

WISEST

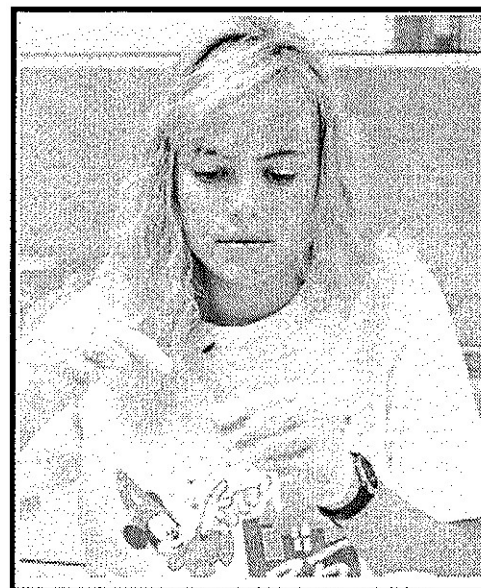
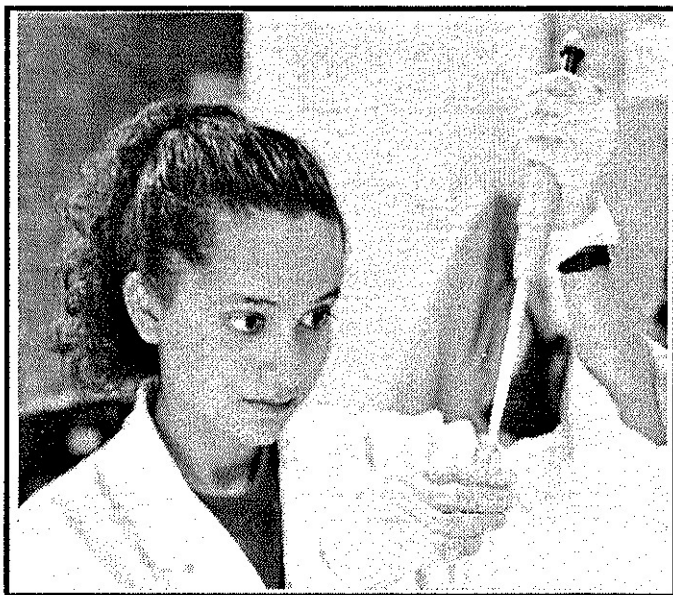
Summer Research Project

1993

Student Reports



"Not only did I have a valuable experience by working in a lab; I was introduced to many new people and given an opportunity to know the university campus."



"I can't say enough about how this research camp has aided me in narrowing down my career choices and the many learning experience it has given me."



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

It has a mandate to investigate the reasons why few young women are choosing careers in the sciences and engineering, to take action to change the situation, and to work to increase the percentage of women in decision making roles in all fields of scholarship. The current membership is thirty scientist, engineers, scholars, educators, and students from the University of Alberta, the Alberta Government, the school boards and the private sector.

In the summer program which began in 1984, students from grade 11 spend six weeks during July and August working as members of research groups at the University of Alberta. The Girls work in the Faculties of Science, Engineering, Agriculture and Medicine with the boys working in the faculties of Home Economics and Nursing. From their response to questionnaires at the end of the program, we know that the young people who participate find the experience broadens their knowledge of fields of research about which they had little awareness. Thus, it influences the choices of courses which they will take at the University and of careers which they may pursue. About 350 grade 11 students have participated in the program to date; these students are encouraged to share their experience with their peers during grade 12. This sharing has been shown to be an effective way of interesting other young women in the sciences. As a reward for doing the best job of telling their friends about the Summer Research Program, one student is invited to participate again after grade 12.

We express our appreciation to the Edmonton Public School Board and the Edmonton Catholic School District who are very supportive of the program, as are many science teachers in high schools throughout the Province. Included in the program this year were 10 students from out of the city and one from the Northwest Territories. We plan to continue to have students from rural schools and perhaps to increase their number.

The success of the Summer Program has resulted largely from the excellent work of the program coordinators. Dr. Dorothy Tovell, the current coordinator of WISEST brings creativity to the planning and warmth to the participants. This year, it was a great pleasure to welcome Salima Hajee as the manager of the program. Her interaction with the students and her ideas added greatly to the student's experience. I thank both of them on behalf of the members of WISEST. This booklet is a collection of the students' reports of the work which they did during their six weeks in the Summer Research Program and indicates both the quality of the research and the variety of the projects which they undertake.

Margaret-Ann Armour
Vice-chair WISEST



It is my pleasure as WISEST Co-ordinator to bring greetings to the students who participated in the WISEST Summer Research Program 1993, their teachers, friends and fellow students, their supervisors and all those who generously provided funding for the programs.

It is always exciting to see new students arrive at the beginning of July, to see how each one experiences working in a research lab at the University of Alberta, and to hear them confidently and capably describing their work at the end of the six weeks. This year although I wasn't able to hear the student reports, I very much enjoyed getting to know at least some of the young women who will be our future scientists and engineers, and the young men who had enough imagination to spend six weeks in the female dominated fields of nursing or medical laboratory sciences. We were happy to have you in the program, and strongly encourage you to tell your friends and schoolmates all about your experiences. I wish you the very best as you pursue your education and work towards fulfilling careers.

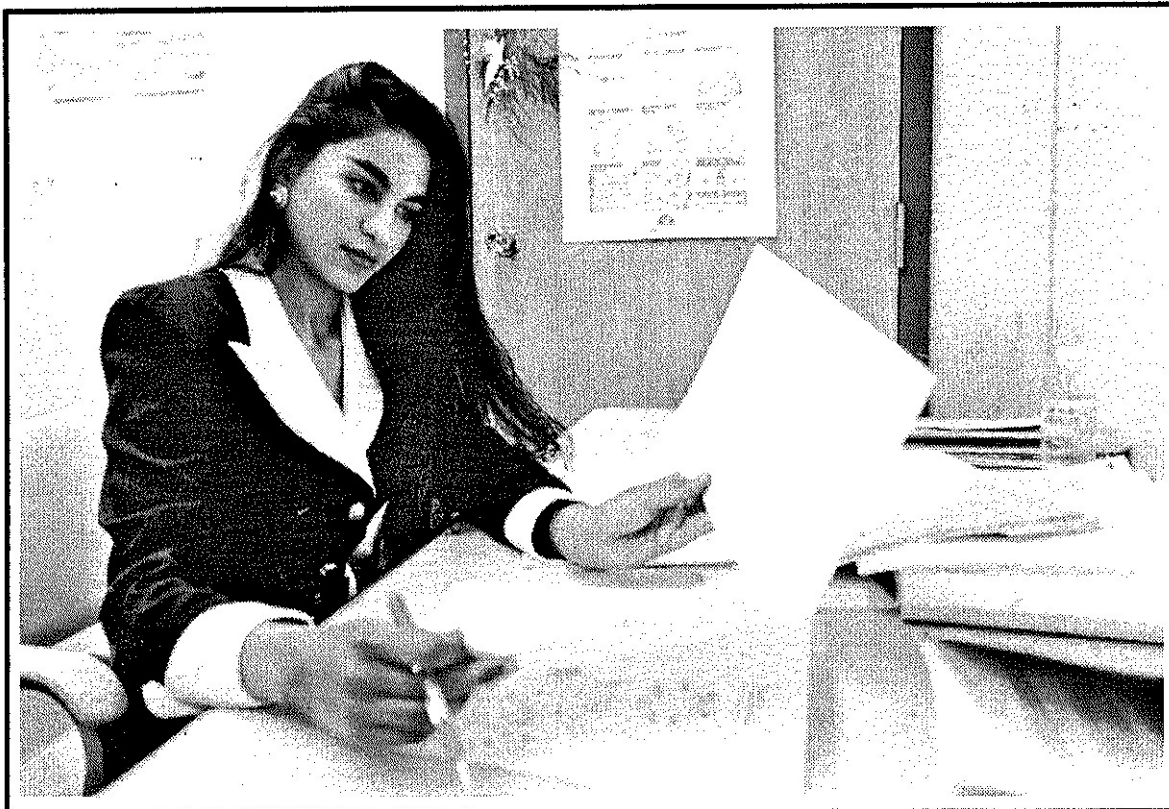
We very much appreciate the way in which teachers and school counsellors support the WISEST Summer Research Program; in making information available to their students, encouraging them to apply for positions, and in completing many teacher reference forms. We at WISEST want you to know that your efforts so not go unrecognized. We rely very much on your help in publicizing the program, and encourage you to share this booklet with the Grade 11 students in your school.

This program would simply not be possible without the supervisors and their technicians, undergraduate and graduate students, and research associates. Your commitment of time in training, supervising and encouraging the students is invaluable. I am indeed pleased to add my thanks to those expressed by the students in their reports.

The program would also not be possible without the financial contributions of our many supporters. In 1993, funding was received from the SE/ED (Summer Employment/Experience Development) program of Canada Employment and Immigration, The STEP (Summer Temporary Employment) program of Alberta Career Development and Employment, the Alberta Women's Secretariat, the Edmonton Catholic School District, the Science Alberta Foundation, the Alberta Heritage Foundation for Medical Research, the Glenora Rotary Club, Weyerhaeuser Canada Ltd., Merck Frosst Canada Inc. and the University of Alberta.

Finally, I want to mention the members of the "WISEST team": Dr. Margaret-Ann Armour, Vice-chair of WISEST, whose commitment and enthusiasm for the WISEST Summer Research Program is evident in so many ways, Eileen Morouny who provided office support, and Salima Hajee, the program administrator, whose contributions, too numerous to mention, were invariably accompanied by the love of learning and a sense of adventure that could not help but inspire the students as well as the other members of the team.

Dorothy Tovell
WISEST Co-ordinator



This booklet contains reports as written by the students at the end of the six weeks in the WISEST Summer Research Program 1993. The students describe their work in the research labs, and also refer to the group sessions which were held each Wednesday afternoon. This year's sessions included a campus tour, a field trip to the Devonian Botanic Gardens, an informal discussion with people who have chosen non-traditional careers, a visit to another lab at the University of Alberta and presentations by the students of their work. Finally, the students attended a luncheon, with their supervisors, as a concluding event for the summer program. I would like to thank the numerous people whose participation made these sessions such good opportunities for learning.

A special effort was made to include students from outside the city in the WISEST program. In addition, this is the first time that a student from the Northwest Territories has had the opportunity to participate in the program. Not only did the students work at the university, but they also got to experience city life by living in Edmonton.

In addition, several social events were planned to give the students an opportunity to get to know one another better. These included trips to "The Greatest Show Unearthed" and an evening at the movies. The students also met every Tuesday for an informal 'brown bag' lunch.

Each student's report is accompanied by a photograph of the student, at work in most cases. I would like to thank Paul Dolphin for taking the pictures. As always his commitment to high standards is evident in the photographs. His competent assistance in the production of this booklet is greatly appreciated.

I also want to acknowledge the students who contributed to the booklet by taking pictures and writing summaries for the various Wednesday afternoon sessions and the social events. I want to thank all the entrants of the 'Cover Design Contest' for submitting such creative entries. On behalf of WISEST, I would like to congratulate Lena Schofield for winning the contest.

Lastly, I want to thank WISEST for giving me the opportunity to organize this year's program. Without Dorothy's patience and her willingness to answer my incessant questions, I don't think it would have been possible. In spite of her extremely busy schedule, Dr. Armour always had time to be supportive and encouraging. To the participants of WISEST Summer Program 1993 - Thank you for a memorable summer! All in all, this has been a summer that I'll never forget.

Salima Hajee
WISEST Administrator

The WISEST Student trip to the Devonian Botanic Garden and The Devonian Lion's Club Park

The WISEST student trip to the Devonian Gardens and the Lion's Club Park is a trip well worth remembering. The Butterfly House and Japanese Garden were interesting with many different species of plants and insects. The highlights of the garden included a bell which could be sounded to announce the University's friendship with Japan and a river that unusually had both a female and male side.

After a lengthy walks through the gardens a trip to the Lion's Club Park was the next planned event. For those who survived for seconds of the well done hotdogs, compliments of Salima, the sights and scenery of the park could be challenged through various walks and hikes. While some found the river to be the main attraction, others could not be taken off the swings. As evening approached most everyone participated in a frisbee throw,



while others became acquainted; as a result I came to realize that throwing a frisbee was not my strong point. All in all I feel the

trip turned out for the best and was well worth the never ending bus rides.

Jay Kormish

Having Two X Chromosomes, and Being a Scientist at the Same Time



On Wednesday, July 21, I arrived late for our talk with women in non-traditional careers. Luckily everyone was polite enough not to notice except for Kirsten, who kept on looking at me and pointing to the empty chair next to her. Then we split into groups.



Our groups had four speakers from civil engineering, immunology, chemistry, and pharmacy. They told us exactly what they did, how they got there and why they enjoyed their jobs. A lot of emphasis was put on the fact that there are millions of options in science. The whole scary topic of being female (gasp!) in male dominated fields only came up once or twice. Our speakers said they hadn't actually encountered very many problems. One of them even has a family, and she says that it's possible to balance the two sides of her life. Imagine that.

One thing kept on surfacing: nothing is so rigid that it cannot be changed. I liked that idea. I just hope that when I have to test it, it turns out to be true.

Sinead Collins

THE GREATEST SHOW UNEARTHED

Dinosaurs 'R' Us - July 19, 1993

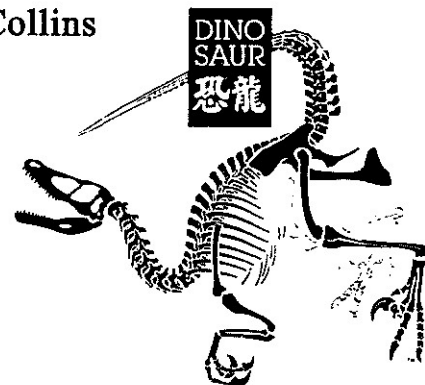


One Monday night, eleven Wisest students crept downtown to see the Greatest Show Unearthed. Some crept via the LRT and spent half an hour waiting for the brave souls who drove, who were waiting for us downstairs, at the show. This would indicate that organization is not our strong suit.

Personally, I liked making dinosaur feet in the kiddies tent best, but I'm sure that everyone was thrilled to pieces over the fossils of the well known dinosaurs, like Tyranosaurus Rex, as well as those of newly discovered species. There was enough hands on activities to keep everyone busy looking for microfossils (which we couldn't find) or examining different casts.

It rained on us. Apart from that minor inconvenience, it was great. Perhaps **WISEST** should add paleontology to its research program. Suddenly I want to dig in the sand with a toothbrush! I want to go to the Gobi desert and get a sunburn! Someone hold me back before I run out and see Jurassic Park! AAAAAARGH!

Sinead Collins



Jellybeans and Genetics: A New Link

July 28, 1993

Today I learned new and interesting fact: fruit fly embryos look like jellybeans with antennae. No, I don't raise my own pet fruit flies. I know this because today I visited the genetic lab. Not everyone in **WISEST** toured genetics; we all had different labs to visit. I had a ball. First of all, it was reassuring to find out that not all labs smell like acetone and are filled with millions of bottles of chemicals (I work in chemistry). I had suspected that these non-chemistry labs existed, but now I'm sure of it. When your in the same lab all the time, it become quite easy to forget that yes, other research is being done. I mean, you know there are other labs, but in the same way you know there are other

planets. They (labs and planets) tend to seem rather unreal at times.

Actually, unless you like fruit flies, plants and DNA, our little tour wasn't that exciting. But I just happen to think all these things are really neat, so I found it to be a thrilling tour. We even met a real, live, mad scientist. I'm serious. He said "Hi, I'm one of those guys who is trying to create life from nothing, basically." He later revealed that he was interested in creation of organs. He thinks eventually, we will be able to grow entire organs out of bits of tissue, so that organ transplants would be made easier. But don't get too excited guys, this one's still in the fruit fly stage.

Sinead Collins

The Great Campus Tour

July 7, 1993

Percy sounds like the name of a goldfish. But no, Percy is the name of the hyper, vertically challenged man in plaid shorts who gave us a guided tour of the U of A campus. Apart from the feeling of being herded around like livestock, the tour was okay, although Percy did his best to confuse us by going around in circles. But no! We would not be confused! Most of the group abandoned the tour after a thrilling trip through the Butterdome, but some brave, sympathetic people stuck it out until the end.

We are such rebel. Percy took us into the Cameron Library, even though every other group he's taken in had been bounced out, mainly because libraries are supposed to be quite places. Quite is not one of the words I would use to describe the Percy-man.

Through some miracle we were not bounced out of the library. That's about as dangerous as the grand tour got.

