all the way from the Extension building that day to pick Adam, my "lab partner," and I up. As we made the long trek back to where our office for the next six weeks would be, we talked and asked questions, excited to finally be able to meet someone who could actually tell us what we were doing. It was then that we learned that it wasn't actually nursing that we would be doing, but rather social support. We would be working at the social support research program, under the supervision of Dr. Letourneau, and with about six other "regular" employees, all of who were at different stages in their academic careers.

Over the next six weeks, I worked on many of the projects that were currently ongoing at the program, and I learned more about the research process than I had ever expected. Beyond the daily rigors of office life, like photocopying and faxing, I assisted the research team in many aspects of the process, and picked up many new skills along the way. The main project on which I found myself working was the homeless youth project. It is a project that, after having interviewed homeless youth and having conducted focus groups, aims to improve the lives of homeless youth around the city by providing weekly group activities not normally available to them. I helped in the recruitment of professional and peer mentors for the youth, compiled a list of possible activities for the groups, did research on various measures and instruments with which the effectiveness of the project could be measured, and even had the chance to develop a workshop of my own creation for the youth.

In addition to the homeless youth project, I also did work with online supports for disabled teens and the "social support as a predictor of adolescents' children's successful development" and "support for women with symptoms of postpartum depression" projects. I've gained invaluable research skills, which I'm sure I will continue to use throughout the rest of my life, and done work on grant and RDC applications, data entry into SPSS, and even some databasing with Microsoft Access.

Now that the summer is drawing to a close it is a time bittersweet to a degree higher than most years because, while I will finally be able to see my school friends on a regular basis once again, I feel that I will be loosing many of the friends that I have made over the summer, in both the WISEST and Social Support Research Programs. But, at the very least, I feel that I have come away from this experience having grown as a person and developed skills in a way such that this summer will always be a highlight in my life, and I will always remember the time I spent here.

Michelle Owokalu
WISEST Supervisors: Dr. Grace Grenadius-Strom & Dr. Peter Mahaffy
Sponsor: GlaxoSmithKline

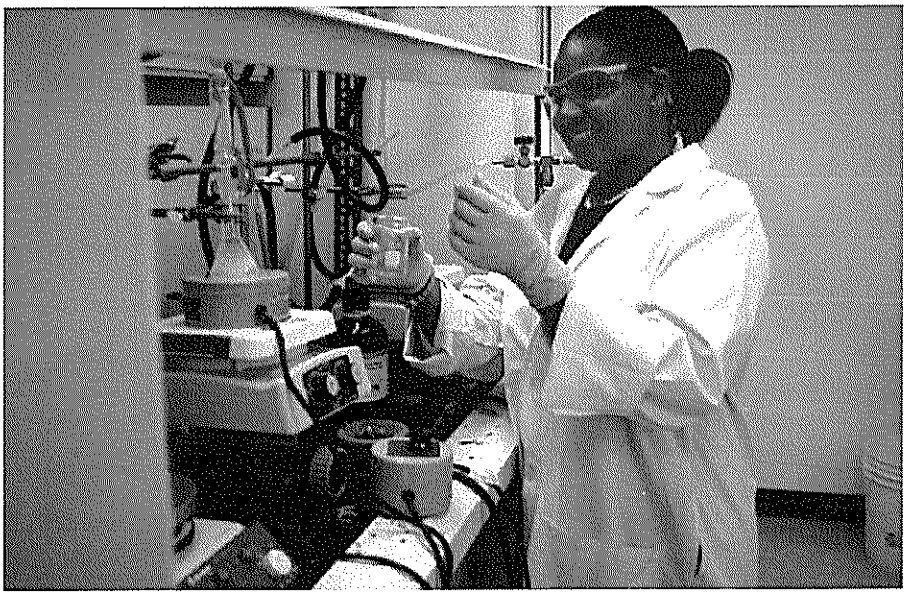
Fun in a Lab at the Kings University College

During the last six weeks, I have worked at the department of chemistry and center for Molecular structure located at the Kings University College in Edmonton, AB. I worked under the supervision of Dr. Peter Mahaffy, Dr. Grace Greidanus-Strom, and several University students on two projects.

My first project consisted of developing techniques for isolating, characterizing and testing biologically active components found in different species of Aloe plants. In other words, I ran bioassays with different types of bacteria and Aloe species to see which species inhibited the growth of bacteria. I tested 4 different bacteria which comprised of E. coli (2 different strains), Basillus Subtilis, and Staphylococcus Aureus on 6

types of aloe: Aloe Vera, Aloe Veriegata, Aloe Grandenditata, Aloe Aculeata, Aloe Brevifolia, and Aloe Dichotoma.

I would load the aloe samples onto thin layer chromatography (TLC) plates using a pipette, and then let that dry for a few minutes. In order for the bacteria to grow I would inoculate it into a nutrient broth and let that sit overnight in an incubator at 36°C. The next morning, a nutrient agar, which when cooled, is like a gel, would be prepared and heated to 50°C and the broth from the day before would be mixed into it. The agar would then be poured onto the plates as thinly as possible, cooled, turned over and placed in the incubator overnight to allow the bacteria to grow on the plate. The following day, the plates would have to be sprayed with a solution that helps us see the bacteria growth and if the aloe plant was a good inhibitor, the section where the sample was loaded onto would have no bacteria growing on it.



My second project involved the creation of pure dinitrile ligands capable of coordination to a transition metal. I worked on a project that a Second year student was in the process of completing and it involved carrying out different reactions that changed the orientation of different chemical structures finally ending up with an ether which would later be used in a Diels Alder reaction. This consisted of working with different chemicals such as ethyl ether, Lithium Aluminum Hydride, and cyclopentadiene. The first reaction I worked on involved the mixture of melted menthol, fumaric acid and p-tdiene sulfuric acid which made dimenthylfumerate. After that, there were many other reactions that took place to add or remove compounds and change the orientation of the structures.

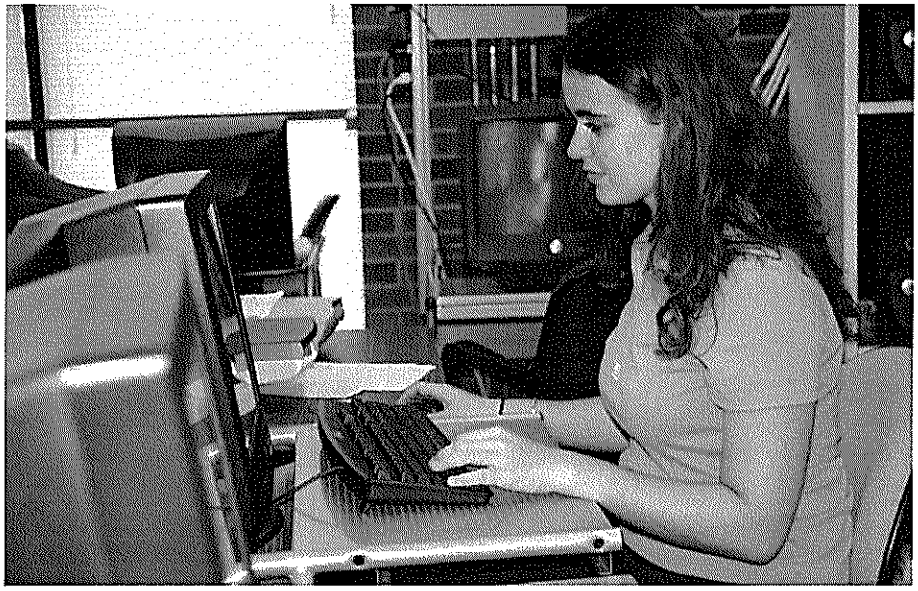
I have learned so much from working in a lab. One thing I learned was that all those weeks of learning stoichiometry in chemistry class really *was* important. I also learned about different chemicals and how to handle them. Before this experience, I never knew working in a lab could be thrilling and challenging. I must say one of the most exciting parts about the lab was finding out the results and when the outcome was good, it made it all the more exciting. Learning to draw different chemical structures was at first a challenge but by the end of the summer I knew a little more than when I started. Working in a lab has definitely given me more confidence in my ability to do experiments and understand different chemicals.

This summer has been a summer to remember because of the friendships that were made with the professors, university students, and other WISEST students. Not only do we get to work in a research lab and learn new things, but we also have fun at the same time. I am extremely glad I had the opportunity to be a part of the WISEST program and greatly appreciate all the hard work this program has done for me and other students.

"This experience has broadened my knowledge on different areas in science research and has made me see the excitement in it. "

Mihaela Carpo

WISEST Supervisor: Dr. Walied Moussa, Dept. Mechanical Engineering
Sponsor: Syncrude Canada Ltd.



In the six weeks that I was involved in the WISEST Summer Research Program at the University of Alberta, I worked under the supervision of Dr. Walied Moussa in the Mechanical Engineering department. When Dr. Moussa was not present, Jon Lueke and Shawn Lywood, both in their last year of university, were there to guide us and answer our questions. The lab specializes in MEMS (Micro Electro Mechanical Systems) and Multiphysics, and it is mainly a computer lab in which computer simulations using ANSYS and MATLAB are run. For my project I had a partner who was also in WISEST, Marta Korz, with whom I interacted throughout the whole six-week period.

My project for the summer involved creating a computer animation to depict one of the applications of Radio Frequency MEMS switches in biomechanics. My partner Marta and I had to learn how to use a program called Blender 2.27, which is used for making three-dimensional objects and animating them to create short films. In the process, we were offered help from Jon and Shawn, and also Nathanael Law, a student at the University of Alberta who is very familiar with the program. It took us about two weeks to become familiar with the many uses of the program. We then continued on to build the different environments needed for the short movie. The animation was to show a patient with a lung disease inhaling an RF MEMS switch, then the switch traveling down his trachea and into his lungs through the bronchial tubes, and eventually getting into the alveoli and to the infected area. The pill then had to be animated after receiving signals in the form of waves from outside the body after someone pressed the switch. The pill would then curl and twist and eventually explode, spreading the medicine only on the area that needed it. We then had to show the disease shrinking and eventually the lung becoming disease free.