Oh well, they never promised us a rose garden. And remember guys, if science doesn't work out, we can always go into Xerox machine sales.

Sinead Collins

Oral Presentations a Real Eye Opener

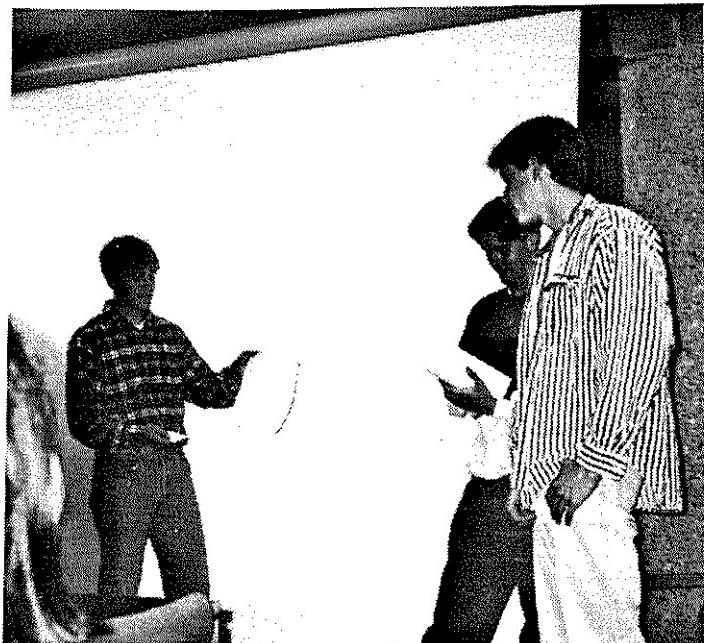
It was really great to hear what kind of things other people are working on. From the farm to the computer lab, 51 people have certainly managed to cover a lot of ground. I'll bet everyone is once again unsure of what it is that they'd like to go into now that we've heard a little more about what is out there.

The visuals brought in were really great, especially the bugs from entomology and who can forget the photocopy card brought in by the guys from nursing!

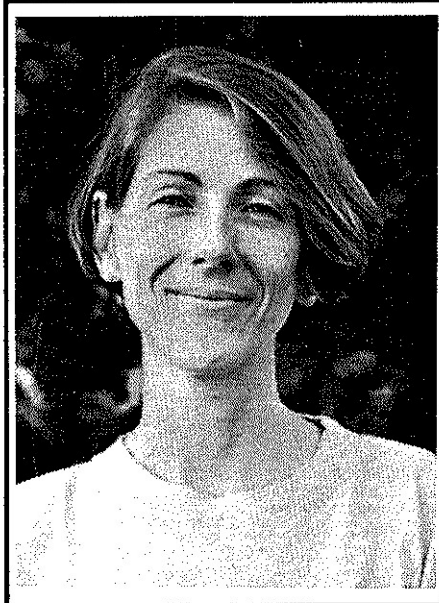
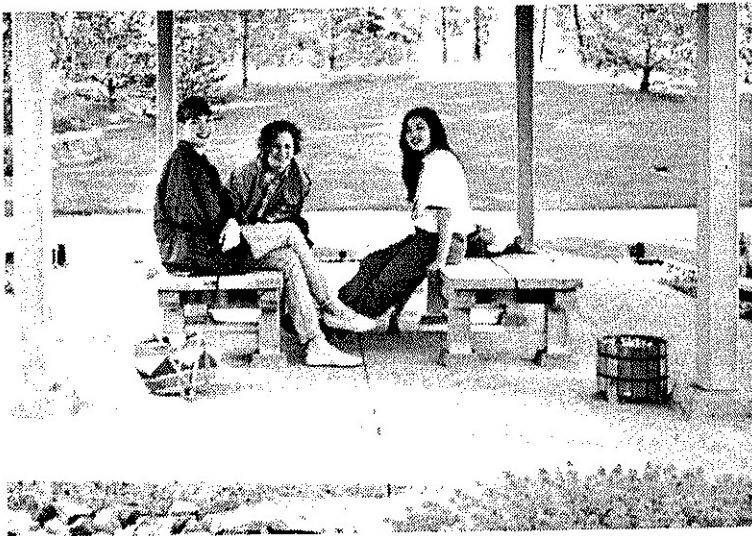
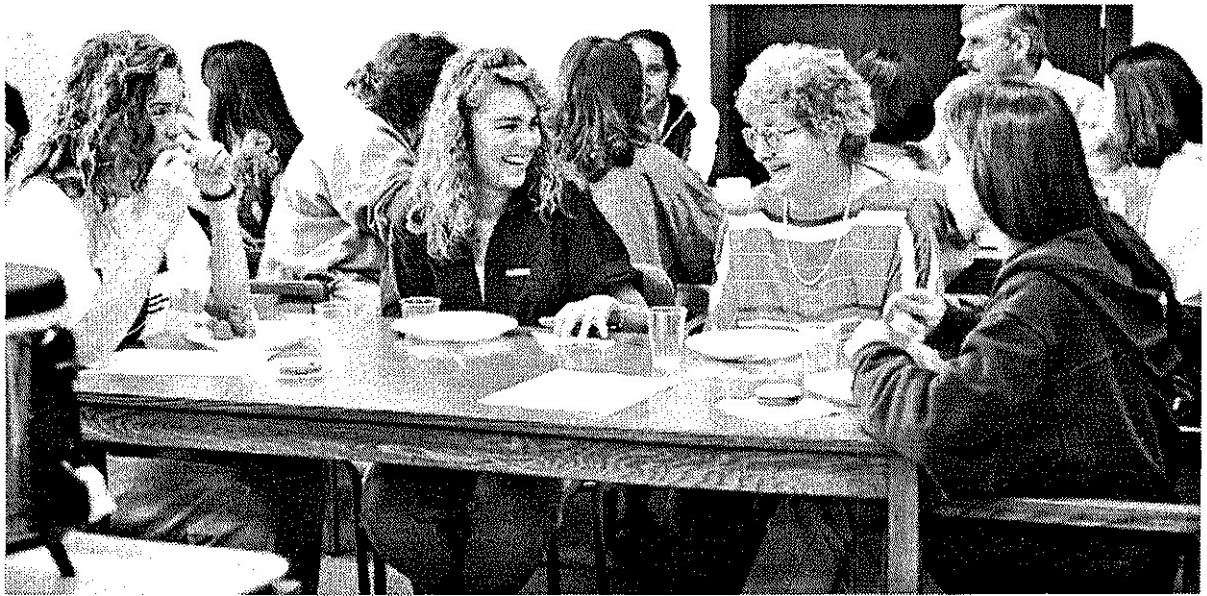
The presentations would have been better had more time been available to each person, it is difficult to successfully describe a month's worth of work in only five minutes. It was often found that the presentations were difficult to understand as most had a terminology of their own without the time to explain it.

I would hope that this has opened everyone's eyes to the myriad of opportunities in the world of science as it has opened mine.

Thanks WISEST,
Lena Schofield



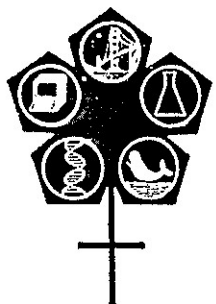
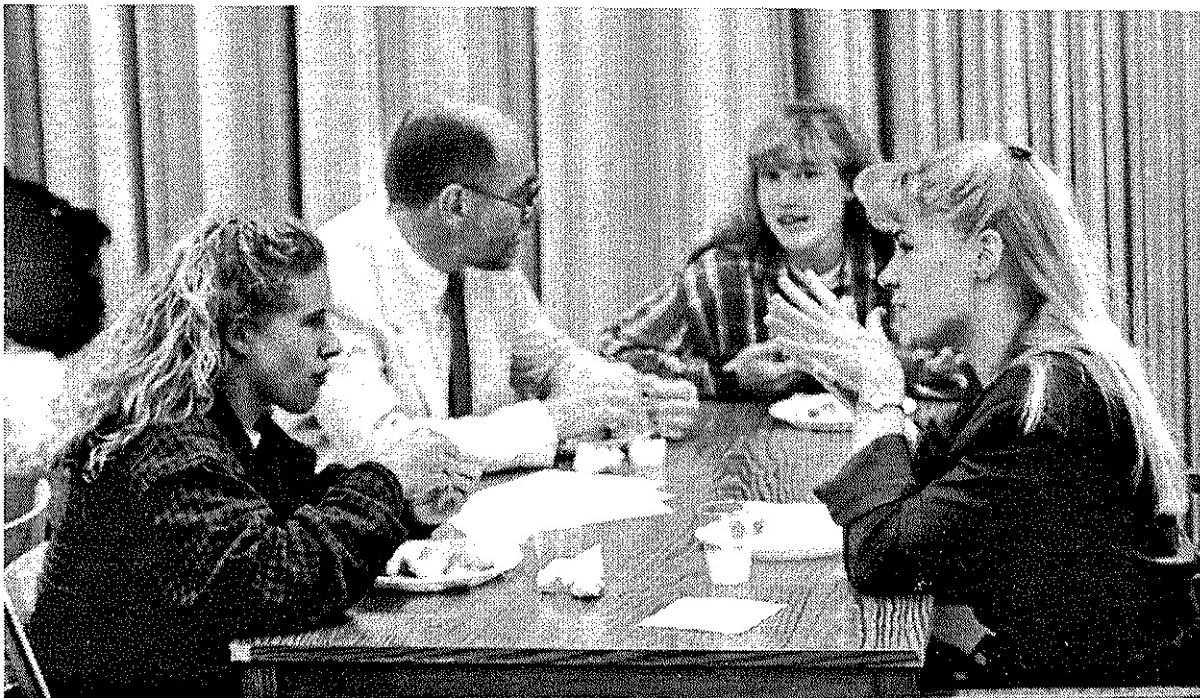
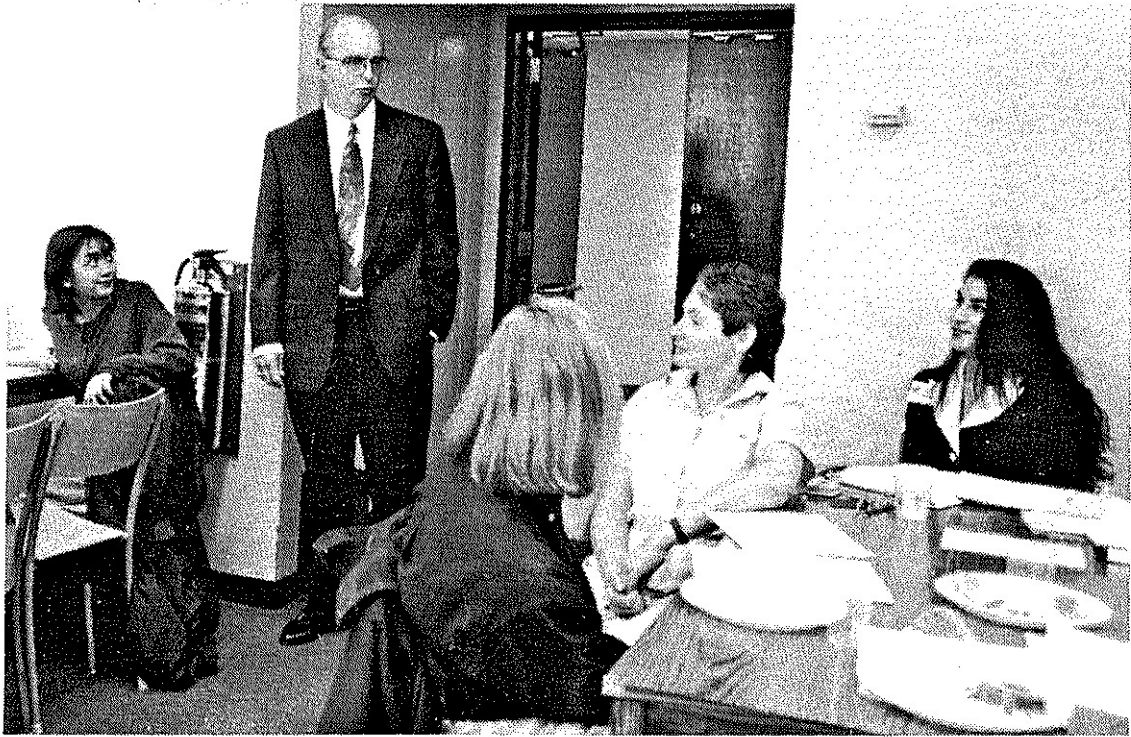
WISEST - A Summer of Discovery



WISEST would like to say a special thank you to Eileen Morouney for her work in our office. Your contribution was very much appreciated.

WISEST Luncheon Wraps Up Another Successful Summer





WOMEN IN SCHOLARSHIP, ENGINEERING, SCIENCE AND TECHNOLOGY

STUDENT	SUPERVISOR	REPORT page #
Aleksandra Stefanovic Queen Elizabeth	Dr. G.H. Sperber Oral Biology Department	106
Anna Lee Lindsay Thurber (Red D r)	Dr. Diane T. Finegood Medicine Endocrinology & Metabolism	50
Beryl Koshy McNally Composite	Dr. Mark Pepler Medical Microbiology & Infectious Diseases	20
Carla Teare Leduc Composite	Dr. Janet Robertson Medical Microbiology & Infectious Diseases	68
Catherine Masters Salisbury (Sherwood Park)	Dr. John Feddes Animal Science Department	38
Charlene Ericksen Spruce Grove Composite	Dr. H. James Hoover Computing Science	17
Christy Mackinnon Paul Kane (St. Albert)	Dr. Dale H. Vitt Devonian Botanic Garden	78
Claudette Rondeau Ecole Notre Dame (Bonneyville)	Dr. Linda Pilarski Immunology Department	90
Connie Tang Archbishop MacDonald	Dr. William Wolodko Biochemistry	82
Graig Milne Paul Kane (St. Albert)	Dr. Anne Neufeld Nursing	62
Dahlia Malchenko Austin O'Brien	Dr. G.H. Sperber Oral Biology Department	106
Erin Burrel Wetaskiwin Composite	Dr. Ellie Prepas Zoology Department	41
Gabrielle Deagle Archbishop MacDonald	Dr. Gordon Rostoker Physics Department	46
Gloria Hsi Bellerose Composite (St. Albert)	Dr. Haane Ostergaard Immunology Department	52
Hannah Piper Ross Sheppard Composite	Dr. Geoffrey A. Machin Pathology	75
Henry Chui Archbishop MacDonald	Dr. Val Dias Laboratory Medicine & Pathology	80
Jackie Ham Fort McMurray Composite	Dr. John Spence Entomology Department	54
Janet Lam Strathcona Composite	Dr. David D. Cass Botany Department	73