Contrary to my initial belief when I first applied to WISEST, my experience was not limited to just the work in the lab. In the course of the six weeks, Jon and Shawn found interesting things for us to do in order to take breaks from sitting at the computer all day. We attended several lectures in the Engineering departments such as Engineering Design and Engineering Management. In the Engineering Design class we sat through a lesson about springs, spring types and spring forces. The Engineering Management class was about managing a business and it was mostly mathematics. It was nice to get a taste of the real university environment in preparation for my first university year.

Marta and I were also given the opportunity to attend the 2003 International Conference on MEMS, NANO, and Smart Systems in Banff between July 20th and July 23rd. The conference was organized by my supervisor, Dr. Walied Moussa, as well as Dr. Badawy from the University of Calgary. It was a great experience that I will never forget given to the amazing people I had the honor of meeting, and the interesting insight into the world of nanotechnology. The conference opened up many doors for me, and it made me aware of different paths that I could take after graduating from the University of Alberta in the research field. I met people from South Korea, Japan, Switzerland, Germany, the United States and some other countries. My job at the conference

was to register all 210 guests and make sure all their questions were answered and they received all of the objects they had paid for. It was very interesting to interact with people from around the world and make myself known to them, seeing as how I could work with them in the future.

My sponsor for the WISEST Summer Research Program was Syncrude Canada Ltd. and, after attending the Banff conference, I was invited, along with Justine Goodkey, to the Syncrude Research Center in Edmonton. I had the opportunity of getting a personalized tour of the facility as well as talking to several employees that were interested in the same field as myself. Dr. Jean Cooley and Mr. Wayne McKee were kind enough to take us both to lunch in the middle of the day. After that, Justine and I extracted oil from sand from the Fort McMurray oil sands. It was a great experience and it is very kind of the company to organize a tour such as this one for the people they sponsor each year.

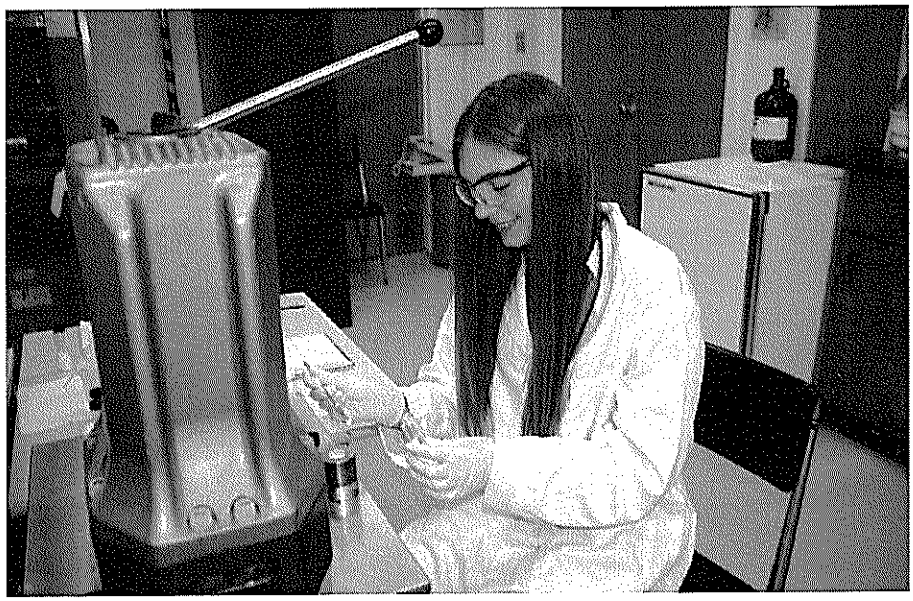
This summer's experience greatly opened my eyes about the many different areas in engineering, science and technology. By talking to students, professors, and the other WISEST students, I was able to better understand what research is all about and how much patience is required. The lectures I attended, the conference in Banff and all of the tours that the WISEST coordinators organized for us all gave me a better perspective on what university life will be like, and what life will be like after I graduate. Also, the program has confirmed to me that Engineering is the field I want to go into when the time comes, and when it does, I will already know students, professors, and everyone from WISEST that will attend the University of Alberta. I feel very grateful for having been given the opportunity to participate in this program, because not only is it the best summer job anyone interested in science could dream of, but it is also a way of meeting new people with common interests, planning your future and having a great time all at once!

Morghain Gibbons

WISEST Supervisor: Dr. Jingli Luo, Dept. Chemical and Materials Engineering
Sponsor: ATCO Gas

For the past six weeks I have been learning all about fuel cell technology in the Department of Chemical and Materials Engineering. The purpose of our research was to prepare a solid electrolyte membrane that maintained its integrity and operated efficiently when H_2S was used as the fuel for the cell under the conditions of high temperature. My lab had been investigating some promising materials for some time, and our objective was to increase the proton conduction of the membranes without deterioration of their strength and chemical resistance.

In principle, the operation of a fuel cell is very similar to that of a battery. However, fuel cells do not run down or require recharging. Batteries store energy by converting electricity into chemical energy that can be converted back into electrical energy when needed. In contrast, a fuel cell converts fuel directly into energy and heat. The electricity entering the batteries has already made this conversion during the combustion of fossil fuels to make the electricity. By omitting these extra conversions, fuel cells are



much more efficient and reduce pollution drastically.

Fuel cells can be so environmentally clean because they run on hydrogen, the simplest element. Their structure consists of an electrolyte with an electrode on either side. Hydrogen fuel is fed into the anode, where it is encouraged by a catalyst to split into an electron and a proton. In proton-conducting electrolytes, the proton passes through the electrolyte while the electron takes a different path that allows the current produced to be utilized. At the cathode end of the cell, the protons and electrons react with oxygen to form water, a most agreeable product.

Unfortunately, while hydrogen is very plentiful, it is never found alone and when it is obtained it is very difficult to store. A great portion of the world's hydrogen is found in organic molecules, combined with carbon and oxygen. While the fuel cells can utilize these sources, and some do run on fuels that range from methanol to gas, carbon dioxide is produced in the reaction. CO_2 is not such a harmful product in itself, but it is one of the major gases contributing to the greenhouse effect, and not so desirable.

In my lab, we are using an even different source of hydrogen. The gas has the appealing odour of rotton eggs, being the substance that makes "sweet" gas wells go "sour". H_2S, one of the most abundant, toxic air pollutants, is produced as a bi-product of the oil and coal industries. When it is used as the fuel in a proton-conducting electrolyte the only theoretical products are be water and pure sulphur, both useful products. In fact, sulphur is a very important material for some industries, and using a fuel cell could become more economical than some of today's refining processes. Fuel cells can get energy out of this unpleasant source while it is turned into a clean beneficial product.

However, if the membrane is not perfect like theory, and somewhat porous allowing H_2S to pass through, other undesirable products like sulphur dioxide can result. The membranes must be gas impermeable, as well as being strong and having a regular homogenous surface and structure. The compound we used was lithium sulphate, a salt that has much potential due to its chemical stability with H_2S and high proton-conductivity. However, while the melting point of Li_2SO_4 (845°C) can withstand the high operating temperatures we needed, the membranes made from the salt were very fragile due to its brittle crystalline structure. We added Al_2O_3, a strong ceramic compound to improve the structure and found that the addition resulted in membranes with improved mechanical and electrical properties. Despite this, our current membranes still have insufficient density and homogeneity, and these defects lead to porosity of the Li_2SO_4 matrix and eventual degradation of the membrane.

To counteract these deficiencies, we set out to determine the perfect ratio of Li_2SO_4 to Al_2O_3 and the optimal procedure to prepare the disks. There are so many different variables that have significant effects on the end result when they are altered during the preparation. These briefly include the ratio, particle size, method of preparing the powder (sol-gel or mechanical mixing), temperature at which the disk is sintered at, the length of time of the sintering, conditions of the heating, humidity, disk size, amount of time and pressure of the press, etc. It is very difficult to control and test each variable, so we have not yet found that ideal membrane and research continues.

So I spent my summer grinding powders when they were needed and using a thirty-ton press to make these little disks, and when they were good enough, getting a peek at them in the microscope. Wisest was an interesting experience; I met a lot of great people who were a lot of fun. I learned a lot about what university is like – I can actually find my way around the campus without getting lost! More importantly, my area really fascinated me, and while I might not be an engineer (who knows?) now I have a nice taste of what it could be like. I really appreciate that experience.

"WISEST was an interesting experience; I met a lot of great people who were a lot of fun.
I learned a lot about what university is like –
I can actually find my way around the campus without getting lost!"

Nicole Bergen

WISEST Supervisor: Dr. Andrew Simmonds, Dept. Cell Biology
Sponsors: Faculty of Medicine & Dentistry and Summer Career Placements Program

This summer I had the opportunity to work in the Medical Sciences Building with Dr. Andrew Simmonds and his research team from the Department of Cell Biology. Much of the research being done in the lab involves *Drosophila* (fruit fly), and how changes in RNA and protein movement within the cell affect cell growth and differentiation. Findings in this area could one day contribute to the discovery of cures for major diseases such as cancer.

My assignment in the lab involved the testing of antibodies on fruit flies. The antibodies that I experimented with had been taken from rabbits and mice. They were made by exposing the rabbit or mouse to a basic human protein found in the endoplasmic reticulum of the cell. The basis of my project was to determine whether the antibodies coded for human proteins would recognize similar proteins in the larva and pupa of fruit flies.

Western Blotting, a multi-step procedure, was used to assess the antibodies. This process involves setting up a gel, inserting a control stain, larva samples, and pupa samples into the gel, and running an electrical current through it to separate the proteins based on weight. Once this is complete, the protein bands are transferred from the gel to a paper membrane. The membrane is then washed in several solutions, including the primary antibody being tested, a secondary antibody that will attach to the primary antibody, and a solution of chemicals that illuminate the secondary antibody. At this point, the membrane can be exposed to film to reveal whether or not a band is visible. If no band is detected on the film, it either means that the antibody failed to recognize the fruit fly protein or that the concentration of the antibody must be adjusted. In the same manner, if the image on the film is too bright and a band cannot be seen clearly the concentrations of the antibodies must be altered accordingly. The distinguishable presence of a band indicates that the antibody has successfully recognized the protein. The data obtained from these tests will be valuable to members of the research team when they use these antibodies to mark the location of proteins within the endoplasmic reticulum of the fruit fly. For example, I used the antibodies to stain embryos of various ages in order to indicate the location of the proteins and detect changes throughout their development.