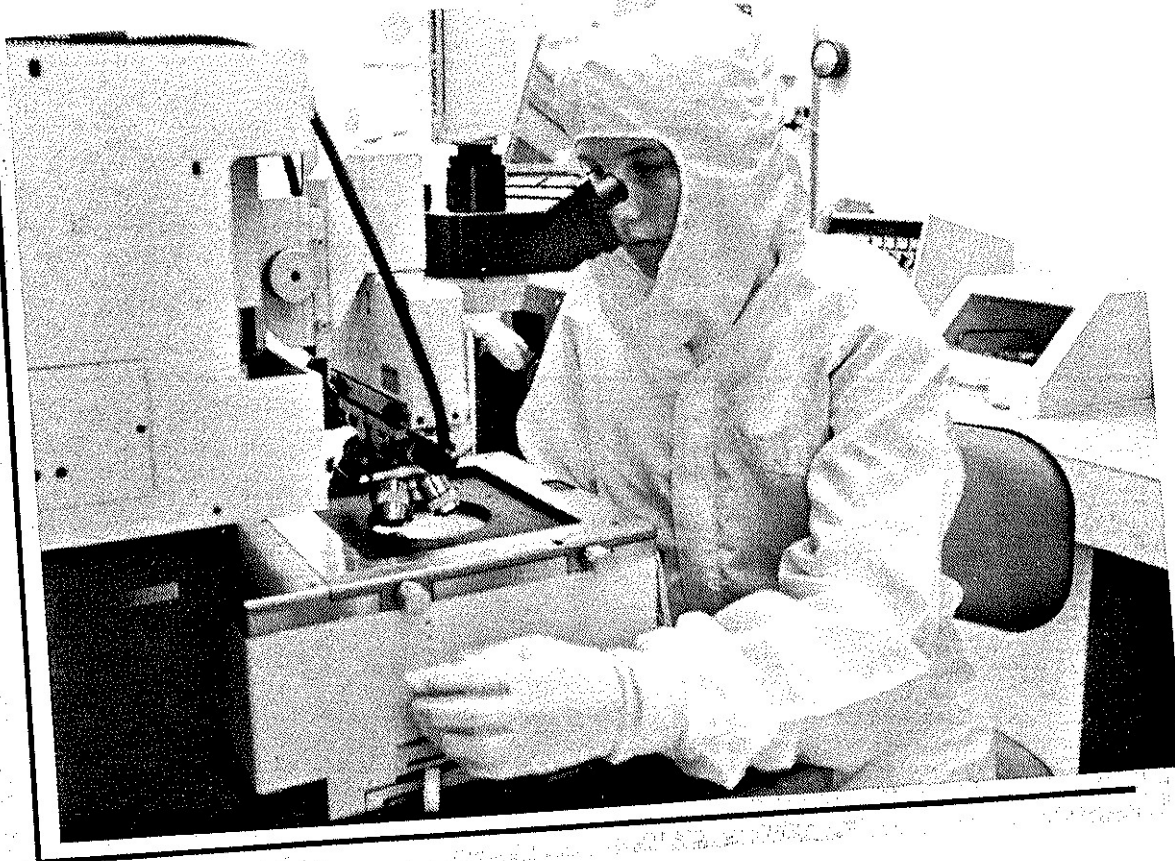
STUDENT	SUPERVISOR	REPORT page #
Jay Kormish St. Paul Regional	Dr. Jutta Preiksaitis Medical Microbiology & Infectious Diseases	44
Jeannie Mao M. E. LaZerte	Dr. William Albritton Medical Microbiology & Infectious Diseases	94
Jennifer D. Elkow Harry Ainlay	Dr. Mark Dale Botany Department	105
Jennifer Snart Jasper Place Composite	Dr. Ellie Prepas Zoology Department	41
Jennifer Wagner St. Thomas Aquinas	Dr. Warren Gallin Zoology Department	32
Jill C. Griffiths M.E. LaZerte	Dr. Alex Lucas Medicine/Cardiology	60
Joanne Zapisocki Sturgeon Composite	Dr. Suzanne Kresta Chemical Engineering Department	28
Julie Andreotti Grande Prairie Composite	Dr. Bruce Yacyshyn Gastroenterology	56
Karen G. Woo Archbishop O'Leary	Dr. Bruce Yacyshyn Gastroenterology	86
Karen Wong Ross Sheppard Composite	Dr. Mark Dale Botany Department	102
Kevin Worth J. Percy Page	Dr. Janet Ross Kerr Nursing	98
Kimberly Malonik M.E. LaZerte	Dr. M. Anne Naeth Nursing	65
Kimberly J. Ross Mannville High	Dr. Susan Rosenberg Biochemistry Department	34
Kirstin Jahns Harry Ainlay	Dr. Mark Dale Botany Department	104
Kirsten Kidd Hilltop High (Whitecourt)	Dr. Yuebin Ning Alberta Microelectronics	15
Leena Chacko Archbishop O'Leary	Dr. M. A. Armour Chemistry Department	76
Lena Schofield P.W. Kaeser (Fort Smith NWT)	Dr. Peter Sporns Food Science & Nutrition	22
Lisa E. Pooke Ryley School	Dr. Faye Hicks Civil Engineering Department	96

STUDENT	SUPERVISOR	REPORT page #
Lorraine Howard McNally Composite	Dr. H. James Hoover Computing Science	17
Marc van der Wekken Archbishop O'Leary	Dr. Olive Yonge & Dr. Marion Allen Nursing	40
Marilyn J. Zinner Concordia College	Dr. John Spence Entomology	58
Michelle Balce Holy Trinity	Dr. Catherine Descheneau Computing Science	100
Michelle Tubman Spruce Grove Composite	Dr. Dale H. Vitt Devonian Botanic Garden	66
Neelam Mahil Harry Ainlay	Dr. David D. Cass Botany Department	70
Oksana Kotovych Louis St. Laurent	Dr. K.R. Kopecky Chemistry Department	88
Philina S. Lee Harry Ainlay	Dr. J. Stemke Microbiology Department	26
Sandeep Tamber McNally Composite	Dr. M. A. Armour Chemistry Department	92
Sinead Collins St. Joseph (Grande Prairie)	Dr. Dennis Tanner Chemistry Department	48
Stacy Gallaway Consort School	Dr. Ellies Prepas Zoology Department	24
Theresa Winski St. Francis Xavier	Dr. Ellies Prepas Zoology Department	84
Tinh Phung Holy Trinity	Dr. T. M. Allen Pharmacology Department	30
Vivian Mak Archbishop MacDonald	Dr. L. D. Jewell Pathology	36
Y-Le Ho J. Percy Page	Dr. Diane T. Finegood Medicine, Endocrinology & Metabolism	51

My Time in the MAD Lab

The summer that I spent in the WISEST summer research program is one that I will remember for a long time. The program ran for six weeks and during this time I worked at AMC (the Alberta Microelectronic Centre) with my supervisor, Dr. Yuebin Ning. While I stayed there, I learned a lot about electrical engineering research, semiconductor processing, and even the University itself. I met many new people and friends, got to experience "dorm life" and cafeteria food, and was on my own for six weeks. It was definitely an experience worth remembering.

AMC is located on the second floor of the Newton Research Building with offices on the third floor. The basement portion is the Materials and Devices Laboratory, or for short, the MAD Lab (the name in itself should tell you something about the sanity of the staff). This downstairs lab consists of two parts, the office area and the Fab or Fabrication area. The Fab is a fairly unique because it is a clean room environment, and to maintain the cleanliness of this area you must wear a cleanroom gown a.k.a. a bunny suit, which covers every thing except for a small portion of your face. You must then go through an air shower to remove the dust particles from you and your suit. The more delicate work is done in the Fab.



Because my stay at AMC was so short I did not get to experience all the stages of research work. This was due to the fact that Dr. Ning was in the finishing stages of his previous project when I arrived, so for the first two weeks I helped him with the construction and packaging of his accelerometers - which are simply micro-devices that measure acceleration. The rest of my stay at AMC was consumed with the thermal print-head project, in which the objective was to design a thermal print-head that had a higher resolution than is currently available. The way a thermal printer works is that it uses heat to create images or words. On the print-head there are several thousand tiny resistors or heaters. When these resistors get hot and come into contact with thermal printing paper they leave marks on the paper creating words and images. Since neither of us knew a lot about thermal print-heads we had to do a lot of research, which meant numerous hours in the library searching for papers and articles on thermal printers.

It was only during the last week that we started to do any hands-on work on the thermal print-head project. Dr. Ning and I started to experiment with the material that he planned to make the resistors from. However, throughout my stay I did perform various chemical etches on several substrates to remove specific materials, and I learned how to operate some of the machinery in the lab.

I learned several things this summer, some of which will help me to make decisions about my future career. The WISEST summer research program gave me a valuable insight into the life of a research engineer, and a chance to get some of my questions answered. Not only was this summer educational and informative; it was an experience worth remembering.

Kirsten Kidd

6 Weeks In Computing Science

by Lorraine Howard and Charlene Eriksen

Summer 1993

The Project

Computing 172 is a first-year university course involving logic, formal systems, proofs, and programming in Computing Science. Our project was to find out why so many students find this course unusually difficult. Throughout the six weeks, we attended the lectures and seminars, completed the assignments, wrote the exams, and examined the notes and material covered in the course. Our end result was a report for Dr. Hoover, our supervisor, describing the easier concepts in the course, the harder parts, and some suggestions on how to change the notes so students will find them easier to understand.

The Course

When first starting *Computing 172*, we never expected to see something like *Alice in Wonderland* translated into symbolic logic. By the time we got to the end of the course, translating English into the language accepted by *Mizar-MSE* became simple. It took a while, but we were finally able to write in the computer's language.

At the beginning of the course, we were presented with a package of assignments. The first assignment looked as if it was written in another language. After about a week we became familiar with this strange notation. Working on this first assignment involved proving two important components known as the variant and invariant which are required in even the most basic programs.

After this brief introduction to logic, we began to work with first-order predicate calculus. Basically, this involved manipulating predicates to form statements which followed the rules of logical reasoning used in proofs. A predicate is simply a description of a property the object under consideration either holds or does not hold. For example, *Knight[A]* means that A is a knight in a set context.

When we were finished learning about predicates and the basic inference rules assumed in the logical system, we applied these concepts to actual proofs. A proof verifies or falsifies a given statement within the context described in the environ. An example of a proof in Mizar (the proof checker) is below.

```
environ
reserve x, y, z for Person;
```



```

given F, G being Person;
a1:  for x, y, z holds Conspire[x, y, z] implies not (Likes[x,z] or Likes[y,z]);
a2:  Likes[F, G] & Likes[G, F];
begin
not Conspire[F, F, G] proof
  1:  Likes[F, G] by a2;
  2:  Conspire[F, F, G] implies not (Likes[F, G] or Likes[F, G]) by a1;
  thus thesis by 1,2;
end;

```

After we had learned how to create our own proofs, we briefly covered simple set theory (which is much like that covered in the high school math courses), and math induction, before learning the reason why this course is necessary. One of the applications of the material in this course was to be able to prove that a program will do what it is supposed to do without aborting. This major concept is called program correctness and is important to all aspects of Computing Science.

The Computers

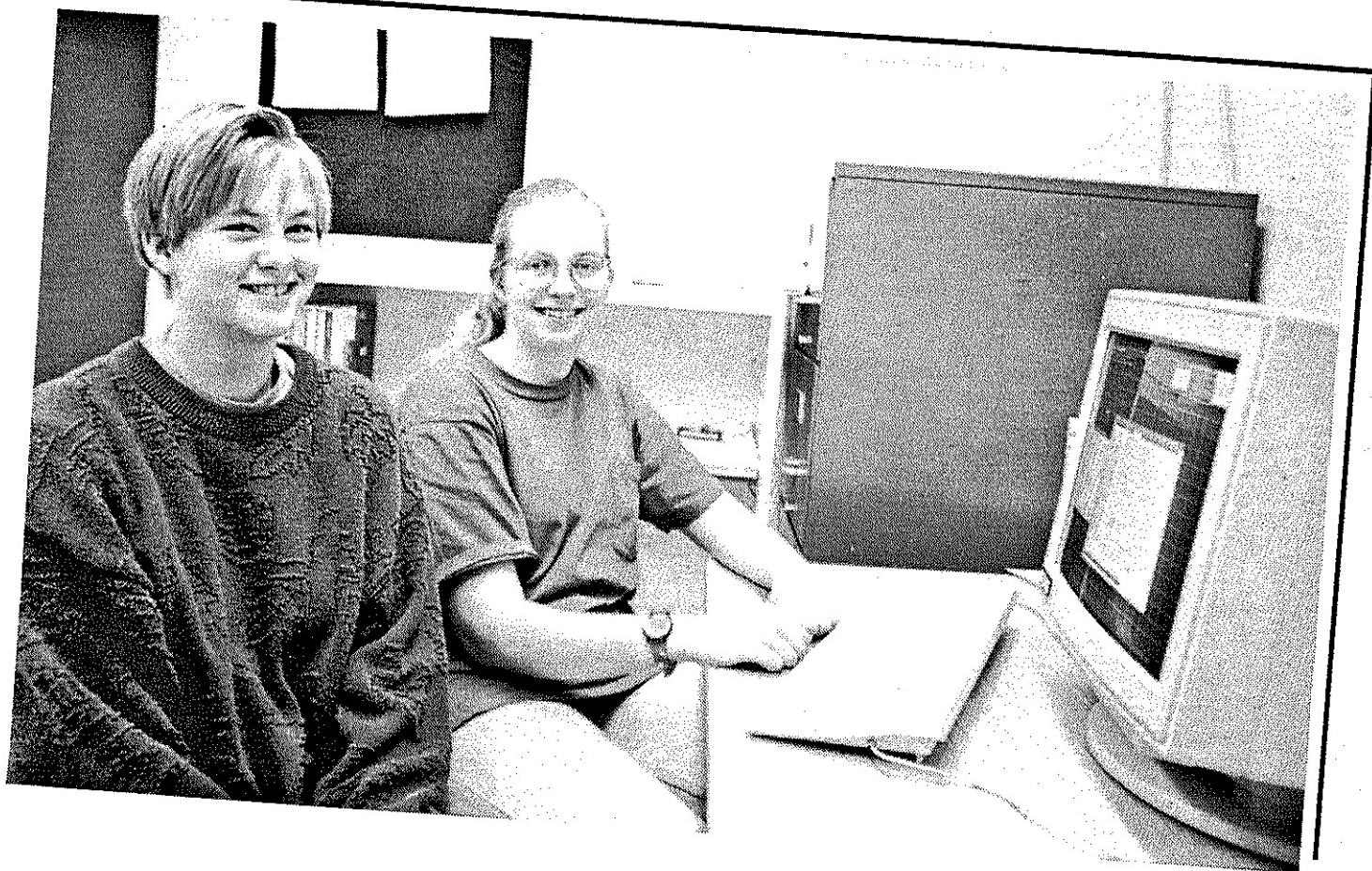
During the first couple of days, we quickly became familiar with how to “kill” a crashed computer, how to find our way out of somewhere we shouldn’t be, and how to use the system’s newsgroup. At this time we also learned how to use the electronic mailing service (elm), the *man* pages, which give information about the commands and programs requested, and other extremely basic aspects of the University’s UNIX system and the *sun3* computers.

After this brief introduction to UNIX, we began to use the *Mizar-MSE* proof checker. This language/program is used in the course to check the various proofs the students create. When the proof is run through *Mizar*, it states what is and what isn’t accepted. When something is not accepted, the computer relays a message according to what the problem is. Once all the corrections have been made, *Mizar* will hopefully accept the proof and it can be submitted electronically using the “try” command. “Try” tests your answers by comparing them with your instructor’s key.

During our six weeks, we also experimented with other programs, like a variation on the original *Mizar* proof checker. The new version, being developed by Dr. Hoover, among others, is called *Mizar-C*. *Mizar-C* checks the proof as it is being written, rather than after it is all done. The “HELP” addition and reference files also make the program more user-friendly. Another program we used is called $\text{\LaTeX}$, which is what was used for this report.

The People

During our six weeks at the University, we worked with many people. We would like to thank all of them, including Kathy Kippen, Mira Kaloper, and John Willson. It was great to work with such friendly, helpful people. A very special thanks to Jim Hoover and Piotr Rudnicki. We really appreciate the time you took out of your busy schedules to give us this opportunity. We learned so much, more than we ever thought possible, during our time here. At first our project seemed



almost impossible, but thanks to everyone's help and advice, we did great in the course. Thanks again to everyone!

The WISEST Program

When we first learned about the WISEST Summer Research Program, we were worried if we would be able to do all that was expected of us. Thanks to WISEST, we now know we can learn how to do anything, including our own research project. Besides giving us confidence in our abilities, WISEST also gave us valuable experience in a research environment and as "students" at the University.

The best part of our six weeks with WISEST was meeting many great people. In our labs and at the Wednesday group sessions, we made countless new friendships and were able to hear about everyone's various projects. We also experienced life at the university level and now feel comfortable with the size of the campus and the people at the U of A.

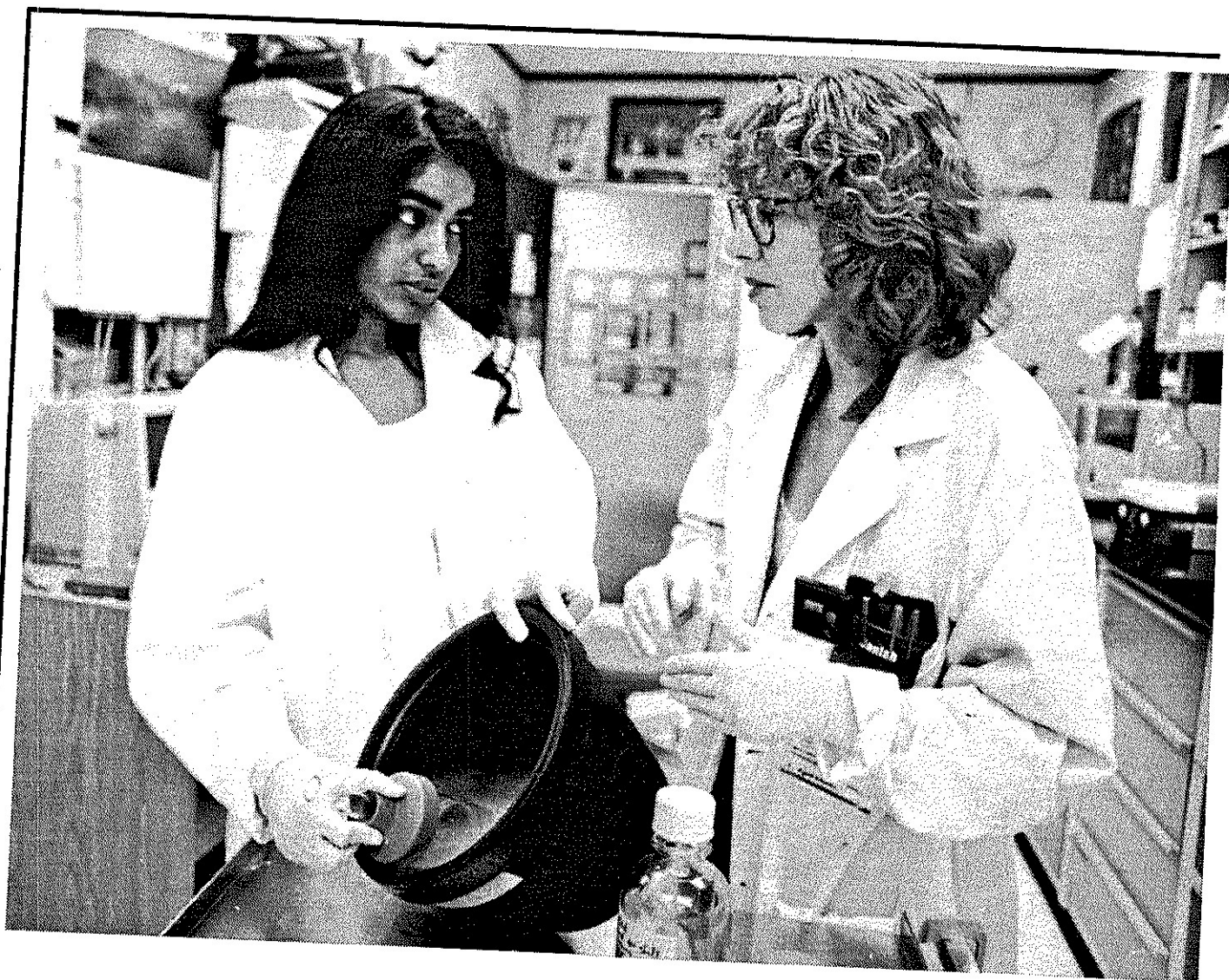
We greatly enjoyed our time with WISEST. The opportunities, experience, and knowledge we gained will always be remembered as a significant step towards our careers in science.

WISEST Summer Research Program 1993

My WISEST experience was spent in Dr. Mark S. Peppler's lab in the department of Medical Microbiology and Infectious Diseases where I worked with his technician Kate. Dr. Peppler's lab focuses on the bacteria called *Bordetella*, which causes whooping cough.

When trying to learn about an organism, researchers usually use a mutant and compare it to the original organism. We used the mutant YRD 22. Kate and I were interested in making monoclonal antibodies. Five mice were injected with the bacteria before I arrived so initially we had to ensure that these mice were actually making antibodies to that "bug". To do so we ran a Western Blot. Each mouse was bled and the blood was spun down using a centrifuge to remove the red blood cells. The serum was then obtained and stored. The bugs were suspended in buffer and then treated in such a way that the cells are broken down into smaller pieces, using equipment such as the vortex and the sonicating water bath. The broken cells were given a negative charge and loaded onto a gel. A current was run through the gel and the material was separated according to its molecular weight. The gel was then placed in a Trans Blot apparatus where the cell material was transferred by electric current onto nitrocellulose paper. The paper was placed in a Deca Probe unit where it was washed several times, then finally the mouse serum was added. The antibodies the mouse made should recognize and "stick" to the Lipopolysaccharides (LPS) of the bacteria. Since the LPS is very small it appears at the bottom of the nitrocellulose paper. At that time not a lot of the serum stuck to the paper. As a result, the mice were given a boost injection and checked again. If the mice are producing enough antibodies, Kate will perform a fusion of the mice's spleen cells and an immortalized cell line. The fused cells are called hybridomas and they will be screened to find those hybridomas which only produce antibodies against YRD 22 therefore the monoclonal antibodies.

We were also helping a Ph.D student describe the mutants she had made. Our job was to see if the bacteria fixed compliment. To do so we did an enzyme immunoassay (EIA). Since the bacteria are very small, we were always working with very small volumes in the compliment fixation assay. 96-well plates were used for the assay, each well holding a maximum of 200 ul. The ten mutants and antibody were added in different dilutions to the plate. After incubation compliment was added to the bacteria/antibody mixture and incubated. If compliment was fixed it should attach itself to the bacteria/antibody complex. Sensitized sheep red blood cells (SRBC) were added and allowed to incubate. If compliment was not fixed, it would attach to the SRBC and lyse them. When lysed, the SRBC release their hemoglobin, the substance which makes blood red. A spectrophotometer was used to read the intensity of the red color produced in each well, the darker the color the less compliment was fixed by the bacteria. Most of the ten mutants fixed compliment but the assay was performed several times ensure its accuracy. Now, our next step is to see if after the compliment is fixed, does it actually kill the bacteria.



Being involved in WISEST, I enjoyed a terrific summer and learned a lot. Everyone in Dr. Peppler's lab were great to work with and really helped me with everything I did. The Wednesday afternoon sessions with the other girls from WISEST allowed me to meet many people from different schools and get to know ones from my own. I'd like to thank everyone involved in WISEST's administration for giving me this opportunity. Finally I'd like to thank Dr. Peppler, Kate, Lisa, Trevor, Laurina, Yvoe and Xin for putting up with me for six weeks because I really did have fun!

Beryl Koshy
McNally C.H.S.

Hi!

My name is Lena Schofield. I spent this summer working in the Department of Food Science and Nutrition, more specifically in a Food Chemistry lab. I worked with Carrie Thomson, a grad student counting the days until she is finished her Ph. D. in Food Science. Carrie took time out of her research, a continuing study on potato glycoalkaloids, to work with me on honey.

To begin Carrie and I conducted some tests called Enzyme Linked ImmunoSorbant Assays, better known as ELISA's. ELISA's use an enzyme, antibodies and antigens to detect other antibodies and antigens on a polystyrene microtitre plate*. The problem was that non-specific binding was occurring in wells where no antibodies had been established.

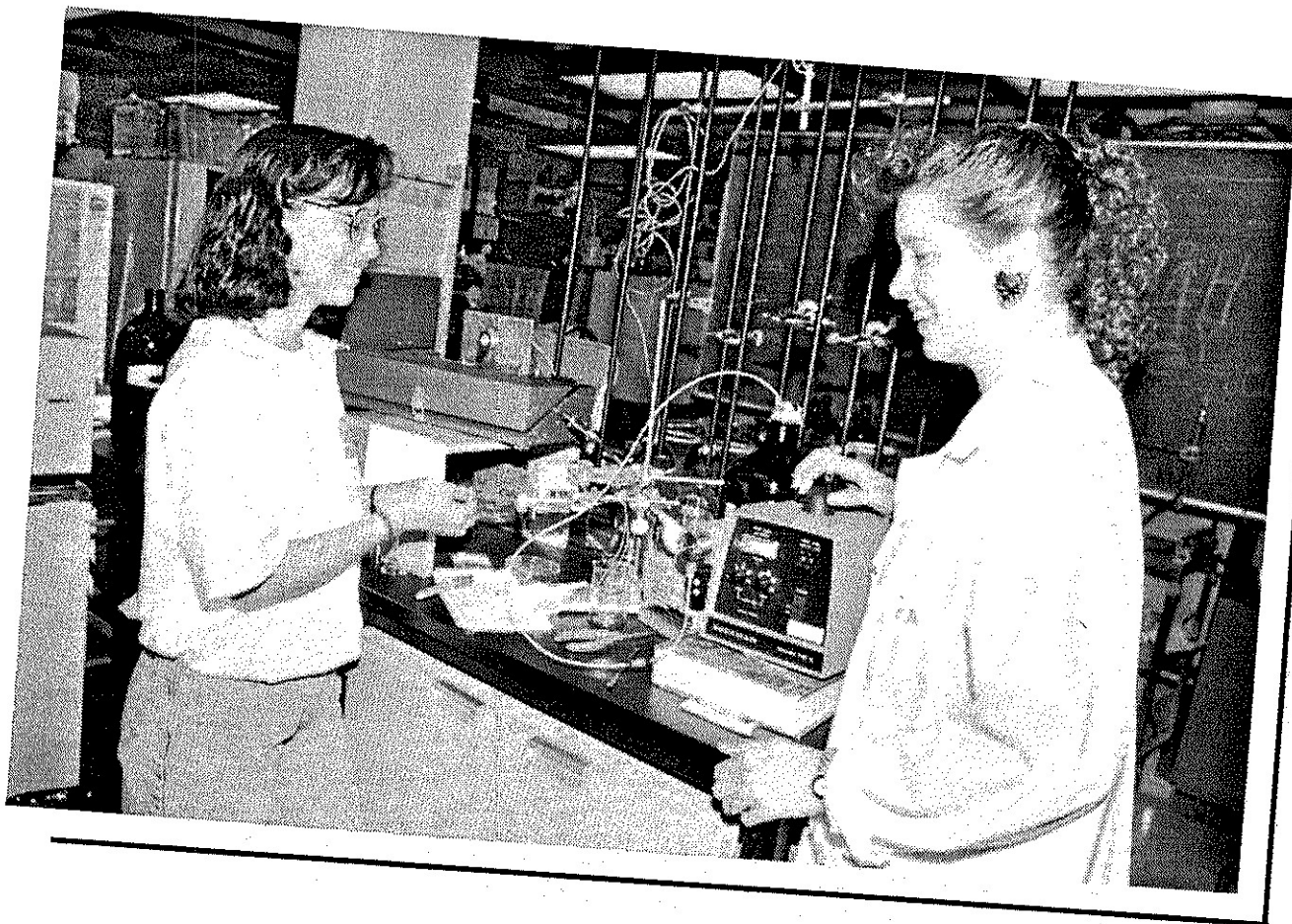
The ELISA procedure which we used requires no radioactive isotopes or centrifugation (as many procedures do) instead, horseradish peroxidase, an enzyme, produces color in a solution of tetra-methyl-benzidine and hydrogen peroxide.

After conducting ELISA's it was found that the non-specific binding was actually a pH effect. Honey has a pH of approximately 3.7, the protein lining the plate is affected by the honey pH as it requires a neutral environment to be effective. To serve this purpose the honey was brought to a neutral pH by adding base. Initially this proved to be a problem. As the gluconic acid was neutralized, glucono δ lactone was produced which in turn produced more gluconic acid making the honey's pH unstable. The honey's pH was stabilized by mixing the honey with a buffer and the appropriate amount of base to form a neutral sample.

When we had solved the baffling problem of the honey ELISA's, we moved on to identify the various organic acids in honey. To identify the organic acids, we use a High Performance Liquid Chromatograph (HPLC).

An HPLC uses a column to separate different acids in a solution. The separation of acids occurs as a result of high pressure (1000 psi). An integrator prints out the results in the form of a graph showing the retention time of each acid in the column. Honey must be filtered through a sep-pak, which removes everything except the acids, before being injected into the HPLC. And then your done, or at least I was.

Outside of the lab I was a resident of MacKenzie Hall with 11 other WISEST girls. Without this I must say that I might not enjoy the program as much as I did. Constant interaction with the other girls allowed me to learn a little bit of what it was the other girls were working on and it was a lot of fun. Late night walks, movies, pizza and enough shopping to make up for all 51 participants kept us busy and made us friends.



Not to forget WISEST field trips, from the Devonian Gardens to the Greatest Show Unearthed it definitely was an experience!

Thanks WISEST, for the great summer!

Laura Schofield

* Polystyrene microtitre plates are plastic with 96 wells; 12 numbered across and 8 lettered down. Referred to as a plate.

MEANOOK BIOLOGICAL RESEARCH STATION

I feel the WISEST program was very beneficial. I learned about many different aspects of science. I experienced the tedious work along with the physically demanding. I observed how much planning and preparation goes into a scientific study. My experience through WISEST opened my eyes and made me even more eager to get into the scientific field than I previously was.

I spent the summer working at the Meanook Biological Research Station. My supervisor, Karen Yee, is a graduate student working on her Masters. She is doing a study on how the liming of lakes affects benthos invertebrates. As her assistant, I went out on the lakes sampling. This involved the use of an Eckman dredge to draw sediment from the bottom of the lake at different depths. These samples were preserved in jars and taken back to the lab. Also, during sampling, we must take pH readings of the water and secci readings (the amount of light penetration). A normal sampling day usually takes from 8:30 a.m. to 3:00 p.m. and is a great example of the physically demanding part of science.

Back at the lab I used a microscope to sort the small invertebrates (such as chinonamids, chaoboras, oligocheates, amphipods etc.) from the sediment. This was tedious work, but often rewarding, especially when you find something new. The invertebrates had to be sorted by species and then Karen had to count them all. In one small jar we found 972 chinonamids.

Along with helping Karen, I also assisted many of the other students at Meanook. Trevor Miller is a university student who helps with a study on fish distribution. I helped him empty his nets and traps. He mainly catches siskow, ling, walleye, pike and perch after he catches the fish, he must cut them up and analyze the gut content. I was pleased I didn't have to assist him with the later. Hilary is another graduate student who works with fish, she studies the behavior (mostly mating) of fathead minnows. I watched her minnows and tallied how many times they performed such behaviors as chasing, cleaning, encountering and foraging. I feel the most interesting part of scientific study is behavior.

There is a large liming project which has been going on for a number of years. Many people are involved in different aspects of this project. There are four scuba divers - Alec, Kevin, Rhys and Craig, who take samples of the water and sediment using peepers. They then have to bottle the water they receive and run tests, such as phosphorous, on the samples. They also sample macrophytes, but I did not observe this type of sampling.



The last study that I assisted with was a study on small mammals. Ainsley, a graduate student, monitors the small mammals that inhabit fence rows. The assistance I gave her was to dig traps with post hole digger. She had 400 traps to dig - by hand.

I had a fulfilling summer at Meanook. I not only learned many aspects of science, but was taught how to waterski and drive a motorboat. I met some nice, entertaining, intelligent people who taught me a lot. Thanks to the people at Meanook and the WISEST program. I had a wonderful summer full of learning and definitely a lot of fun.

-Stacy Gallaway-

WISEST Summer Report

Philina Lee

This summer I had the opportunity to work with Dr. G. W. Stemke in the field of microbiology. The goal of my project was to produce vast quantities of bacterial *plasmids* (DNA) through the following procedure:

1. Modifying existing plasmid DNA by *digesting* (cutting) it with enzymes and incorporating in a new segment into it
2. Replicating the modified plasmid through PCR (*Polymerase Chain Reaction*)
3. Placing it in live *Ureaplasma* bacteria
4. Purifying out the product through a process involving repeated centrifuging and the addition of dense substances such as phenol and chloroform



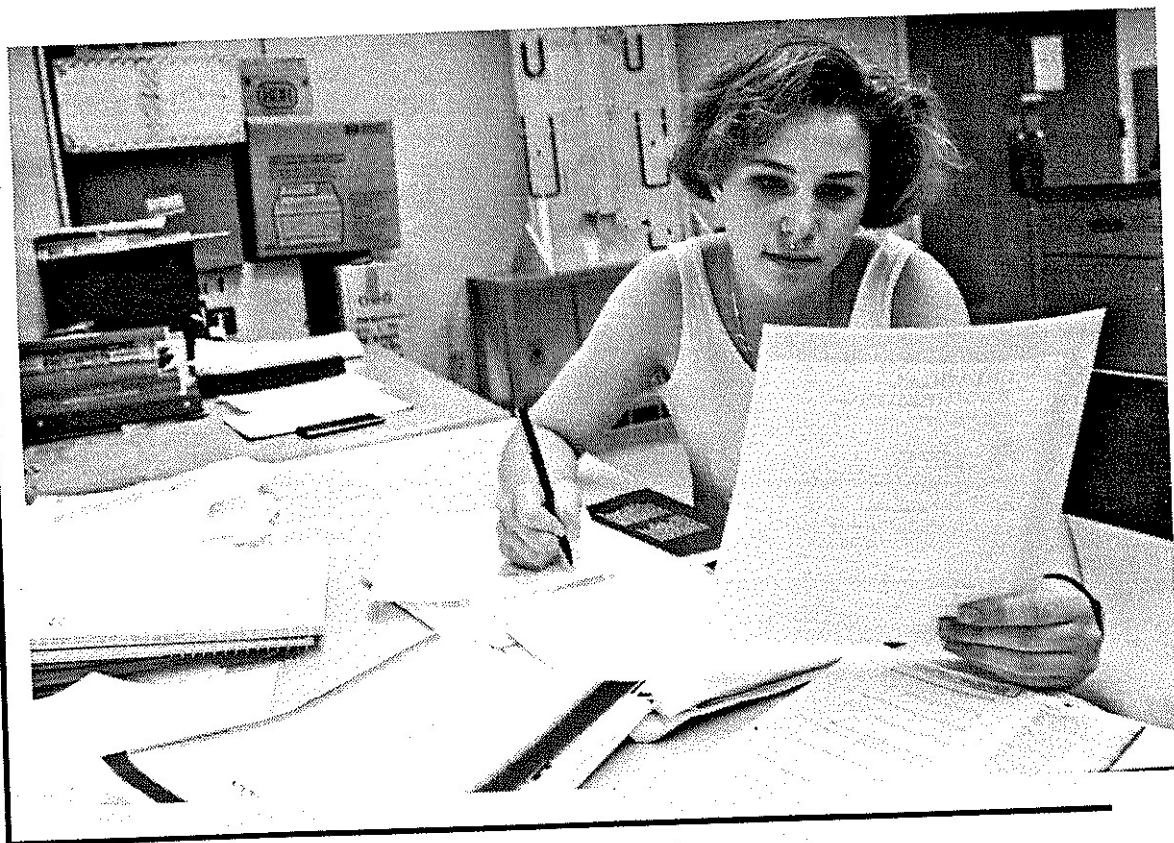
The engineered DNA that I produced will be applied to further experimentation, in which it will be utilized for the base (nucleotide) sequencing of bacterial DNA.