My experience as an employee in a research lab has certainly been a worthwhile experience. I have expanded my knowledge of laboratory practices, science and university in general. The basic skills and experience that I have acquired from working in a lab will prove to be a valuable tool in the future. I am now capable of operating some lab equipment and have experience carrying out several laboratory procedures. I also have a more complete understanding of what it means to belong to a research team, as I have partaken in routine events such as lab meetings. After several conversations with the professor and university students working in my lab I have gained a much better

insight of what to expect when I attend university.

Overall, I have enjoyed my six-week WISEST experience. Through the WISEST program I have had the opportunity to meet new friends, familiarize myself with the University of Alberta campus, and have a great time! The WISEST program encompasses high school students from different parts of the province and, while to know some of them, I discovered a great deal about life in various environments and was fascinated by their diverse interests and goals. Additionally, the insight into science that I have gained through events and activities organized by WISEST has opened my mind to some of the numerous possibilities of the field. These events have also helped me to acquaint myself with the campus. All in all, the WISEST program is an incredible experience, which I am grateful to have had the opportunity to participate in.

Ninada Ganta

WISEST Supervisor: Dr. Brian Fleck, Dept. Mechanical Engineering
Sponsor: Suncor Energy Foundation

During my participation in the WISEST Summer Research Program, I had the opportunity to work in the Department of Mechanical Engineering. Though Dr. Brian Fleck was my supervisor, I was given the chance to work with a variety of different people, such as those in Mr. Mark Ackerman's lab, grad students and other summer students on numerous projects. I even had the chance to work with Dominique Koenig, who was a WISEST student in 2002, which really made it easier to get started and helped me to feel comfortable with this whole experience.

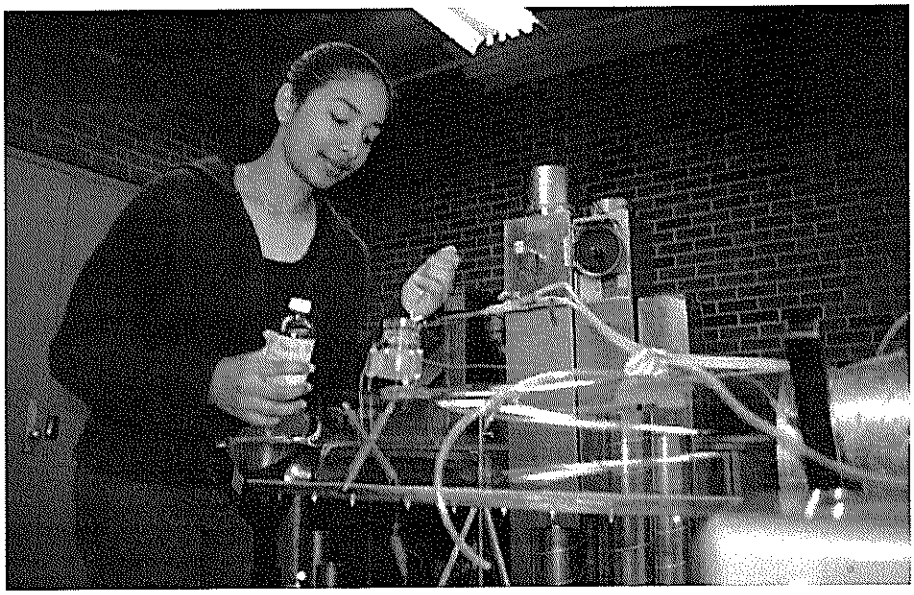
For the duration of WISEST, I worked on various projects, though we mainly focused on accuracy of VAV (variable air volume) box airflow arrays in non-ideal duct configurations. I worked with a grad student, Wayne Klaczec, for whom this had been an ongoing project. This project funded by both the University of Alberta as well as ASHRAE, tested common VAV airflow sensors in poor duct geometry, in the hopes of improving accuracy. The different tests that were conducted, allowed for more precise results, ultimately leading to a better founded conclusion. This project was really interesting as I got a lot of hands on experience.

There were many ways to go about completing this project, which is why data was collected from so many different sources. By using two different brands of 6", 8", and 10" VAV terminals along with different duct lengths before the VAV terminals, we were able to recreate several non-ideal duct configurations. As tests had been set up in the Timms Center for the Arts, we were able to reconstruct the worst setups in the lab, which helped with identifying many of the problems. We even started a smoke wire project to allow us to photograph the way air flows around the VAV airflow sensors. This was accomplished by setting up a clear duct structure with the same airflow sensors and sending mineral oil down a thin wire. This would then be heated producing smoke in evenly spaced streams, going through the sensor, allowing us to observe the activity. This project, so far, has led to the conclusion that field calibration is necessary to produce accurate readings in the airflow sensors.

Throughout my time in the Department of Mechanical Engineering, I gained work experience in a lab environment, which has led to my new outlook on the area of scientific research. This summer job was not just about observing or shadowing others in their day to day work, it was about getting first hand experience working on a project. Having just completed grade eleven I felt that it was time I seriously considered my career options, and though I had decided that science was my area of interest, I still could not decide on a path that I would like to continue on. I had given engineering some thought as a possible career, though I had some reservations as I felt it might not be as exciting as I had first thought it was. However, my experiences showed me that mechanical engineering is definitely a career that I could see myself having, and more importantly enjoying.

Engineering, as I recently learned is such a vast field leading to so many specific career options, that I found it hard to decide on what particular kind I would like to pursue. Thanks to WISEST I got the chance to actually experience and explore my own interests in the field of science. I learned about how research is done, the ups and the downs, having everything possible go wrong, and the immense satisfaction that goes with accomplishing your goals.

Though this was a job, these were some of the best summer holidays I've had, as the people I had the opportunity to work with and learn from made work something that I looked forward to everyday and will miss. By talking to them and learning about their experiences in the engineering and research area I learned a great deal about what it takes to pursue engineering. The people in the labs I worked with were so much fun and I loved working with them. Thank-you guys! This program and its experiences are something that I will take with me, as they have taught me about science, engineering, research, as well as helped me with my decisions regarding my career options.



Rene Lee

WISEST Supervisor: Dr. Linda Hall, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Ministry of Innovation and Science

This summer, I had the opportunity to work in the Department of Agriculture with Dr. Linda Hall and her research team. Going into this program, I had no idea what to expect. I heard formidable comments and appraisal from teachers and Wisest alumni about the program in general. However, being placed at the university research farm, I didn't know if I should be expecting lab work or farm work. Being raised in a city, I knew I wouldn't be able to stand getting dirt in my nails or standing under the sun the whole day. This experience toughened me up and gave me a different outlook on scientific research.

Working in the crop diversification unit, Dr. Halls' research team conducted several experiments looking at everything from herbicide resistant crops to transgenic plants. Suddenly, my day became solely dependent on the weather. We only managed the crops in pleasant weather conditions, and stayed inside when it was either too hot or too wet. Everyday I went to the research farm not knowing what the team had in store for me. Although I had one project to focus on, I helped the other team members whenever they needed a hand most of the time. Work hours were very similar to school, but the spontaneity of each day sparked interest and curiosity. Some tasks throughout the 6 weeks included: pulling weeds, staking flags, measuring wheat height, cutting biomass samples, weighing biomass samples, learning about weeds, and taking coffee breaks! I became a frequent customer of Tim Horton's iced cappuccino, 7Eleven slurpies, and chocolate chip cookies. I was introduced to several research farms in and out of town including one in Ellerslie, Lacombe, and north side. I discovered that the world of agricultural research has its own terms, routines, and even discussion topics. I heard about spraying herbicides at 5 in the morning, specific types of weeds growing out of control, and words like forage, combine, agronomy, and Alberta Agriculture.

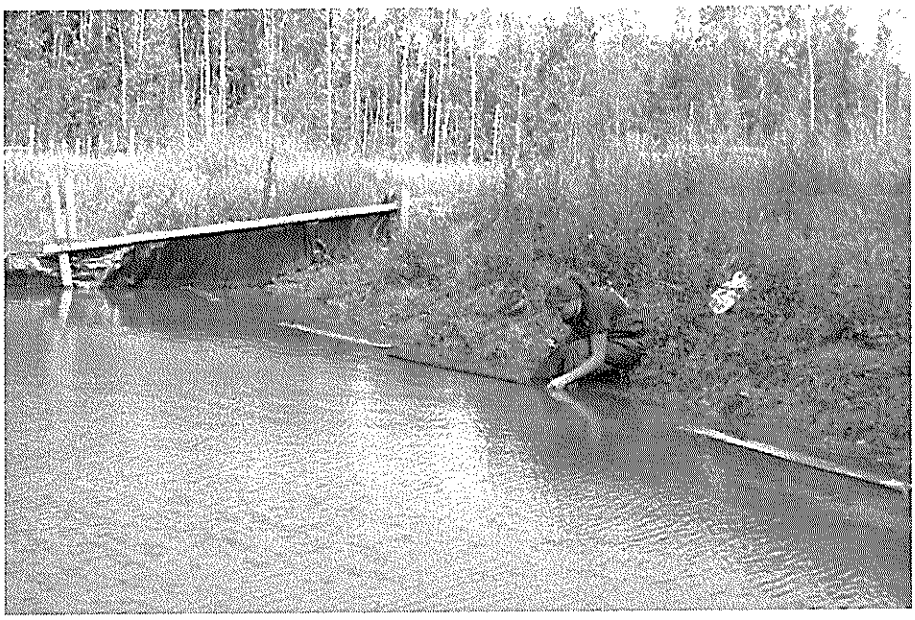
The project I primarily focused on with Dr. Hall's masters student, Marc McPherson, was the study of transgenic safflower plants. A variety of safflower (Carthamus tinctorius) has been generated with resistance to the herbicide Liberty (glufosinate) and the ability to produce a plant made pharmaceutical. Using the oleosin fusion protein system, it may be able to encode proteins of interest. There are environmental and agronomic risks associated with the cultivation of transgenic plants We directed our research towards admixture and the potential of seed banks generated from seed loss during harvest. Therefore, we looked at seed dormancy and persistency of these seeds in transgenic plants. This project consisted of burying nylon sacks containing approx. 200 seeds at 3 different depths. The burial depths were replicated and randomized in each site, Ellerslie and Lethbridge. Sacks containing transgenic and wild type seed were paired for each extraction. Extractions are performed once a month over the course of 2 years. For the July extraction, we removed a pair of sacks from each plot at both sites and took it to the lab for seed viability testing. This included counting the number of germinated plants, seed coats, and seeds. After placing the seeds in a container with a fungicide chemical for 5 days, we again counted the number of germinated seeds. For the other seeds, we cut them open and placed it in a petri dish with tetrazoleum solution. Respiring cells will react with the solution and stain the paper in the dish bright pink. All these steps were taken in order to discover the proportion of viable seeds between transgenic and wild type plants over time.

Over the 6 weeks working with Dr. Linda Hall's research team, I learned about agricultural research and gained an experience of a lifetime. I got the chance to work in the lab, in the office, and enjoy the sunshine. Before going into this, I never knew agriculture required so much science! Like in every scientific area, agriculture is a growing and changing field with much research to improve and make efficient farming techniques, crop productivity, and discover new ways to utilize plants. Weeds alone is a field of study by itself. This program enabled me to explore a new field of science I've never experienced before, and this exposure will definitely ease career pathway decisions. Not only did I make money while learning, I formed new friendships and got a nice tan!

Rhiannon Edwards

WISEST Supervisor: Dr. Bill Tonn, Meanook Biological Research Station
Sponsors: Faculty of Science & Summer Career Placements Program

During my six week work experience with the WISEST Summer Research Program, I was working at the Meanook Biological Research Station with graduate student Jeff Divino under the supervision if Dr. Bill Tonn. As well as myself, Celeste Taylor and Inka Lusebrink were working as assistants for Jeff. The project focused on the ecology and life history traits of a type of fresh water fish common in boreal Alberta – the fathead minnow. The focus of the main investigation is to determine how reproductive timing affects over-winter survivorship of fathead minnows and their offspring. Another project I assisted in was to determine any possible maternal effects on young of the year. The main project was centred on experimental ponds built in the spring, and the maternal effects investigation took place in large tanks in the pond area.



The design of the survivorship investigation was to simulate different winter lengths and the natural occurrence of seasonal ecological differences. One group of fish stocked into one half of each pond were encouraged to reproduce early on in the season, while the group of fish in the other pond halves were kept from reproducing for three weeks at the beginning of the season, just as some years ice cover on a lake remains for a longer time than other years. The first group of stocked fish began spawning relatively shortly after being held in aquariums and stocked into the ponds, and continued to spawn for about four weeks. The other group of fish, however, began spawning only two days after the stocking date, and only continued to do so for about three weeks. As the fish were laying eggs, it was our job to monitor the rate at which they did so, which included counting every egg mass daily. Some observations that were made were that the fish stocked later in the season tended to have larger masses for shorter periods of time, and that the eggs themselves hatched in a shorter period of time. After the young of the year had hatched, we then had to monitor their growth, in order to see if there were any differences in the rate at which the offspring of the fish stocked at different times grew. In addition, after the winter months, the young of the year will be measured again in order to determine any differences in survivorship of the two pond halves. The project is ongoing, and no conclusive data has yet been obtained, but the results will most likely reveal a reproductive strategy of the fathead minnows.

The other project separated large and small female minnows in tanks, and the eggs and offspring were collected and kept separate in different tanks. The study will show whether or not maternal effects can increase rate of survival for the offspring; in other words, if a larger female will produce young that are larger and grow at a faster rate, therefore increasing their chances of survival. The project will hopefully assist further research into reducing the effects of winterkill, which is the serious reduction in a population due to the depleted amount of dissolved oxygen in lakes that occurs because of long periods of lake ice cover. Information from this project may be helpful in trying to keep populations of fish in lakes and ponds throughout boreal Alberta high.

I am very grateful for being given the chance to work with the WISEST Summer Research Program, as I was able to see many other women working in non-traditional roles in the field of science, and it helped me to make decisions about my academic future. Working at the Meanook Biological Research Station gave me an opportunity to experience field biological research. Not only was I assisting with everyday tasks, but also I was welcomed onto the research team and accepted as a member with a valuable opinion. I got the opportunity to work with strongly oriented men and women in a field that I would like to pursue.

"Not only was I assisting with everyday tasks,
but also I was welcomed onto the research team and accepted
as a member with a valuable opinion."

Roshini Nair

WISEST Supervisor: Dr. Sylvie Quideau, Dept. Renewable Resources
Sponsors: Faculty Agriculture, Forestry, and Home Economics & STEP

I was given a position in Renewable Resources during the WISEST Summer Research Program. I dealt with the sciences of soil in the shiny, green Earth Sciences Building which many of you admired (he, he) when you arrived at Parking Lot E for our Weekly Wednesday Field Trips. Yes, yes, I actually worked in that building. Anyway, the real reason why I had a good summer had to be because of all the brilliant people I worked with. My main supervisors were Kirsten Hannam, a graduate student, and my professor, Dr. Sylvie Quideau. During the summer, I also worked with Xin Zhang, Lucie Jerabkova, Roxanne McMillan, Jennifer Pichach, and Oxana Biryukova. Each of them has their own project and I was thrilled to be of some help to them! Thanks!

My project dealt with the pH of soil. Contrary to my earlier beliefs, soil pH is a hugely important component of the growth of living things. All the samples I worked with came from EMEND, which stands for Ecosystem Management by Emulating Natural Disturbance. EMEND is a research site located northwest of Peace River, designed essentially to study the effects of clear-cutting and burning on different types of forest. The world is growing increasingly dependent on the forests for resources and studying different factors can help us preserve what is left and still obtain the required resources. Some of these situations studied can affect the pH of the soil, which in turn affects what organisms and plants can grow there. I received samples from all over the site (thanks Lucie!) and my job was to measure the pH of the samples and interpret the data, or at least try to interpret the data...with Kirsten's help!

Now you may be thinking I spent an entire summer fiddling with those lovely goldenrod-colored pH papers, spending equal amounts of time trying to detect the difference between a lime and emerald green on their guides as I did on the actual litmus paper. Well, thankfully, I didn't. Instead I was privileged to have been able to use the digital pH meter, the *brand new* digital pH meter! Consisting of an electrode, digital pH calculator and plenty of buffer fluid, this handy-dandy meter was my partner in research. To prepare the soil to be tested, I had to create a calcium chloride solution and add 20mL to each sample. This basically "mops up" the extra hydrogen ions in the soil in the duration of an hour and then I was able to measure and record an accurate pH. I went through about 360 samples of soil through the course of the summer. I participated in many other experiments in addition to my main project work including extracting water from soil with Oxana, separating soil particles into silt and sand with Xin, working with many plant species and I even took a field trip with Jennifer to Ellerslie to grind huge soil samples in a big machine. I loved working in the lab. Everyone on my lab team was extremely nice and very helpful. I'll miss all the great country music and eating jackfruit at lunchtime. I'll miss meeting so many people from different countries and chatting about everybody's hometown or home-country. I've realized I need a lot more practice talking French although I tried my best talking à français to Dr.Sylvie. I think I may have also developed quite an affinity with soil...it truly is impressive stuff! It was a great atmosphere which made even washing beakers

enjoyable! I had a perfect summer working with everyone.

I have to mention that WISEST was so much fun in part because I stayed in Residence and living with all those other out-of-towners was a great experience! I've made a ton of new friends and I can't thank everyone enough for putting up with my antics (ex. the gala). It's been great fun so thank you, WISEST, for a magnificently terrific summer and I still can't believe I got accepted! I can't wait to see all you super-smart people in University. I see that we are headed for great things...

Saleem Al-Nuaimi

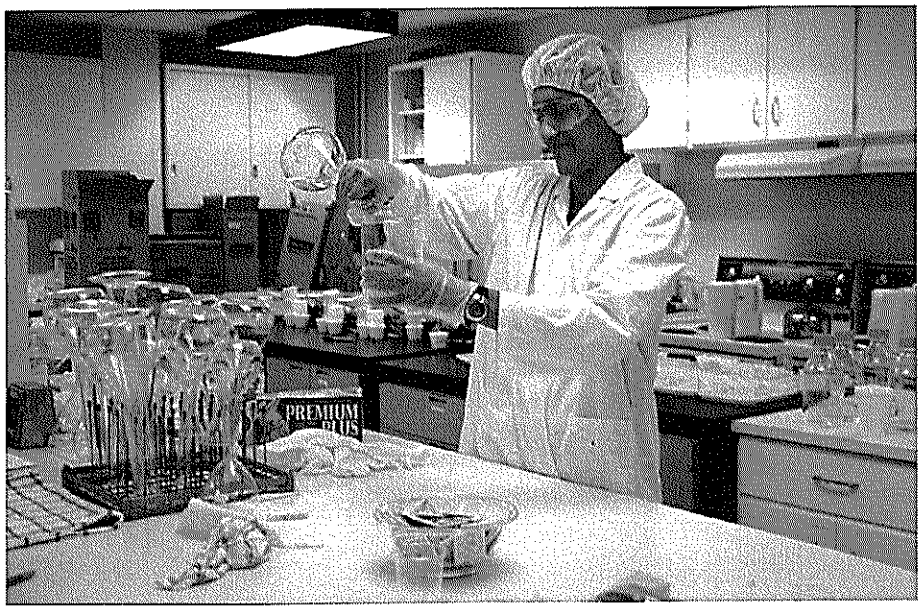
WISEST Supervisor: Dr. Wendy Wismer, Dept. Agricultural, Food & Nutritional Science
Sponsor: Alberta Heritage Foundation for Medical Research

During the fascinating six weeks in the WISEST Program, I was somehow mysteriously placed in Agriculture, Food, and Nutritional Science. However, I thank this fate since it was a pleasure to work with my supervisor, Dr. Wendy Wismer and her research team. I did not work directly with her, but I aided two graduate students with their interesting projects.