In the duration of my project I learned a variety of methods employed by microbiologists and geneticists: how to work everyday laboratory equipment, the importance of sterile technique, and how scientists analyze DNA in order to further understanding of the organisms involved as well as of the character of nature's hereditary instrument. I also found that procedures which seemed appalling in their complexity and length became easier to follow. These skills were especially valuable in that I can better understand the processes involved when these experiments are described in books.

Apart from gaining knowledge on genetics, bacteria, and the skills to work a lot of new-fangled machinery, I also learned about the working world: interacting with people of different ages and levels of experience - an interesting encounter after the regularities of the classroom, cash benefits, long waits, learning from mistakes, the satisfaction of contributing to cutting-edge research, and the rigors of waking daily at 7:00 AM! Also, experiencing the inner workings of a research laboratory makes lab work seem less intimidating. It was great to actually be working hands-on with equipment that I had only read about previously.

Overall, the program was a terrific experience for learning, participating in the work, feeding my interest in genetic engineering, and earning money for the worthy cause of a trip to New York!

I'm Joanne Zapisocki and I worked with Dr. Kresta in the field of Chemical Engineering this summer. Throughout my summer I had various jobs, most of which included library research. In total I had four different projects -- each very different than the other. The first project I had included going over children's books of the grades one and five levels to find books that could be read to kids



and that could be related to science and engineering. Most of the good books that I found were about the environment or easy to read books about scientists. The second project I had included going over a magazine's table of contents in ten year intervals to determine the change in article emphasis. Encouragingly the shift favoured articles written about the environment. In 1965, the year I started my study there weren't hardly any articles on the environment, but by 1992 almost every article had something about environmental impact. My third project included going over the new Physics 20 STS program of studies and finding experiments that could be done to illustrate the concepts. I did this because Dr. Kresta is conducting a workshop in the fall and she needed this information for it. My fourth project was my favourite. I went to different labs with different Graduate students and I learned a lot about the equipment and procedures that were used. All in all my experience with WISEST was a positive one and because of WISEST this is one summer that I will never forget.

A Summer to Remember

by Tinh Phung

For the past six weeks I have had the great privilege to work for Dr. T.M. Allen in the department of Pharmacology under the supervision of Christian Hansen.

Dr. Allen's lab is involved in finding ways in which drugs can be effectively and specifically delivered to cancer cells in the body. Liposomes, which are made up of phospholipids (the same molecules that form the membranes of all animal cells), are used to carry anticancer, or other, drugs in their water-like interiors. However, because they are treated like foreign particles, liposomes can not easily reach cancer cells as the liposomes are rapidly removed by the body's immune system. Incorporation of polyethylene glycol-derivatized phospholipids into liposomes (Stealth liposomes) results in enhanced therapeutic efficacy of their entrapped drug by imparting to liposomes the ability to evade the body's immune system (ie. mononuclear phagocytotic system (MPS)) and remain in the circulation for prolonged periods of time. Antibodies can be conjugated to these long-circulating liposomes to make immunoliposomes which can then be targeted to the cancer cells. Immunoliposomes, carrying anticancer drugs, can then recognize and bind to the cancer cells, resulting in the death of the cancer cells.

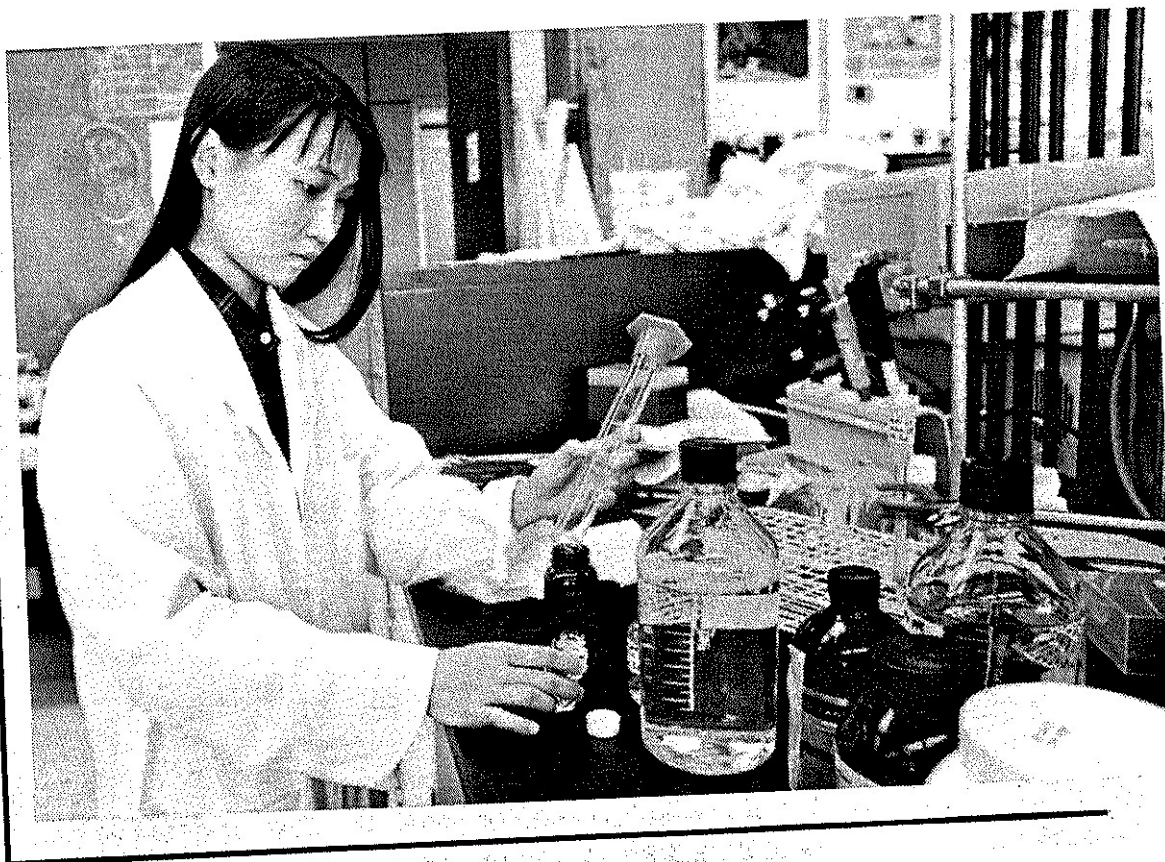
Research in the lab this summer included experiments to improve on methods for antibody attachment, drug loading, and liposome formulation (Drug Delivery System). I was involved with liposome preparation, conjugation procedures, and loading of the anticancer drug, Doxorubicin (DOX) into liposomes. But for the most part, I was involved in developing a fluorescamine protein assay to detect minute amounts of antibody proteins attached to the liposomes. As well, I help standardize an assay to determine the amount of DOX inside liposomes.

We needed to develop and optimize a protein assay that is able to detect the small quantities of antibodies bound to liposomes. A good sensitive method is fluorescence. The compound, fluorescamine becomes fluorescent when it attaches to proteins and is able to be detected on a fluorimeter at very low levels. We found that fluorescence does work to detect antibodies bound to liposomes and that we can detect antibody at levels as low as 5 $\mu\text{g/mL}$. As well, we had to find the best solvent to delipidate the solution of liposomes because the lipid interferes with the fluorescent readings. We confirmed that ethanol was our best choice. Also we established that a 1:1:1 ratio was the most appropriate ratio between the fluorescamine in acetonitrile, sample in buffer (at $>1\text{mM}$ lipid), and ethanol. Based on this information we produced a standard curve that corresponded with the protein concentration of our liposome samples. Best results were obtained with the following procedure. A series of dilutions is made to the protein-containing samples from 5 $\mu\text{g/mL}$ to 80 $\mu\text{g/mL}$. Fluorescamine is dissolved in acetonitrile to make a solution that is later added to each of the diluted samples. The samples are then set aside to mix for thirty minutes. Ethanol is added to each of the samples to delipidate the solution of liposomes. Samples are read on the fluorescence spectrophotometer with excitation wavelength set at 395 nm and emission wavelength set at 475 nm.

Results from the readings are graphed on a computer to make a standard curve so that the amount of protein on the liposomes can be determined based on the standard curve.

The WISEST experience has been both extremely beneficial and rewarding. It provided me with the opportunity to gain valuable insight into research and learn many techniques, as well as the functions of various equipment. Not only, did I acquire new knowledge and skills, but also I made new friends and have accustomed myself to the university campus.

Thanks to WISEST and Dr. Allen's lab, I had the most fulfilling job and most memorable summer.



ISOLATING A CELL ADHESION MOLECULE

Hi! My name is Jennifer Wagner and for the past six weeks I have been working in the Department of Zoology under my supervisor, Dr. Warren Gallin. To many people, the term Zoology refers to animals, but in this lab we work indirectly with animals. We use basic molecular cloning methods and usually we only work with the DNA from animals.

My project was aiding Dr. Gallin and Anita Hui in the search for a cadherin within the jellyfish, *Polyorchis penicillatus*. A cadherin is a calcium dependent cell adhesion molecule. Cadherins are important because they are the molecules that allow cells to adhere to each other. We are trying to isolate the cell adhesion molecule within a jellyfish because jellyfish are very primitive, and therefore, they should have a very simple cell adhesion molecule.

In order to isolate this cell adhesion molecule, various methods and procedures are used. We start by doing a ligation. This is where you join *Polyorchis* DNA and bacterial DNA to form a round plasmid. Many plasmids are made in this process. Then you take these plasmids and move or transform them into bacterial cells. This transformation can be done either by electroporation or calcium shock. After the plasmid DNA is in bacterial cells, the cells are allowed to grow so that millions of copies of the plasmid DNA will be available. Miniprepping is the next step. This is where you isolate just the plasmid DNA from the bacterial cells. After miniprepping, you digest or cut the plasmid DNA using specific enzymes. These restriction enzymes are specific to certain bases, so they will only cut when they recognize the proper DNA sequence. In order to see the sizes of the cut DNA that you have after digestion, you do electrophoresis. This process will spread out the digested DNA and separate it into bands according to size. To see the bands of DNA that are made, you use UV light. The next step is to set up what is called a Southern Blot. This is where you take the DNA from the gel electrophoresis and transfer it onto a nylon membrane. Following this transfer, we must probe the nylon membrane. The probe was made using a chicken template for a cell adhesion molecule. When the radioactive probe is placed with the nylon membrane that contains the *Polyorchis* DNA, hopefully, the probe will hybridize or link to the DNA. If this happens, the *Polyorchis* cell adhesion molecule could be in the DNA that hybridized. The last step is to expose the nylon membrane on x-ray film so that hybridization can be noticed.

We are now at the point where the probe has hybridized to the *Polyorchis* DNA. This, however, does not mean that we have isolated the cell adhesion molecule. There could be millions of molecules, that are the same size as the cell adhesion molecule, that appear to be hybridizing. So now the molecules which appear to have hybridized have to be subpooled. We have to take all of the molecules in that hybridized area and use them as the inserts in the ligation. Then we have to repeat the whole process, from ligation to probing, to see which molecules now hybridize. We repeat this until we are left with the one hybridizing cell adhesion molecule that we have been looking for.



My experiences in the WISEST program are too numerous to go into great detail. The first two weeks at work, I have to admit, I was quite lost! Dr. Gallin spoke to me about what was happening in the lab, but at that time, with all of the information that I was receiving, it was about as clear as mud. At the first couple of lab meetings, I was lost too. But by about the third week I was starting to catch on. Overall, my six weeks were fantastic! I learned many things and I had a great time. I don't think I made any major mistakes during my stay, although Dr. Gallin sometimes wondered what I was doing. But, not to worry, I had everything under control! I want to thank Dr. Gallin for having me at his lab for the six weeks and for helping me out with this report. I also want to thank my lab friends Lynne, Anita, Dave, Bohdana, and Tim for all of their help, guidance, and sharing of their knowledge. They really taught me what research is all about and I've come to appreciate it greatly. Probably the biggest bonus of this whole WISEST program is that I met so many new friends at the lab and in the program. They are now familiar faces that I know I'll be looking for in a year. Best of luck in all that you do and don't give up on your dreams!

Biochemistry: Working With Mutations

I worked in the Department of Biochemistry under Dr. Susan Rosenberg. Dr. Rosenberg and her colleagues are researching molecular mechanism(s) for homologous recombination and adaptive mutation in *Escherichia coli*.

There are two basic types of mutations. Darwinian mutations: mutations that probably occur by errors made during DNA replication; and adaptive mutation: mutations that arise growth independently when cells are challenged with environmental stress(selective conditions). Environmental stress can range from temperature sensitivity to starvation due to lack of digestive enzymes for the food present. Cells arising growth independently means that the cells are not growing or dividing on the plate. Darwinian mutations normally occur during growth, so if growth is stopped then any mutations that occur must be occurring adaptively.

Dr. Rosenberg's lab has previously showed that the accumulation of adaptive mutants is dependant on a functional rec B protein. The rec B protein is essential for homologous recombination in *E. coli*, that is, when two pieces of DNA exchange information. My experiments were designed to answer the following question: since adaptive mutation is dependent on a functional rec B protein, would an *E. coli* strain lacking this essential protein also be deficient in Darwinian mutation?



I used a strain of *E. coli* bacteria that had a mutation that made it sensitive or unable to use lactose as a carbon source (for food). This was my wildtype bacteria. I would plate out these lactose sensitive bacteria onto plates that contained only lactose as a carbon source. Two days after plating out these bacteria, I would begin to see revertant colonies, or colonies that had undergone adaptive mutations in order to digest lactose for food. Each day more revertants would appear, in other words, wildtype bacteria accumulate under selective conditions in a time dependent manner.

On some of these plates, after day two, there were high numbers of revertant colonies. These colonies or jackpots grew due to early Darwinian mutations that occurred during growth of the overnight culture. If many colonies grew on the first or second day, then a Darwinian mutation probably occurred early in the growth of the overnight culture. I could observe the jackpots because of these high numbers of lactose colonies that appeared on the second day. On the other hand, if the Darwinian mutation occurred late in growth, it would be obscured by the adaptive mutations also occurring from the minute the cells were plated, therefore no jackpot would be noticed.

Since I wanted to see if Darwinian mutations are dependant on a functional rec B protein, I repeated these experiments using a strain of bacteria that had a mutation which inhibited the rec B protein. I found that there was no significant difference between the number of Darwinian mutations that occurred on wildtype and rec B bacteria. In other words, an inhibited rec B protein does not significantly change the number of Darwinian mutations that occur. These experiments will have to be repeated many times to make sure there is no major difference of Darwinian mutations between these two strains.

I feel that WISEST is one of the best things that has ever happened to me. I want to thank all those that made my second summer at WISEST possible, I am now sure that I have made the right decision when it comes to my career. I must thank everybody in the lab, Dr. Rosenberg, my supervisor, Reuben and Simonne, for explaining and helping me with my project, Sue and Christinia, for keeping away boredom, Greg, for enlightening conversations, and Heidi, for the company while we awaited our acceptances. I wish all my fellow WISEST students good luck in the future and thanks again to everyone at WISEST.

Wisest Written Report - By Vivian Mak

This summer I was given the chance to participate in the Wisest Summer Research Program. Before I started work I was thrilled to be given such a unique opportunity. I had some expectations about the program, many of which were fulfilled. To me, these six weeks were quite a learning experience. Through my involvement with the research of duck hepatitis, I have conducted various laboratory tests, learned to use different equipment, and met lots of people in the University while pursuing my own interests.

I worked in the Department of Pathology at the University of Alberta. I was also involved with a hepatitis-B research team. This team studies the effects of antiviral agents against hepatitis-B virus using a duck model. For my project, I studied tissue that was harvested from ducks treated in 1991 with dddAPR (2', 3'- dideoxy diaminopurine riboside). During treatment, ducks were sacrificed at different intervals. We collected their tissue from various organs in order to study the effect of the treatment. Then I used an immunohistochemical method called immunoperoxidase to determine the existence of an extra-hepatic (outside the liver) infection and found out if the dddAPR would clear any of this infection. First, I cut the tissue into pieces four micrometers thick and placed them onto slides. Then I performed the immunoperoxidase staining procedure on the tissue sections. When I finished, I examined the tissue under a microscope and took note of the number of cells that stained brown to determine how positive the tissue was. If a large percentage of the cells were stained brown, it would denote a strong infection. Also, the more intense the brown stain was, the more positive were the cells.

One of my immunoperoxidases proved to be very intriguing. I was trying to detect hepatitis-B virus antigens in the spleen, since an article published by another research group indicated that they found viral antigens present in certain spleen cell types. In the end, I found evidence of hepatitis-B virus antigens in the spleen. Surprisingly, I observed more positive antigens in a sixteen week treated duck than in a sixteen week placebo.

I had a few other minor projects in the lab. One of them was the agarose gel electrophoresis. The department of Pathology had some duck hepatitis-B virus DNA inserted into a pUC DNA vector that was sitting in their fridge for a long time. They wanted to ensure the integrity of the DNA, so they asked me to do a gel electrophoresis. This was done by digesting the DNA at known sites and running the digested DNA through the agarose gel. The agarose gel electrophoresis verifies the base pair length. If the position of my digested DNA matched the known positions it would mean that my DNA was still intact and had not been digested by enzymes before the experiment. Luckily, I had this outcome.

My next project was a dot blot hybridization. I prepared a duck hepatitis-B DNA probe for in situ hybridization. I used the dot blot hybridization technique to quantitate the probe and determine its sensitivity and specificity. The result of this experiment turned out to be encouraging because my probe was sensitive and specific.

This summer I learned how to use some equipment in the laboratory such as a vortex, a centrifuge and a microtome. I have been taught how to use "Medline". This is a CD Rom which helps users locate the journals they want. This is very practical and useful because I know how and where to get necessary information for future essays and term papers.

From this job, I was able to meet many people. There were several friendly individuals in my lab who were willing to help me and teach me about their work. I appreciate the time and effort they spent to guide me through these six weeks. Through the various social functions organized by Wisest, I have met the other participants on different occasions. We had outings that included trips to Devon Botanic Gardens, a wiener roast and even the Dinosaur World Tour. We met people with non-traditional careers in the University, visited labs on campus and ate lunches together. All these events were well organized and enjoyable.

When I first came to work for Wisest, I had hoped to explore the field of medicine. Wisest provided me with this chance because I was able to talk to other students, researchers, lab technicians and doctors that I worked with about their professions and my areas of interest. I was also allowed to view and join in their work. For example, I was able to watch a liver biopsy on a duck, I was permitted to inject the ducks with the chemicals they were being treated with, and I was granted to watch gross pathology done in the surgical suite of the hospital. My most memorable experience of this summer was watching an autopsy. I walked into the morgue, a little apprehensive, but in the end I found it extremely fascinating. As a matter of fact, I even took part in the autopsy by helping the doctor cut the tissue he needed. I learned several things about anatomy that day.

Wisest has provided me with a terrific experience this summer. I discovered many things about the University, the Department of Pathology, the field of medicine and the Wisest program. I feel very lucky to be chosen to participate in this program as it has enhanced my life a great deal.



Being accepted into the WISEST Summer Research Program was a dream come true for me. Not only would I have a job for the summer but I'd also get experience in the field of Animal Science, which thrilled me because I love animals and am considering perhaps pursuing veterinary medicine in University.

When I first arrived at the Poultry Research Center at the University Research farm, my first thought was "Am I really going to spend six weeks inhaling this (pardon the pun) fowl odor!" You see, I'm a city girl and had never been on a farm before. Thank goodness after two days, I no longer noticed the smell although I'm sure the girls in residence wondered where the strange odor of Kentucky Fried Chicken was coming from everyday.

I think my first week was the most difficult and it resulted in toughening me up a lot. There quite a few things that at first I found unpleasant to do. I didn't like carrying dead chickens and watching someone have to kill a chicken because it was sick. But after a while I learned to distance myself and put things into perspective. After all, if I want to be a vet I'm going to see many animals in pain and have to make the best decision for their sake, despite me feelings. Once I managed this, I really began to enjoy working on the farm. The people I worked with were great and made everyday interesting. They also taught how to laugh making even disgusting jobs bearable. I have to say that the worst job was weighing the chickens because we had to hang them upside down and they weren't to fond of that. Believe me, I learned pretty quickly why everyone there wears overalls. Protection!!

Everyday of the week had a special chore that had to be done. Monday was for egg weighing, Tuesday for artificial insemination, Wednesday for weighing birds, and Thursday and Friday for weighing out feed for the weekend. I loved to collect the eggs because the hens were always so warm, even though I did receive a few unfriendly pecks. I was also excited when I finally got to hold a baby chick. I was amazed at how tiny and soft they were and how fast they grew. After just one weekend I noticed they were already losing the fuzzy yellow down on their wings and replacing it with white feathers.

I really didn't have a research project of my own. I was more of a helper, doing whatever needed to be done. However, My supervisor, Dr. Feddes, did want me to observe if chickens would use a scale in their pen. He wanted to design some way of weighing chickens and separating them into uniform groups according to weight, which would be very useful for industry. I tried various ways of setting up the pen to make the chickens walk across the scale. The most successful way was dividing the pen into half with the scale the only way across to the other side. Then I put all the chickens on one side and the food on the other. I also made the observation that it was no problem getting a chicken onto the scale. It was figuring out how to get the chicken off. The chickens had a tendency to fall asleep on it!



This summer was an experience I will never forget and even though I still haven't decided on what to take in University, I have had a taste of University life and know I enjoy it. Thanks WISEST!

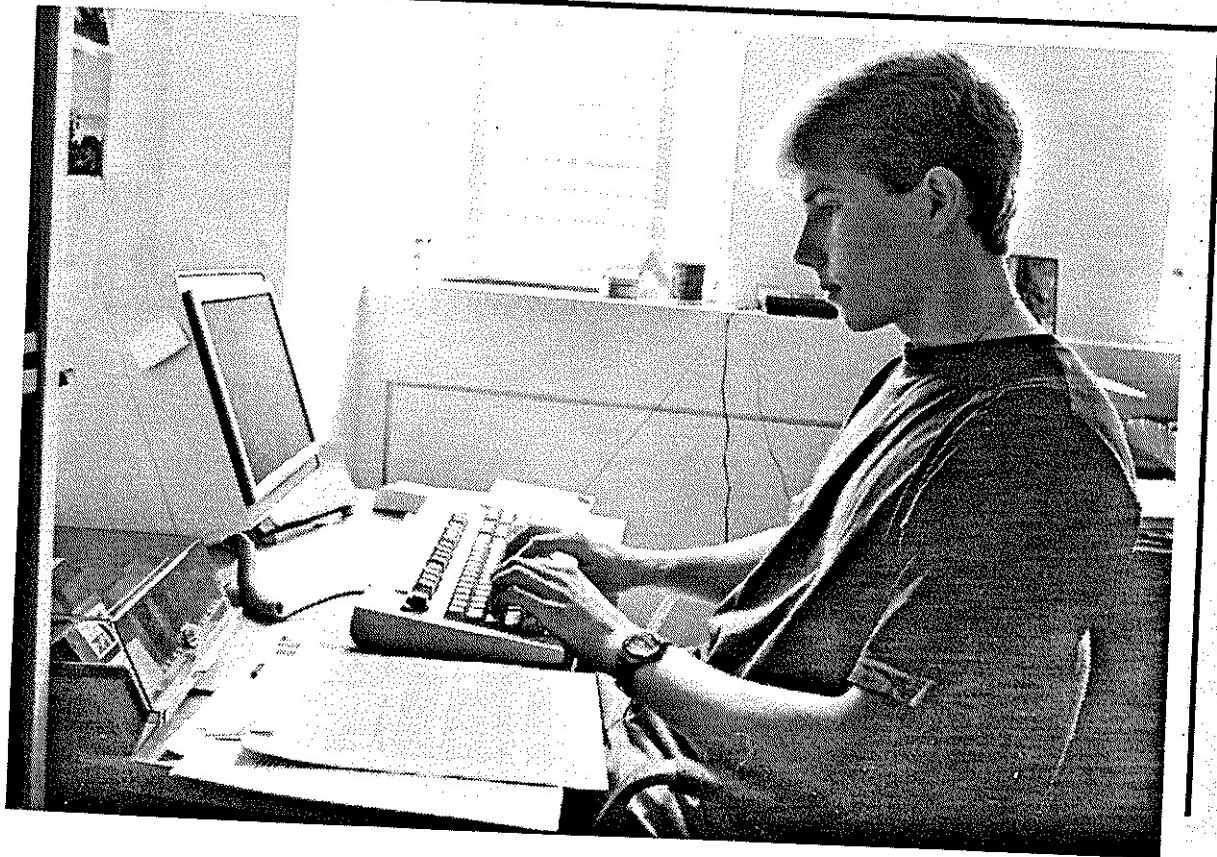
Catherine Masters

Final Report

Well, what can I say ? I don't suppose this is what I had expected to be doing. Then again, what did I expect to be doing in the field of Nursing. Technically, I was a research assistant, realistically I was a go-for. I now know the university library system better than I could ever have hoped for. My supervisor would find the material or sources, and I would go get it. However, I suppose I should discuss briefly (as I know very little about them) what my supervisors are researching. Dr. Marion Allen is currently conducting a historical study on blindness. It covers all possible aspects of blindness from the religious and cultural point of view to the educational side. If you can imagine, there are a lot of books and journals to get in this one. Of course, not all of my time is spent in the libraries. When I'm not there I'm typing in data on the computer, back in the office. In a nut shell that's what I do for Marion Allen, and when I switch over to Dr. Olive Yonge, its not much different. More libraries, more computers, more data. Of course, Dr. Yonge is a little more resourceful in finding things for me to do, adding to the list of duties any possible odd job she can think of.

So there's my report, probably pretty shabby compared to all the others in bio-engineering and nuclear physics or whatever else. But before I leave the program I would like to add that I learned a lot. I couldn't think of a better job for the same rate of pay. My supervisors were wonderful, always kind and patient, and really made me feel at ease. Over the last six weeks, I have grown quite fond of this university, as confusing as it may seem at first. A small part of me is going to miss coming here every day (except for the part that has to wake up every morning). To those reading this who may be considering applying , you won't regret it (and the 1000 bucks doesn't hurt either).

Marc Vanderwekken



Bonjour! My name is Eddie L'Eprouvette (Teddy the Testube for those of you who prefer English). I'm new to the limnology lab -I replaced one of the testubes that Erin broke the week before last, and I'd like to share my first experiences in the lab with you.

Voici! Here I am in the testube rack. Wait, what's this that Jen is pouring into me? It's wet and kind of green. It is...je ne sais quoi...water? Whoa!! We're moving! Where are we going? Oh la la!! Hot Hot!!....

(1 hour later) I have just come out of the autoclave, or as we call it, 'the sauna'. Here come Jen and Erin, the WISEST students, with the reagents to test for phosphorus. Oh zut!! I'm turning blue! My buddy Tim says that that means the water contains a large amount of phosphorus. From what I hear this is not good, because lots of phosphorus means 'beaucoup d'algae' which means green, slimy water. Now Erin is pouring out my water to read the colour intensity on the spectrometer (better known as the spec). Au revoir water!

Cough, cough!! I just got doused with water and I'm no longer blue. C'est bien! But wait, now Jen is putting some bits of green, used filter paper in me! This must be the test for chlorophyll that Tim told me about. Next come a couple of squirts of **ETHANOL**!!.....

Salut! I'm back. I don't quite remember what just happened. (I was feeling a little intoxicated -I'm still a novice.) Supposedly, the ethanol dissolved the chlorophyll off of the filter paper, I was put in the fridge for a time and then the colour was read, once again, on the spec. This will indicate the amount of phytoplankton found in the water.

Now they are cleaning me in the **ACID** bath?!?! This might hurt. (several hours later) Youppee!! Jen is taking me out of the acid bath! I get rinsed SEVEN times with distilled and de-ionized water (poor Jen) and I'm ready to be used for the silica test.

Silica tests determine how much of this nutrient is available for diatoms to use for the construction of their

shells. Jen and Erin add a series of reagents and samples of water at specific time intervals, and then read the colour intensity on the famous spec. What a useful machine!!

Acid bath 'encore'-I think I'm getting the hang of this! And 'voila'!!! Here comes Jen again to rinse me off. Is she ever here 'de bonne heure'!! (early)

Maintenant, Erin is feeding me some sample that has been centrifuged (it tastes horrible!). Presently, I am being placed into a bright machine. She will compare the colour of my water to a standardized colour disk in order to get a numerical value. If the colour of the water is very light the value can also be obtained by using the incredible spec.

Bet you can guess what comes next!! That's right! **ACID BATH!**

Finally Erin appears to pull me from the acid!! Do I ever feel waterlogged (or acid-logged as the case may be)! My next adventure comes with the turbidimeter. This machine measures the amount of light passing through a substance. It varies depending on the amount of "suspended particulate matter" in the water.

Back to the acid bath. Need I say more!!

Fortunately, the two girls can measure conductivity directly from the sample bottle. Today is my day to rest! Tres bien! The conductivity test measures the amount of hydrogen ion activity in the water.

Bonne nuit! Jen is taking me away to sleep in the cupboard. Wait! **WAIT!** I'm slipping! Aaaah!!! I knew that this life was just too good to be true! C'est la vie! **CRASH!!!**

Oh!! Sorry Eddie, but thanks so much for your insightful experiences!

As Eddie explained, after the water is collected from the lake or dugout, it undergoes numerous tests and analyses. Finally the accumulated data is entered into a computer and is graphed in order to illustrate the changes in the body of water. Appropriate actions are then initiated to regulate potential problems in the water. For example, several liming projects are presently in effect to control algal levels in particularly green

lakes.

Over the summer we had an incredible time in our lab, considering we were working with a group of middle aged science buffs. (JUST KIDDING!!) We have fond memories of playing solitaire on the computer, watching the **farmboys** at work (or rest, or play) and fighting over the radio station. We'd like to thank everyone in ~~the~~ limnology for making our experience there a very comfortable (and memorable) six weeks, and also for putting up with us and our incessant questions. A special thanks to Gertie Hutchinson for taking us under her wing (just a figure of speech) and remaining calm no matter how many mistakes we made, samples we lost or beakers we broke. WISEST provided an incredible opportunity for us and opened our eyes to great new options for our futures in science. See you again next year!! (We hope!)

THANKX AGAIN!!!