The primary project I worked on was aiding Kenton Delisle's (a graduate student) research regarding the chemo-sensitivity of seniors (taste and smell perception). This research is vital in understanding the food choices and preferences seniors are making today and how that relates to their nutritional status. So, my research team and I visited many senior facilities in Edmonton to conduct the research, consisting of: paper work, threshold testing, and taste preference.

The paper work contains consent forms, information sheets, questionnaires, threshold and taste preference testing sheets. Therefore, somebody (like me) had to put all this paper together into a package. At the senior facility, Kenton introduces and explains the research in a brief presentation. Once all the consent forms are complete, the seniors can either complete the questionnaire (determines the senior's self-perceived chemo-sensitivity capability), or head on to the threshold or taste preference testing stations.

To prepare for threshold testing, I conducted a serial dilution, creating a stock solution of sucrose at 600 mMol and I diluted that eight times, by a factor of 2.2. Once all eight sucrose solutions are complete, I poured them into 30 mL cups, labeled from 1A/1B (least sucrose concentration) to 8A/8B (initial stock solution). However, only one cup out of the A/B has the sucrose solution, while the other has distilled water. A salt series was also identically created and conducted, except I diluted the stock solution by a factor of 2.5. The seniors basically swish a sample in their mouth, spit it out and try the next one to detect which sample, A or B contains the solute (rinsing with distilled water before and after each sample). Once the participant achieves three consecutive correct detections, their threshold level is determined.



Finally, I made ice tea and tomato juice to conduct the taste preference section. I added two Red Rose® tea

bags to a litre of boiling water and let them sit for six minutes. Once I made four batches of tea, I added different concentrations of sucrose, starting at 5% (50g of sucrose/L of ice tea), then 8%, 11% and finally 14%. I also basically poured four batches of 1 L Heinz Tomato Juice® and added the required salt concentration, starting at 0.252% (no salt added, is the concentration of the Heinz Tomato Juice®), 1.002%, 1.752% and finally 2.502%. When the seniors taste the samples (of course rinsing with distilled water), they must rank them from most to least liked, which determine the concentration of solute the senior participant found most pleasant. I had to be very patient to work with the seniors, since everyone knows how they can get "off track". Once all the sheets are gathered from the facility, I marked them and entered them into the computer in order to be used by a statistician for processing.

I also aided a second graduate student, Mike Seibel, in his research of creating a flavor profile for Saskatoon berries. In brief, I basically created many chemical reference standards through dilutions and micro-pipetting to create the required flavors: musty, earthy, sour, sweetness, astringent, grassy, fresh/fruity, almondy, and overall Saskatoon flavor intensity. A Saskatoon berry trained panel was formed in which they tasted different cultivars of the berry and evaluated them in comparison to the reference standard on a line scale. The cultivars were labeled with three-digit codes, to make the identity of the cultivars unknown in order to deter any bias. I also aided in programming the evaluation program, known as Compusense. However, I also conducted pH, colorimeter and refractometer tests on the different cultivars to complete the Saskatoon Berry Flavor profile.

"I had a wonderful experience in the WISEST Program!
It was a great pleasure to work with Dr. Wismer and her research team and
I also thank my sponsor for their generous support of this vital program."

Samantha Wojtkiw

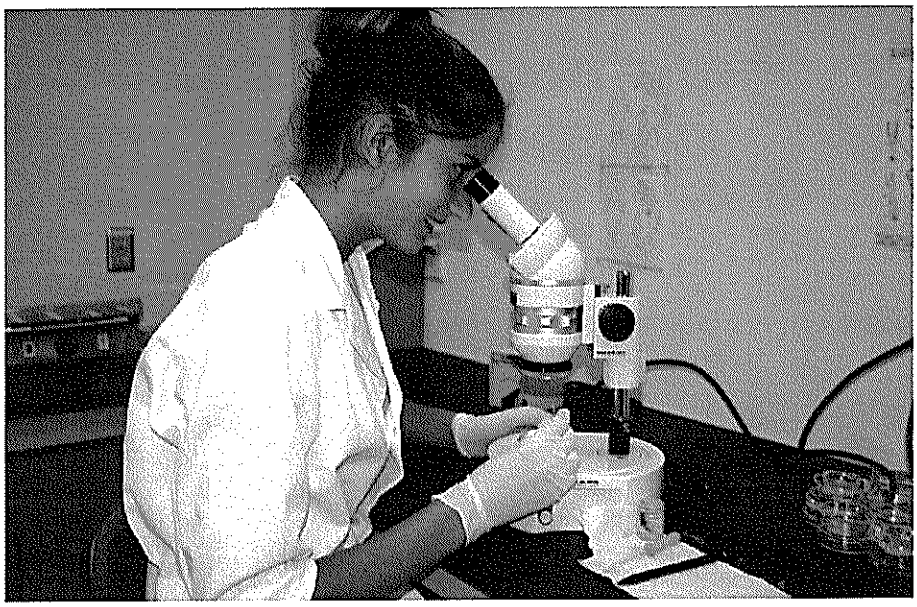
WISEST Supervisor: Dr. Heather Proctor, Dept. Biological Sciences
Sponsor: Alberta Ministry of Innovation and Science

The first six weeks of my summer have been spent helping Dr. Heather Proctor, a zoology professor, in her research lab of the Earth Sciences building at the University of Alberta's campus. Alongside, working hard with me, was my fellow WISEST student, Steph. We were busy conducting a biodiversity study, to find the mites and lice that inhabit the birds of Alberta. Our research will be added to previous and present studies of birds and their parasites.

Each morning we come in and begin to sort, name, and record electronically, and then finally wash the hundreds of dead birds resident in Dr. Proctor's freezers. Although these processes can get a bit smelly, most of the deceased are window-kills, so there is usually not a big mess. The birds then enter a bucket filled with ethanol, soap detergent, and water. Making a "martini" is the next step. Stephanie and I shake the thawed birds for about ten minutes, so the parasites hiding in their feathers come free. After removing the birds from their bath, we drain the water in a very fine sieve, trapping the smallest of the mites, and place the bodies in a rotating barrel of sawdust to dry. We then examine our catches under a microscope, looking for individual mites and lice to separate from the mixture of feathers, dirt, and debris. After placing the chosen insects and arachnids in a dish of lactic acid, we move them onto the heating plates to clear, eager for the next morning to come and make them into microscope slides. This enables us to see important features of the mites and lice, necessary for their identification. We then record every individual parasite and the bird that served as its host.

Throughout our stay at Dr. Proctor's Lab, we were able to assist several other people with their summer jobs. A couple of days were spent, here and there, helping others in the lab organize their projects. We even took a field trip to the Fish and Wildlife Forensic Laboratory. There, not only were we able to pick up more birds to wash, but we had the privilege of receiving a tour of the facility. Several experts on birds

visited Dr. Proctor in her lab, such as a professor from Grant MacEwan College and an instructor who borrowed some birds to teach banding. We were also graced with a surprise visit from John Acorn, also known as "The Nature Nut" from his popular television series.



From participating in the WISEST summer research program, I was able to gain a wide variety of skills that I will be able to use in my future endeavours. Familiarizing myself to a microscope, learning how to make slides, as well as becoming skilled at transferring and recording data, electronically, on spreadsheets will now be on my list of abilities. I am also able to recognize a broader span of Alberta birds, and their family, genus, and species' names have become more recognizable.

The WISEST research program was a wonderful opportunity that I am thankful to have been a part of. I have met many new and interesting people who I hope to keep in touch with even after our time with WISEST is up. Hearing about the various jobs in the wide ranges of labs around (and outside) of campus has provided many inspiring conversations. The discussion with the role models and the lab tours that I have attended have opened my mind and have helped me with several career-related decisions. The world of research is broad and ever expanding and I am grateful to have witnessed this process of study. Merely being on campus, surrounded by graduate students who are always willing to answer even the simplest of questions that I have, is a fantastic situation to be in. Having an encouraging and fun supervisor, or "boss", who loves what she does and is ready to help in whatever way she can, added to the pleasure of having a summer job with WISEST.

Sara Croxford

WISEST Supervisors: Dr. Stan Boutin & Dr. Erin Bayne, Dept. Biological Sciences
Sponsor: Alberta Ministry of Environment

When I first heard about the Women in Scholarship, Engineering, Science and Technology Summer Program, I was sitting in my Biology 20 class. It was a quick announcement right before lunch and my first thought was about how it would be great for my friend who wants to be a pharmacist. At the time I wasn't really interested myself and had no idea if I even wanted a career in the sciences. I got applications for both of us anyway and an information booklet. After reading it through, I realized just how valuable this opportunity would be, not only in gaining work experience, but in helping me to choose a career. I sent in my application and then did all I could do—wait. I was so excited and relieved when I got the call from Tera. She told me all about the kind of things I would be doing at the University and promised I'd have the time of my life; I have.

Over the past six weeks I have been working in the Biological Sciences Department in the Zoology wing. The head of the lab is Dr. Stan Boutin, but my main supervisor was oneanother lab member, Erin Bayne. He gave me a lot of different projects to work on this summer, but they all had to do with one central

objective: to discover the impact of seismic lines on the surrounding environment. Seismic lines are used by geologists and geophysicists as a way to determine if an oil or gas field exists. They send shockwaves into the ground and measure the time it takes the underground rocks to reflect the waves back to the surface. The waves are generated by pounding the earth with a vibrator truck. Oil and gas companies need to make pathways through Alberta's boreal forest to allow these vehicles access, hurting the environment.