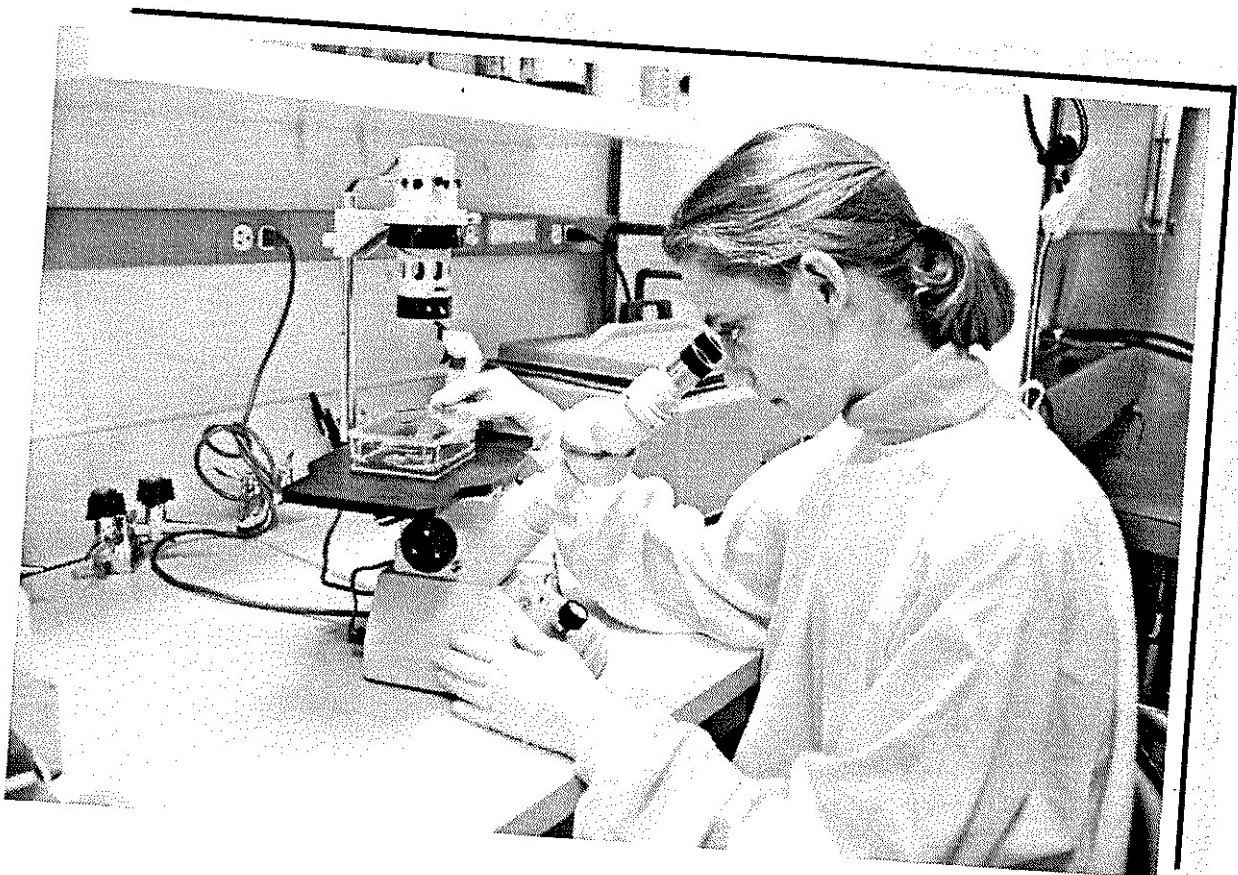
Erin Burrell
Jennifer Snart



The Cytomegalovirus Study

My involvement in the WISEST Summer Student Research Program has given me a chance to discover the many opportunities that the world of science has to offer. I have very much enjoyed my stay on campus and believe that I have been bettered as a result of it.

During my six weeks in WISEST I have been exposed to the area of Microbiology and Immunology. My supervisor during this time was Dr. J. Preiksaitis who is a medical doctor specializing in transplant patients. Although I was not given a specific project I was given the opportunity to work in a larger four year cytomegalovirus study.



Generally the cytomegalovirus (CMV) is a virus that remains latent or in other words dormant within a person who has been initially infected. When people who are CMV positive are immunosuppressed the once latent virus reactivates. Such a reactivation often proves fatal in transplant patients and often adds to the rejection of an organ. What our research is trying to prove is that the CMV virus can not be passed through blood transfusions and therefore needs not to be screened.

Basically my role in the study was to gather and prepare donor and recipient samples. Also I was given the chance to test blood samples for CMV antibodies. Thus far our study has supported the theory that the CMV infection can not be transmitted through blood transfusions.

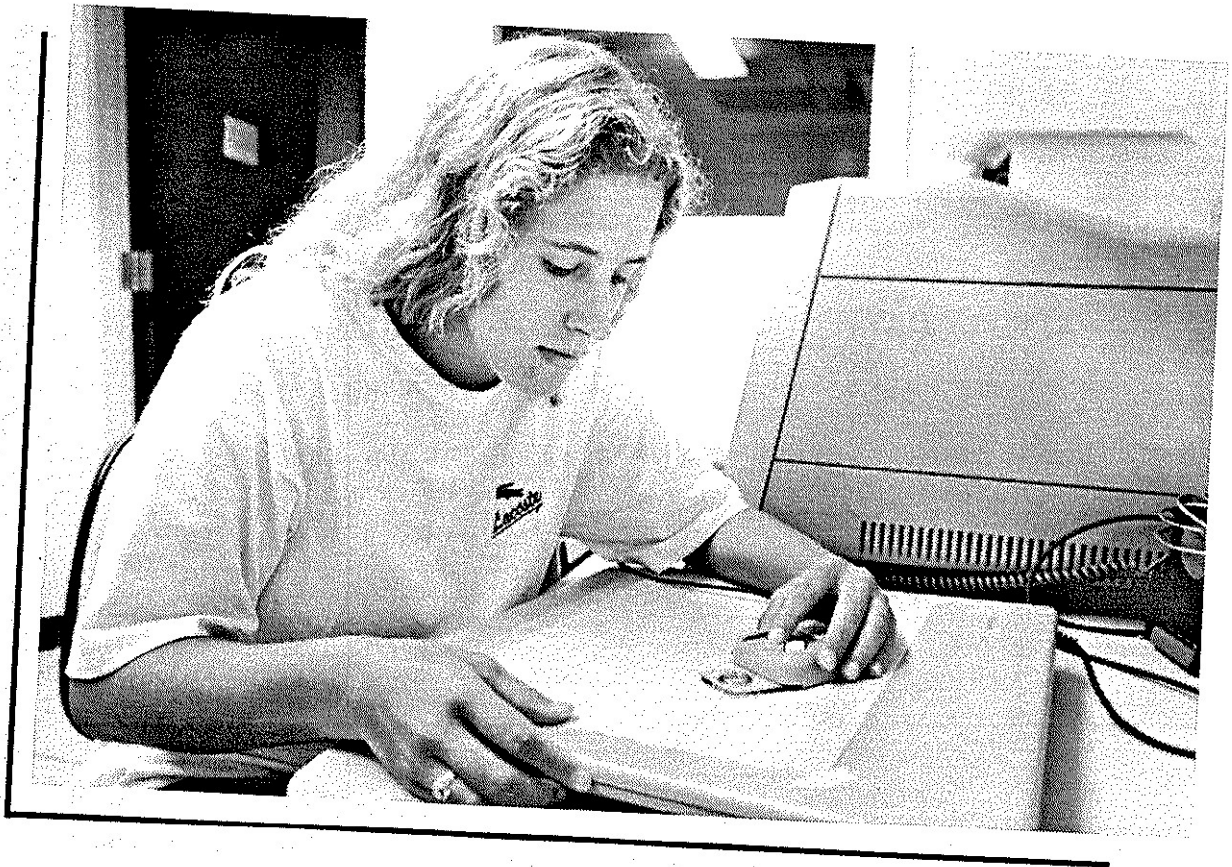
All in all I have found WISEST a challenge and a definite worthwhile project. It is in my best hopes that this project will continue, allowing others to share in the success of non-traditional roles.

- Jay Kormish

The Department of Space Physics

For six weeks of my summer, I have lived and worked deep beneath the ground in the basement of the biological sciences building studying the skies above us. Ironically, I worked with the department of physics for space research two floors below the earth's surface without a window in sight.

Space physics is the study of the interaction between the magnetic field of the earth and the solar wind. I was introduced to this area in physics for the first time when I met with my supervisor Dr. G. Rostoker. My excitement grew as I was lectured on the subject for two hours. I was able to ask anything and soak up all the information saturated into the answers given by Dr. Rostoker.



I soon learned that I was to be gathering data from satellites and then through many processes and programs use the data to form latitude profiles. The data I began with was in the form of magnetograms. My first task was to digitize these so that the data was in a form that the computer would be able to read. I had been given accounts in two computer systems and my independence in the lab. The next step was to choose a quiet day from the magnetograms for each disturbed day. The differences of the data from the two days were then found and plotted by the computer. I worked with a number of different stations in both Canada and the United States. My final step was to take one exact time during the day and plot each station's magnetic perturbation values. The graphs produced are latitude profiles.

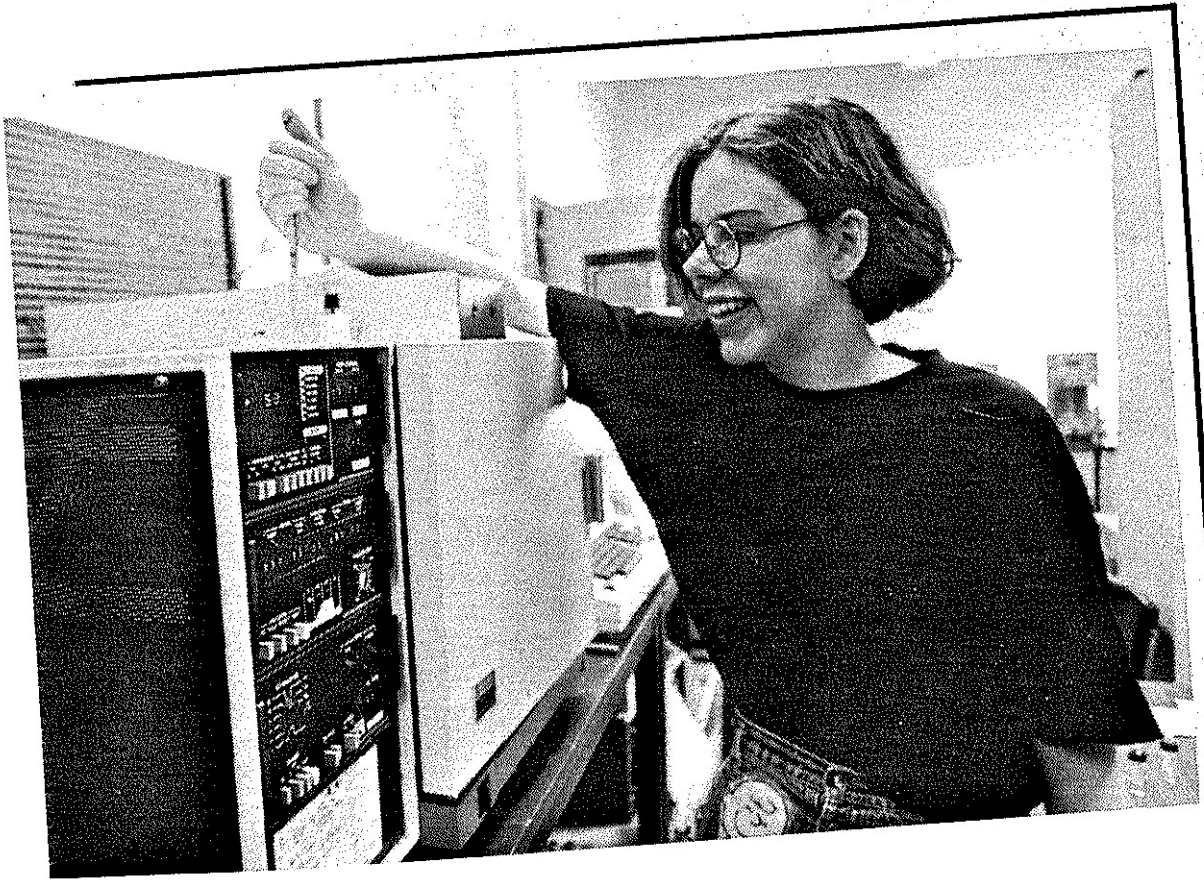
My research is one source which will be integrated into the work of Susan Skone. My graphs will help determine the position of the electrojets in the magnetic oval. I learned to analyze each latitude profile and find the outer boundaries and the centre of the electrojet by reading the maximum and minimum values for the X and Z curves. This information will be used by Susan, the graduate student with whom I worked, in the creation of her thesis on the nature of the auroral oval activity.

Overall my six weeks at the University of Alberta were very productive. I not only succeeded in increasing my knowledge on space physics but on other possible career options as well. WISEST provided me with summer employment, a campus tour, a university full of opportunities, and friends along the way!

Summer of the sexy lab coats.

In the picture here, as you may have noticed, I am not wearing my sexy lab coat. That is because I am running a GC, and if the machine were to explode, a lab coat wouldn't do much to save me. My name is Sinead, and I am a chemaholic. There is no cure for this, only treatment. At the moment, the only known treatment is to spend your summers getting up early to work for minimum wage in a chem. lab with another chemaholic, eating blue smarties. I have spent the past six weeks working in the chemistry department with Penny (a summer student and my partner in crime). We work for Dr. Tanner, and our project was to help other people with their projects by making compounds and doing a bit of math. We didn't actually have a project of our own, but I managed to learn quite a bit. I learned how to do piles of reactions that I'm sure will come in handy in my everyday life such as: a photochemical reaction, an ozonolysis, a hydrogenation, and other equally impressive sounding things. I can distill compounds, and I know all about purple smoke and what to do when it escapes from the spinning band and the entire fifth floor comes to our door to ask what the stench is. I know what to do about small, contained fires in the fume hood. All that, and I learned how to clean test tubes too! From what I've been telling you, you may think that I spent six weeks doing grub work, and you wouldn't be entirely wrong. I did a lot of dishes, but I also became quite competent at a few of the different techniques that are used in a chem. lab. I learned how to interpret a chromatograph, so if I'm ever held at gun point and asked to look at the chromatograph and tell the mobsters whether or not they have a pure compound, I will be able to do it.

I don't live in Edmonton, so I stayed in Lister Hall for the summer. It was great because I got to learn about other people's projects, and I finally met a bunch of people my age who talk about physics while they watch TV, and who see the humor of yelling "potential energy! kinetic energy!" while you're swinging. It was nice to be able to sit around and wonder how one would go about getting the oxygen out of carbon dioxide and not being considered weird for wondering. It was also nice to run screaming through the hallways like complete idiots, and make fun of the ads on TV. I made new friends and developed my social skills. I managed to turn a few of my new friends into trekkies. My mom is going to be so proud.



So I guess you could say that I got the entire WISEST experience. Yes, I worked here, slept here, ate here, and goofed off here for six weeks. Now I'm ready to go home and eat real food. It's time to throw in the sexy lab coat and move on. Not that I don't love it here, but what can I say, after we spotted Elvis at Mac's last week, I decided that this had to come to an end. Bye. Live long and prosper.

Sinead Collins

My Summer Holiday in the WISEST Program

By Anna Lee

For six weeks this summer, I worked in the department of endocrinology and metabolism under the supervision of Dr. Diane T. Finegood. In Dr. Finegood's lab, diabetes is worked with extensively. I helped the researchers in the lab with a variety of projects. It was a very interesting and educational experience.

The researchers in the lab are working on a number of different projects, mainly to see the effects of the transplantation of islets of Langerhans from the pancreas of a healthy rat to a diabetic rat. My usual tasks were to help with experiments like dog clamps, FSIGT's, OGTT's, to monitor rats (by taking blood, etc.), and to analyze these blood samples taken from the experiments for levels of glucose. I also had other related jobs such as library work and helping set up for the experiments.

The lab was a little different from what I expected. I came in on August 5th thinking I was going to work with serious people who all had PhD's. I found the researchers to be fun to work with and I met not only doctors but undergrads as well. I discovered that I could actually follow some of the conversations going on. I did not know what working with animals would be like when I first came, but soon saw that it could be fun and that the animals were not subjected to any cruelty. My knowledge of the research field and diabetes in particular broadened greatly.

This program helped me discover what it is like to work in a research lab. I gained a lot of knowledge and experience from it.

I met many intelligent (and some very strange) people through working at my lab and through my memorable stay at Lister Hall. I still haven't decided what I'm going to do when I get out of school, but I now have a clearer picture of my choices as a result of being part of the WISEST program.

Anna Lee

A WISER SUMMER WITH WISEST

When I first learned I had been chosen to work in the WISEST program with Dr. Diane T. Finegood of Endocrinology and Metabolism, I was ecstatic. I pictured working side by side with the renowned professor, collecting important data and discovering astonishing breakthroughs in the area of diabetes. I pictured sitting down for coffee with highly intelligent and learned scholars discussing human life or medicine. As I've worked for four weeks, I've discovered those images were a touch off the mark.

On the first day, I met my supervisor, Dr. Diane T. Finegood - wearing cotton shorts and sandals. I soon realized that Dr. Finegood was truly an expert in her profession, and also a very practical lady. Cotton shorts and sandals are much more practical on a hot July day than the stuffy white lab coat I expected. I also found her to be extremely relaxed, laidback, friendly and funny. I hold for her the highest regard and respect.