My first task to do with these pathways involved working with maps taken of certain townships in northern Alberta. I was working to prove the theory that seismic lines do not grow over, contrary to popular belief. Given a map made in 1978 divided into a numbered grid, I had to randomly select a square find the closest seismic line, and measure a specific distance. The next step got me visiting a place I never thought I would go to or even knew existed, downtown Edmonton's Air Photo Library. I had to take my maps and using the black and white photographs provided, trace the evolution of each line chosen. For example, record what year the line was put in, whether it was turned into a gravel road, railway, or well acccess site, and most importantly, determine if it ever grew over. This may sound relatively easy work, but it was quite tedious as there were many lines in the photos making it hard to tell one from the other, especially if there were no lakes or landmarks around the lines to go on. There were so may townships to do, the other lab members are still working on them, but so far, the data confirms the hypothesis. Seismic lines never fully grow over.

The rest of my work surrounded data entry. I had to enter many different things important to the research including the data collected from the library, data about the types of birds living around the lines using the Geographical Information System, oven bird telemetry data and vegetation data. The last was one of the most interesting as I got to learn most of the Latin names for Alberta's trees and shrubs. The hardest thing was trying to read the field team's writing!

Another exciting experience I had, was being granted the opportunity to see what was going on in the field firsthand. I was taken to the lab's field camp at Steep Bank Lake by Lac La Biche and got to spend two days visiting the camp and meeting all the different people working there. It was an awesome trip! I got to go on a quad for the first time, see the seismic lines and well pads up close, see some neat wildlife and camp through a really frightening thunderstorm. It really has gotten me thinking about a career in environmental conservation.

"Overall, this has been a summer I'll never forget.
It has given me the chance to explore the university campus,
make a few new friends, get to know a few friends better, and understand more about
how even small things can drastically affect our world."

Sarah Brennan

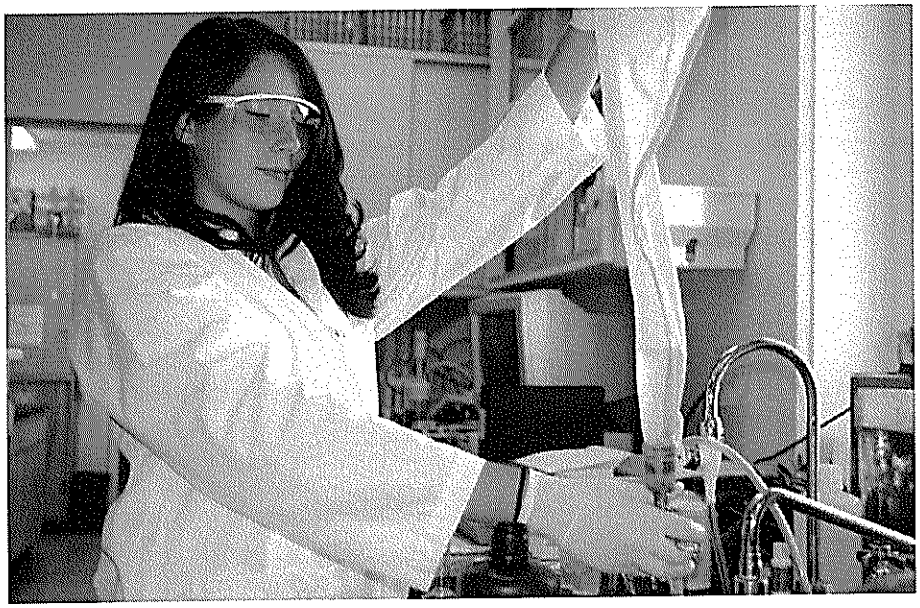
WISEST Supervisor: Dr. Rina Freed, Dept. Biological Sciences
Sponsors: Faculty of Science & Summer Career Placements Program

Throughout the six weeks of the WISEST Summer Research Program I have been working in the limnology lab of the Biological Sciences building under Dr. Dave Schindler. This lab accommodates many different projects, all relating to the study of bodies of fresh water areas such as the many lakes and ponds of Alberta.

The project that I was most directly involved with was headed by Dr. Rina Freed and focused on researching the cumulative effects of development on the water quality of Lac La Biche. To add to the environmental and scientific interest, there are also public concerns about the declining water quality of the lake. The lake is the 7th largest in Alberta, and the community is one of the oldest, though it has a population of only about 2,700. Lac La Biche is an important recreation site, as well as a basis for commercial fishery and the source of drinking water for not only the town of Lac La Biche, but the nearby community of Plamondon as well. In addition, the town also discharges treated sewage into the lake, adding to the already high natural nutrient concentrations. The main objective of the project is to gain a better understanding and to help provide solutions to the water quality problems and other issues that the area is experiencing.

Lac La Biche is located approximately 220 kms northeast of Edmonton, and because much of the project involved work at the lake, I spent nearly half of the six weeks in the field. Often in the field I would be working with summer students as well as Dr. Freed, taking samples at the outflow and inflow streams of the lake, as well as sampling and gathering data from a boat out on the lake itself. This included collecting data from 5 different sites at different locations on the lake, ranging in depth from about 6 to 20 meters. At each of these sites we would collect samples of zooplankton, phytoplankton, diatoms, and integrated water samples at varying depths. The data we collected included the water temperature at each descending meter to the bottom of the lake, and the amount of dissolved oxygen in the water at these depths, as well as measuring the amount of light penetrating into the lake, to help gauge the ability for photosynthesis to occur.

During the six-week program I was also involved in a project led by a grad student, Steph Neufeld, which studies the effects of land use on the quality of water in the streams surrounding Lac La Biche. The work we did involving this project was mostly in the field, taking water samples and gathering data, as well as collecting invertebrates at each of the stream sites. This data was similar to that which we helped to gather with Dr. Freed for her project, and included measuring the velocity and total water flow of the streams at specific points. With Steph we would then take the water samples back to camp, where, like with the lake samples, many needed to be filtered. The invertebrates that we collected we then sorted, live, at the camp, and put into an alcohol solution before being brought back to the lab to be sorted again, this time with the help of microscopes.



I found that by having an opportunity to work in a

scientific laboratory as well as in the field, I got a broader understanding of what the project was about, as well as a good insight into the endeavours of biological research. It was also helpful that I worked on two separate projects that were still related, so I really got to see the whole picture of all the issues being dealt with at Lac La Biche.

The unique opportunity I was given by the WISEST Summer Research Program helped me to broaden my knowledge and understanding of science and research, and how it is applied to real issues that concern not only universities and scientists, but people such as those in the town of Lac La Biche. I am very grateful to WISEST for the experience that I have gained in both a scientific lab and in the field environment. This has been a great hands-on chance for me to explore the numerous careers and research possibilities that science has to offer.

Shannah Sutherland

WISEST Supervisor: Dr. Charlie Hao, Dept. Laboratory Medicine & Pathology
Sponsor: Petro-Canada Community Investment Program

This summer, I spent six weeks working in the University of Alberta's Department of Laboratory Medicine and Pathology. I was lucky enough to be placed in the lab of Dr. Charlie Hao with the direct supervision of Jin Song. Throughout the program I also shared a project directly with a HYRS Student.

When I first came to my lab, my supervisor began handing me piles of research journals that quickly filled an entire binder. I found myself reading for most of my work day and I didn't realize just how much I was learning until I began my research project. At first glimpse of my lab, my project, and my reading I was immediately overwhelmed and taken back by exactly what was expected of me. I kept thinking to myself, "and they want me to do all this in just over a month?!" I was very scared but as soon as I began my project and started working all of my worries and fears drifted away. All those days of reading prepared me for the project that I would be working on and it gave me the necessary background to have a basic understanding of what I would be doing everyday.

Throughout the six weeks, the HYRS student and I worked with six different types of leukemia cells. Our project mainly dealt with the understanding and overcoming resistance of the cells to a drug called TRAIL (tumour necrosis factor-related apoptosis inducing ligand). To do this we completed several different experiments to allow us to fully understand the cells we were working with.

One way we did this was by testing cell death when we treated cells with TRAIL and CPT (a chemotherapy drug) individually and then pretreating another group of cells with CPT for sixteen hours and then proceeding to treat them with TRAIL for various lengths of time. Some experiments that we did were based on trial and error. This made finding excellent results frustrating and very difficult; however, it was always interested to see how the results turned out. Other methods that we used in the lab were time courses,

which meant a lot of incubation time. These gave us a new understanding because we could analyze cell death after twenty-four hours, forty-eight and seventy-two hours while comparing it to our non treated control.

During my time at the lab, I was able to use new equipment and learn new lab techniques that I otherwise would not have been exposed to. In several of my experiments I was able to use machines that normally I would not be able to use and for the most part, it became a daily routine to use equipment such as the centrifuge and the plate reader. While there are many large machines in my lab that I have used everyday, there are also tiny pieces of equipment that I have become accustomed to using, such as the haemocytometer. At first glance, the haemocytometer looks like a mirror placed between two pieces of plastic, but has a much greater purpose; counting cells. For many of my experiments a specific number of cells were needed to carry out the task successfully. On the haemocytometer there is a microscopic grid that when you place under a microscope is visible and shows how many cells there are in approximately one tenth of a micrometer. This instrument makes a daunting task, such as counting individual cells, a little less monotonous.

Throughout these six weeks I have gained valuable skills that will become assets as I continue my education into university. I have developed many laboratory techniques that most grade eleven students have not heard of, let alone experienced. Also, talking with undergrad and graduate students in my lab as well as at WISEST activities (such as the small group discussions) has given me a new outlook on what life is really like at university and what the tasks of researchers, professors and lab technicians is like. As a participant in the WISEST Summer Research program, my eyes have been opened to the endless opportunities available for me, especially in a career in science and technology.

Shelley Ma

WISEST Supervisor: Dr. Margaret-Ann Armour, Dept. Chemistry
Sponsor: Epsilon Chemicals Ltd.

I have been placed in the Department of Chemistry under the much admired Dr. Margaret-Ann Armour and Dr. W. Hunter. I am also working along side another WISEST student Emily Pawluik and the project that we have both been assigned to is the safe disposal of toxic chemicals, specifically, household pesticides and herbicides. Emily and I both started out doing the same experiment to help introduce us to the real project. At first, I was confused because some of the techniques and ideas were completely new to me. But as the project progressed, I began to understand the techniques and logic behind them.

Our first task was to successfully separate benzoic acid, p-chloroaniline and naphthalene from a stock solution. We learned separating techniques such as liquid-liquid extraction, washing, filtering, and crystallizing. To make sure the material we collected in the end were really what we thought they were, we looked up each compounds specific information, such as their appearance and melting points. We then tested each compounds melting point. After we had finished this, we moved on to learning what chromatography was about. We would be using thin layer chromatography (TLC) techniques and the gas chromatography (GC). After all of this preparation, we were then ready to use our newly acquired skills to help us succeed in our real project.

My project specifically deals with the safe breakdown of the herbicides: atrazine, mecoprop and trifluralin. The procedure consists of adding oxidizing agents to the solutions to break them down into other compounds that wouldn't be as harmful to the environment. If successful, these techniques would be useful for ordinary gardeners to help them to destroy any excess waste material that they might have leftover. I first started with atrazine by following a given procedure. First, I would use sodium hypochlorite (household bleach) and stir it with atrazine. I would then extract that atrazine or what was left of it and did a TLC test. This TLC would then be compared with a previously done TLC for pure atrazine dissolved in dichloromethane. The time that the solution was left to stir increased if there was no change in the TLC's.

The same procedure would be done with mecoprop and trifluralin. These experiments did not always go as planned, but luckily, my supervisors were always there to give me constructive input and suggestions to help me overcome the obstacles.

I also had a chance to help out while summer school classes were invited to come into a laboratory to do experiments. There were two groups that had come. One was little elementary students and the other class was an adult class learning English as a second language. They were both a wonderful group to work with. I myself learned how to make nylon, make bakelite and witnessed a fascinating oscillating experiment.

Emily and I have also been invited to the annual barbeque held at Dr. Margaret-Ann Armour's backyard. Close friends and members of the chemistry department staff also attend. Other former WISEST students that have been placed in the department of chemistry under Dr. Margaret-Ann Armour were also invited. There was delicious food served and I met even more wonderful people. I also played my first game of croquet and came in fourth place.

I am so grateful that I have met such wonderful educators and researchers, who are truly intriguing people that come from different backgrounds. I have been given a rare chance to be able to do research and learn about what really goes on with by actually doing hands on work. I would urge anyone and everyone to apply for this once in a life time opportunity.

"Personally, the end of these six weeks only marks a beginning to opened doors that I never would have imagined I had and the experience that I will be leaving with will definitely help me in making my future career choices."

Simran Singh

WISEST Supervisor: Dr. Catherine Field, Dept. Agricultural, Food & Nutritional Science
Sponsor: Faculty Agriculture, Forestry & Home Economics and STEP

I started my experience at the lab on July 3. My normal working hours were from 9 am to 5 pm. I was employed by Dr. Catherine Field but directly supervised by Sue Goruk. The lab I worked in was located in the Faculty of Agriculture, Forestry and Nutrition. My research team is researching how different diets affect the immune system. Pigs and rats are used as models of the human immune system. The animals suckle for three weeks (during which time the mother is fed the control diet) and then they are weaned off abruptly and fed one of 5 high fiber diets for another two weeks. They are then killed and their spleen, mesenteric lymph node, blood and Peyer's patches are removed. These immune tissues are all associated with the immune system in the intestine. Our job was to count the number of cytokines that the

immune cells make when they are stimulated. The cells that mainly produce the cytokines are the T-cells. This was done by doing a series of experiments. My job specifically, was counting only the interluken-10 cytokines found in the spleen and mesenteric lymph nodes. Interluken-10 cytokines are released by T-cells in the blood and are anti-inflammatory (they control swelling). There are many other different types of cytokines. The information that we get from the pigs and rats immune system helps a lot because the aspect of the immune system we are studying closely mirrors that of a human, specifically a new born child. As a baby is being weaned from a mother's milk to food, their risk of getting an illness or infection increases a lot. By studying the rat's and the pig's cytokines, we will be able to tell if a certain high fiber diet may decrease a young babies chances of getting a serious illness. The different high fiber diets that we are testing right now are barley, oatmeal, cellulose (This is the control diet.), HPHV (High Purity High Viscosity beta-glucan) and HPLV (High Purity Low Viscosity beta-glucan). All of these diets vary in their type and content of beta-glucan (dietary fiber).

The procedure to count the IL-10 cytokines is very complicated. We prepare a plate and then add an antibody to it which will attach itself to all the IL-10 cytokines once the samples are added. The plates are then blocked using assay diluent. This step is very important because it makes sure that the antibodies bind only to the IL-10 cytokines. The plate is rinsed and then the samples are added to the plate and are incubated for two hours to allow the cytokines and antibodies to bind. After the incubation period is over, the plate is again rinsed and then working detector is added to detect all the antibodies which have been connected to an IL-10 cytokine. After the plate is rinsed once again, substrate solution is added. This dyes all the IL-10-antibody structures which have been tagged by the working detector. Stop solution is added in the plates to stop anymore reactions and then a machine reads the plates and counts the cells. This assay usually takes a full day to complete. The samples we use have different mitogens (chemicals which cause a cell to divide very quickly) added to them. My samples contained the mitogens lipopolysaccaride, Concanavalin A, or beta-lactoglobulin. Lipopolysaccaride is a stimulant from the bacteria E. coli and stimulates B cells while Concanavalin A (from the Jack Bean) stimulates mostly T cells. Beta-lactoglobulin, on the other hand, is a protein found in cow's milk and stimulates both B cells and T cells. The stimulation of T cells and B cells both have different consequences regarding the IL-10 cytokine.

Stephanie Grundke

WISEST Supervisor: Dr. Heather Proctor, Dept. Biological Sciences
Sponsor: Alberta Ministry of Innovation and Science

A Peek into the World of Entomology

During the summer of 2003, I worked as a WISEST student at the University of Alberta. I was placed into the Biology department, working alongside Dr. Proctor. She specializes in the study of arthropods, especially mites. A very small amount of knowledge is known about this area. That is the purpose of this project: to fill the gap by collecting mites and lice off of the birds available to us.

These birds were collected in various ways. Some were window and road kills, part of museum collections and some came from Fish and Wildlife forensics. My boss was excellent at exposing me to a diversity of experiences. I got to visit the Zoology wing and the Fish and Wildlife Forensic Lab to pick up more birds. Primarily, I tagged each of the birds with a specific number and recorded the information into a spreadsheet. I discovered that we had over 400 specimens in the freezer. These ranged in size from hummingbirds to pelicans.

After that was completed I got to start collecting our data. I chose 11 species of birds for our project. I placed the thawed bird into a bucket, of corresponding size, with 50 mL of ethanol and a few drop of detergent. Then it was filled it with water until the bird was covered with extra space available under it so the mites and lice could fall out with ease. After this was completed, I had to martini, vigorously shake, the bird for 5-10 min. The hummingbirds were not too bad, but the hawks and grebes sure made my arms sore.

After the shaking was all over, I removed the bird and wrapped it in some paper towel to aid the drying process. Next, I strained the bath water through a very fine sieve to catch all the particles that came off of the bird. I collected the residue into a beaker and then into labeled vials, along with 2 drops of lactic acid to prevent evaporation. Once that was completed the wet birds were placed into the bird "dryer". This was a machine that had a barrel full of shavings on a pulley system that rotated it. I placed the wet birds inside of this for about an hour and then they would come out dry, a bit covered with shavings, but nicely dry. Then every few days the shavings would have to be replaced because it was getting too wet to work effectively.

After the vials were allowed to sit for a few days, I screened them for any large mites or lice. If any was found, I removed it from the vials and placed it into 100% lactic acid to remove any air in the specimens and to increase clarity. After a day on the hot plate these "critters" are ready to be mounted. I used mostly PVA to mount. But by the last days I ran out and had to use a substance called Hoyer's. I mounted the mites and lice and placed them on the hot plate to dry so that they could be identified. Heather Proctor, my boss, identified the mites and the lice were sent away to Dr. Terry Galloway at the University of Manitoba

Once the information came back, I started analyzing the data. All the information was checked with published observations to see weather what we found represented a new host-parasite record for Alberta or Canada. Then with the digital camera and a microscope, pictures were taken of the slides for my poster. I played around with them to make them more attractive then went to work creating my poster.

The WISEST program was a very beneficial way to spend summer. I learned a lot about possible careers and meet a lot of new people along the way. I also learned a lot about my self and the sort of things that interest me so that I have a better idea of the things that I like and dislike.

"It was a positive, once-in-a-life-time experience that I will never forget."

Suong Uong

WISEST Supervisor: Dr. Mark Ackerman, Dept. Mechanical Engineering
Sponsors: CIBC and STEP

During the six-weeks of the WISEST Summer Research Program, I certainly learn a great deal about Mechanical Engineering under my supervisor, Mr. Mark Ackerman and along with his research team. As far as I know, most of the projects in our lab are related to evaluating and designing fire resistant clothing and instruments. The purposes of these projects are to determine the energy transfer and the level of damage it does to the skin.

One of most frequent injuries in industries is the second-degree burn, which is caused by fire or hot water spills. The project I am working on is associated with hot water splash. Similarly, the purposes of this project are to establish water resistance and reliability of different fabrics by determining the amount of energy transferred through the fabric when it is in contact with hot water. This procession allows me to calculate at what temperature and time a second-degree burn will occur. First of all, a water heater, connected to plastic tube, is set at a specific temperature such as 60 C to keep the water hot for the experiment. The water then travels via the tube to the valve and is shot straight out to the fabric that is sandwiched by two aluminum frames with an insulated calorimeter at the back. According to what the calorimeter detects, a programmed computer is used to record the temperature and time. Nevertheless, this experiment also involves the use of the program EXCEL to graph the data so we can see the relationship between the severities of the burn and the temperature as well as the time. To make it more interesting, the position of the apparatus (fabric sandwiched by the frames) is tested vertically, horizontally, and is alternated with three different types of fabrics: Epic-fire resistant and water repellant; Nomex Vappo-fire resistant and coated with gortex on the back that allows vapor transmission; Untreated Proban-fire resistant but not water repellant. To further enhance the experiment, we test the difference in energy transfer when the fabric is directly in contact with the calorimeter, and when it is spaced apart by 6mm of air.

Apart from the hot water splash project, I also learn about movie editing. In another words, I import the movie recorded on the camcorder to the computer, and modify the film by adding transitions, music, effects, titles, and remove some scenes that are unnecessary. After the entire modification, I can burn it onto a DVD-R so it can be viewed on DVD players.

Furthermore, I have the opportunity to design some parts for my "Hot Water Splash" project, and to watch it being built in the machine shop. At the same time, I learn about how the different machines function, and even have a chance to operate one by myself. In addition, I learn to solder the various types of thermocouples together. The most unforgettable part of this summer for me is to go out to North of Edmonton to observe a house being burn and the mannequin being lit on fire. The key behind these investigations is to determine the heat flux in the house when it is burning, and to verify the reliability of different fabrics when the mannequin is lit on fire.

Little did I know about engineering at the beginning, but due to WISEST, I am able to gain valuable knowledge in the Engineering areas that I never thought of experiencing at my age. My experience in the lab allows me to understand that Mechanical Engineering deals with designing and innovating new equipments that assist in solving problems around the world such as forest fires. I always think of University as a very intimidating place to be due to it's huge size and my unfamiliarity, yet, just by listening to the stories that people in my lab shared with me, reassure my fear and change my view about the University. Now, I just can't wait until high school is completed so I can quickly head to the University of Alberta and experience the long-term excitement and challenge.

"I have got to say WISEST has not only broaden my perception in the Engineering area, but also inspires my enthusiasm in some other careers. Personally, this summer is one of the most valuable and interesting summers I will never forget."

Tara Booker

WISEST Supervisor: Dr. Cindy Paszkowski, Meanook Biological Research Station
Sponsor: Epsilon Chemicals Ltd.

During my experience with WISEST I lived and worked at the Meanook Biological Research Station, ten minutes south of Athabasca. I was involved in two projects while I was there. In the first one I worked with Kirsten Norris, who is a grad student under Dr. Cindy Paszkowski, on her project. The purpose of the study was to look at the relationship between the wood frog and the northern pike. Two experimental ponds were set up that were each divided into two sections, resulting in four pond sections. They were named 1A, 1B, 2A, and 2B, with four pike placed in both 1B and 2A. Each day two visual surveys were performed in each pond section to look for tadpoles and fish. As well, minnow traps were set for twenty-four hours to catch tadpoles so that they could be measured and weighed, and their development stage was also recorded. The minnow traps also caught invertebrates that were also recorded. About once a week the two pond sections with fish in them, were set with gill nets. A gill net is a fine net that gets stuck behind the gills of a fish. The nets can kill the fish if left in for a long time, so they were only left in for an hour at a time. When we caught the pike we weighed and measured them. We also flushed their stomachs to see what they were eating and if they were eating any of tadpoles. Once the tadpoles metamorphed into frogs, the pit-fall traps were opened. Pit-fall traps are holes dug into the ground with a coffee tin placed into the hole. Rocks to act as a perch for the frogs, a stick so that any small mammals could get out, and wet moss to keep the frogs moist, were set into the traps. These traps were

set up around the frog fencing, which enclosed the ponds. The traps were checked every day along with a ten-minute area search. The frogs were measured, weighed, and then released.

One day I went out into the field with Kirsten to Lac La Biche 100 to check the pit-fall traps out there. It was an hour and a half drive there followed by a quad ride into the bush. It was hot, the bugs were bad, and important things were forgotten back at Meanook, but it was a fun experience that I will never forget.

I was also in charge of the RANA pond. RANA stands for Researching Amphibian Numbers in Alberta. It was a pond enclosed by frog fencing, with 21 pit-fall trap stations set up around the pond. There was an inside and outside trap at each station. Each day I went and checked the traps and maintained their condition. Three different amphibians were caught in the traps: the Wood Frog, the Boreal Chorus Frog, and the Boreal Toad. Each amphibian was measured and weighed. Their location, species, age, sex, and whether or not they had a mid-dorsal stripe was recorded as well. Afterwards they were set free on the opposite side of the fence that they were caught on.

My experience this summer has been amazing. I am so glad that I was placed at Meanook, because it is an experience that I will never forget. I never really worked in a lab, as I worked outside in the field all day, which was all made possible by working at Meanook. I come away with battle scars due to working outside, such as many mosquito bites, but it was all worth it, it shows that I have done something I enjoy. I walk away this summer with new friends and a wider knowledge of the things ahead of me. This summer has confirmed my earlier ambitions to go to university and go into biological sciences. My career options have also been widened and now I am seriously thinking about a career as a research scientist.

Teresa Storch

WISEST Supervisor: Dr. Ben Jar, Dept. Mechanical Engineering
Sponsor: Epsilon Chemicals Ltd.

This summer, I participated in the WISEST Summer Research Program. It was an experience that gave me the opportunity to learn a lot about many different topics. I spent my six weeks working in Mechanical Engineering with Dr. Ben Jar, doing research on fiber composites.

I got to work on my own project, which was to try to find out whether water would cause cracks in a fiber composite to grow. I got to make my own specimens to use for tests. I had a total of eight specimens that were made of glass fiber inside a polyester resin. Over the course of my project, I spent a fair bit of time in the Mechanical Engineering machine shop. This was really neat because there are so many cool machines and there is always someone building something interesting. I was using one of the presses to damage my specimens. The speed of the press when I did my tests was 0.05 inches per minute! You could barely tell that it was even moving.

After that, I started the portion of my project that could potentially generate new knowledge. During the day, I put two of the repaired specimens and two of the damaged specimens in water at 70°C. The remaining specimens went into the oven at the same temperature. At night, all of the specimens were put into the freezer. The specimens in the water were the ones of particular interest because we wanted to see how their cracks behaved. I thought that their cracks would get larger because as the water got into the cracks, it would expand as it froze, causing the crack to grow. I measured the area of the damage in each specimen to try to accurately determine what the cracks had done. At the end of my project, I actually found that the damage in the specimens that were in the water had actually gotten smaller, instead of larger. It was a big surprise for me because I thought that was impossible. So then we were left trying to figure out what exactly had happened and why.

When I wasn't working at the lab, I was at residence, which is where I lived for the six weeks with 7 other WISEST girls. We had a lot of fun exploring campus, going to festivals, movies, and plays, shopping, and

just hanging out. It was refreshing to get to spend time with people who are so much like me. They taught me that geek is the new cool and that I should be proud of being smart.

I learned a lot of things over my six weeks in WISEST. I found out that experiments are not as simple as they are made out to be in high school science. They are far more complex and they won't always work out the way you expect them to. However, everything happens for a reason.

Research is not nearly as boring or as simple as it sounds. Instead, it is complex, challenging, and even exciting. It is not about sitting in a small, dark room by yourself doing experiments all the time. It is learning, thinking, trying new things, and not getting discouraged if they don't work out. Research is interacting with other people to find out about what they have done, why things happen, and what needs to be done differently. Outside of the lab, I learned how to find my way around campus and Edmonton. By talking to people, I found out a lot about university classes, different faculties, and life in general. I also learned that I am really interested in engineering. All of my doubts about what I want to do after high school are gone now because participating in WISEST has helped me realize what I am interested in and where those interests can take me.

Being a part of WISEST was an amazing experience. I would not hesitate to recommend WISEST to anyone who is interested. It is truly the experience of a life time.

"I learned so much, while at the same time
having a ton of fun and meeting some very cool new people.
Every day was an exciting adventure."

Valerie Dacyk

WISEST Supervisor: Dr. Shelagh Campbell, Dept. Biological Sciences
Sponsors: Faculty of Science & Summer Career Placements Program

Life in a Genetics Lab

What can I say about my six week duration in the WISEST summer research program? The only words to describe this experience are: it was totally awesome. I would have never expected what a difference this experience would make in the way I view things. This experience opened my eyes to what goes on in a research lab, as well as the workings of the university. "University life" as some would say, is quite different than anything else and, thanks to WISEST I was allowed to experience this life for a short amount of time. This will be a great asset when it comes to actually attending university. Between the extensive lab work and getting accustomed to the university, my experience in WISEST was unforgettable.

The first day in WISEST was a bit nerve-racking not only because the university is such a big place but also the idea of having no idea about what the next six weeks was going to hold. This feeling quickly subsided once I met my supervisor and he immediately insisted that "SCIENCE IS COOL". That phrase soon became commonplace once the actual lab research began. During the first couple of days in the lab I was a bit apprehensive about what they were asking me to do, "You want me to do WHAT kind of reaction?" After a while I soon learned what they were talking about and realized that it was not all that hard.

Eventually I got into the swing of things at the lab; this was the point at which I discovered lab life is A LOT different than any other kind of job you could ever imagine. The rules that apply are: show up whenever you want, leave whenever you want, but mainly make sure all of you work is done. Plain and simple. This concept baffled me at first but I soon realized that this meant if you showed up at twelve o'clock one day you probably didn't leave till eight o'clock that night. It was an adjustment to get used to this new concept but once I got the hang of it, I found it works very well.

The lab work had its good days and its mediocre days. As many people will tell you working in a genetics lab you will encounter many experiments that require repetitive work. This I found can be very true. After we finished our first experiment, life in the lab picked up amazingly fast, in two weeks I found that I was conducting experiments (with help) that I had read about in Biology 30. It took me a while to understand exactly what I was doing and why, but once the knowledge portion was passed the experiments became rather interesting. I found it quite amusing to be wondering, when I came into work, whether the test I had set up the night before had worked. As you start getting more and more involved with the work that is going on, you become interested with the experiments and their results. This personal interest is a major point that made lad work so exciting. At the end of the program I found that the good days greatly outweighed the mundane days.

The most amazing thing that I found during the Six weeks duration was that I never went to the lab without being curious about what I was going to do that day. The WISEST program offered me a once in a lifetime opportunity to explore the university and the lab and nothing ever could replace this experience. I truly had an excellent six weeks.

"In total I learned that lab work is very different than any other kind of job, and I learned that university can be a lot of fun if you just look at it the right way."