Sitting down for coffee with highly intelligent, learned scholars became a reality, although one could not always tell about the latter part through some of conversation.

Although I did not come close to discovering any cures for diabetes, I hope what I did was just as important in the process of diabetic research. I analyzed a lot of glucose - truly, a LOT! - I helped with and watched surgeries on the animals, I did some sewing (puppy paks), I helped with other various experiments and with odd and end jobs that were necessary. Instead of the cute bunnies I was hoping to work with, I ended up with the dreaded rats. However, after handling them, and helping with monitoring, I've developed an affection for these little critters.

I did not get my own project to work on, but rather I helped with several ongoing experiments, which is much more interesting. I've found this whole summer fun on the whole part, and know I've grown wiser from the experience.

-Y-Le Ho-



A SUMMER JOB?

When I first heard that I was accepted to work in the WISEST program, I did not know what to expect. But soon after, I found that my summer vacation "fun" was only just beginning. Under Dr. Hanne Ostergaard (and help from so MANY others) in the Department of Immunology, I had a bundle of laughs and definitely developed many skills, and learned a lot I never knew or even heard about before.

Immunology used to only mean the immune system to me, but not anymore. I had not imagined it to be so complex and many-sided, and of course, complicated. But with the MUCH needed help of everyone around me, I soon enhanced my knowledge in the field (even though I probably looked really stupid every time I asked a stupid question, with an obvious answer). And now, with being briefly introduced to Immunology, I have built an interest for the subject and hope to soon do more in it.

My first day was just a basic tour, and well, I guess . . . that went in one ear and out the other, because the following days I had to ask where something was, what something was, or how to use something every time I needed any sort of thing. I'm extremely lucky my lab did not get overly frustrated with me! But, I finally got the hang of things and made it through those days of confusion and started on my project.

In simple terms, my project was to study the morphological changes of T-cells when in contact with different antibodies coated on plastic assay plates. In the human body, there are white blood cells and red blood cells. The white blood cells have a specific group classified as lymphocytes. Included in this group of lymphocytes are the T-cells and B-cells. My project concentrated on the T-cells, which are cells that attack foreign substances or cells, called antigens (such as those cells infected with a virus or tumor cells). During the course of the six weeks, I tested the direct changes of a certain protein molecule, CD-45, which is found on the T-cells in the immune system. CD-45 is important for its enzymatic activity and is therefore responsible for splitting phosphate bonds and releasing these phosphate bonds. It is believed that this activity may somehow be linked to the shape changes of T-cells and be a very essential part of our human body system (and us functioning). If my experiments all worked out (crossing my fingers every time), I was to see whether or not CD-45 is associated with the structural changes of cells.

One part of my project was to test different antibodies to CD-45 and different cell lines containing and not containing CD-45. Different antibodies to CD-45 recognize different areas on the protein molecule, therefore by discovering which antibodies cause morphological changes, it is easier to determine which specific parts of CD-45 are related to a cell's morphology. Furthermore, I was to experiment whether different antibodies caused different phenotypes of the cells, like sending out dendrite projections (similar to those of nerve cells). By using various cell lines, I could narrow my studies down to a couple of cells instead of the ten or so I began with.

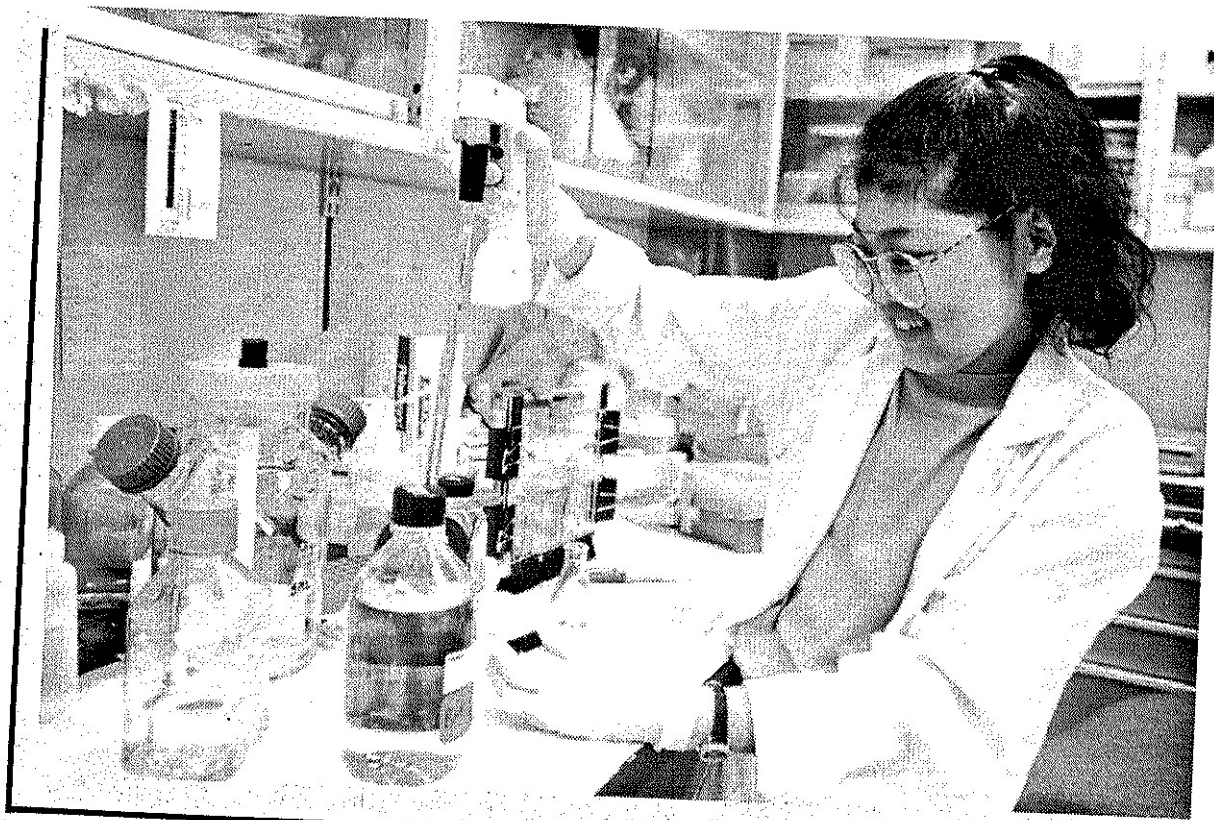
Another area of my experiment was the use of inhibitors, which, obviously, aid in inhibiting some region of activity or regulation duty of the protein molecule CD-45. The three inhibitors that I utilized were *Genistein*, *Vanadate*, and *Cytochalasin E*. The genistein inhibits the ability of CD-45 to regulate the kinase activity of the cell, which is the adding on of a phosphate group, whereas the vanadate is a phosphatase inhibitor and therefore, inhibits the breaking off of a phosphate group. On another angle, cytochalasin E inhibits the function of the cytoskeleton by causing the breakdown of it. By performing these experiments, I was able to concentrate on some very exact roles of CD-45 instead of the much broader point of view I had started with.

After I gathered evidence, I graphed my data on the computer to show general trends I had unfolded. This allowed me to further my skills on the computer and gave me the chance to use programs that I had not been familiar with. One particularly fascinating opportunity that was given to me was the viewing of a mouse surgery. Through that procedure, I was able to see a mouse spleen and thymus. Moreover during my six weeks, I was introduced to an interesting concept: taking pictures with a microscope. It was a different experience altogether, with a camera being attached to a microscope and where I could actually create something concrete out of the work I had been doing. Along the lines of producing something visual, I also ran one gel and experienced the waiting, the watching and the dish washing that came along with it.

Through this "summer job", I admit I did have a couple of boring hours, just waiting and watching. But, I soon learned that if I sat around long enough pestering others for work to do, I would be provided with something from someone (either doing computer files or standing by the milli-Q water system waiting for a twenty liter container to just about overflow or filling up the millions of pipette boxes). But, even through all those little jobs, I felt useful and felt like I was really experiencing life and work in a research lab - helping fellow workers and making the lab function properly. Plus, I can never forget that all these side jobs were made just a little better with humor from others in the lab.

Working in the Immunology lab with Dr. Ostergaard showed me how scientific research is very essential. I discovered that the morphology of T-cells is very valid in gathering other evidence on how the activity of a T-cell is carried out, how cells may travel through the body and maybe how the T-cell is activated to find foreign substances. All of these processes are very important to humans and are things happening everyday within us. This summer showed me face-up the importance of science.

All in all, I feel that my summer was really satisfying and it has been very beneficial in deciding my future career path. I got to appreciate science to a greater extent and actually see what was happening behind the dozens of textbooks. Through this eye-opener, I was given the chance to experience the importance of research and science to our normal everyday lives. But, besides all of this learning business, I met a lot of interesting people and saw the university at different perspectives. I hope this program will continue for a long time yet for all those future grade eleven's (so they can be mind boggled for a few weeks too). It was a GREAT experience and I would like to thank all those involved for giving me such a wonderful opportunity.



A Summer of Fun and Bugs
by Jackie Ham

There once was a girl named Jackie who felt the need for some direction in her life. So one day she came to work at the University of Alberta, in the Department of Entomology, for Dr. John Spence. This excited Jackie for she had never really dealt with bugs before.

Jackie also worked with a girl named Marilyn and a summer student named Stacey Rasmussen. Since Dr. Spence was a busy man, they also often worked with his assistant Nora Berg.

Together these four took care of all of the water striders in the lab. They also picked spiders and beetles from samples of dirt, counted tiny spider eggs, read weather tapes, and fed many spiders in an experiment. In addition to this, they did quite a bit of work with a plant called Tansy which was causing problems for the farmers.



Day after day they worked and on Tuesdays they travelled to George Lake to do field work. Each day around ten o'clock in the morning, Nora would come over and say, "Coffee? Sure." And so it went for six short weeks.

Then the day came for Jackie and Marilyn to leave. This was truly a sad day for Jackie had very much enjoyed her summer job. But no matter how much she liked sorting samples, her work was done there and it was time to move on.

"Thank you," she said to Dr. Spence and everyone in the Department of Entomology. "This has been one of the best summers of my life. Unfortunately, I do not share your passion for bugs, but working in an area of science has given me the direction I was looking for. I think I will become a lawyer!"

As Jackie left the Earth Sciences building that day, she thought about the two most important things that she had learned. One was that living and shopping in Edmonton for the summer could be very fun. The other was that if you allow yourself to learn about insects, you will find that they are not so bad after all. You may even discover that bugs can be our friends!

The Six Weeks I Spent in Gastroenterology

By Julie Andreotti

When I first received my letter from WISEST telling me that I had been accepted into the program and that I would be working with Dr. Bruce Yacyshyn in the department of Gastroenterology, I was not exactly sure what they meant by "patient data collected on inflammatory bowel disease". I'm sure you can imagine some of the horrific images that were conjured up in my mind! Nevertheless, I was very excited about spending my summer in Edmonton in the WISEST program.

I soon discovered that I would be carrying out a family study of Crohn's disease. Crohn's disease is an very unpleasant chronic inflammatory bowel disease that can cause symptoms ranging from severe abdominal pain, diarrhea, and appetite problems, to arthritis, liver problems, eye inflammation, and other problems. Very little is known about this disease- scientists do not know what exactly causes this illness. It is currently thought that it is a result of both genetic and environmental factors. Presently, the only way to treat Crohn's disease is through the use of medication such as anti-inflammatory drugs.

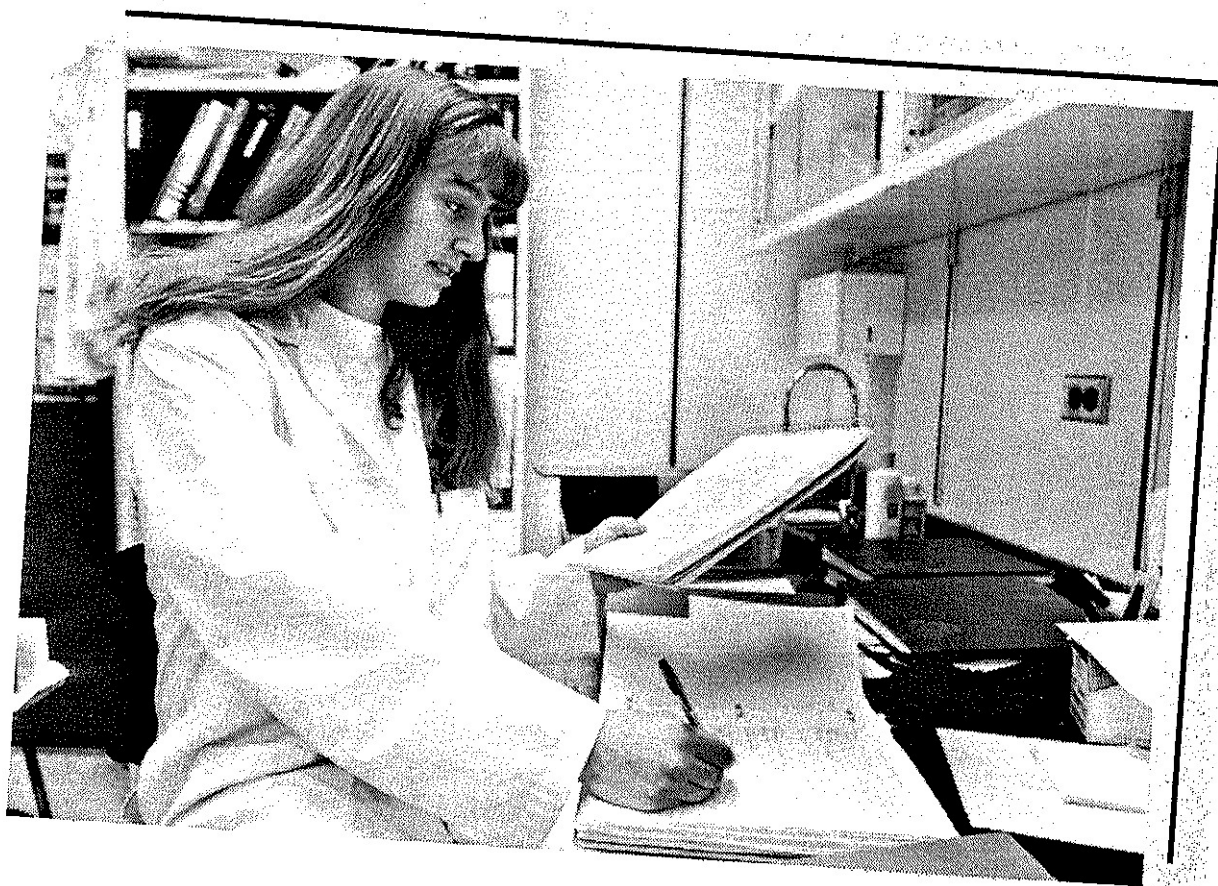
I first compiled charts of information that I had collected from the files of Crohn's patients and created a questionnaire. The next step was to call these patients to see if they would be willing to participate in the study, which involves the questionnaire, as well as a urine sample and blood test. If the patient agreed to participate, I would obtain the numbers of their close relatives to see if they would be able to take part in the study as well. The urine sample is a test for intestinal permeability. This is determined by ingesting a sugar solution containing Lactulose and Mannitol. Some studies have shown increased intestinal permeability in Crohn's patients as well as even some of their apparently unaffected relatives. Through the use of the urine test and the blood test (developed by the talented Dr. Yacyshyn and his sidekick lab technician, Kasia Matejko), Dr. Yacyshyn is hoping to obtain a better understanding of the disease, and perhaps determine who may be at a greater risk of developing Crohn's.

Aside from calling people and doing paperwork, I was able to attend a GI round (every Tuesday at lunch, people in Gastroenterology gather to discuss various things) and see various lab techniques and procedures. I was also lucky enough to see two types of surgery, endoscopic surgery (the non-gory type), and a part of the real, hack-'em-open and rip out their intestines surgery (I swear that they took at least 3 feet out of this poor guy). I also learned to use the Confocal Microscope (a very high tech laser scanning microscope).

The majority of the work done in the lab involves work with human tissue. As a result, we were not able to purify blood or

work with specimens because of the risk of hepatitis. Nevertheless, I really enjoyed working in WISEST. It certainly has given me a more accurate picture of what science, and research in particular, is like. It was very interesting to take an inside look at what medicine involves. Not only was I able to look at patient files, but spend time in Dr. Yacyshyn's office. Through this, I was able to get "a behind-the-scenes look" at the medical field (not to mention that it was also fun to walk around the hospital with a lab coat on acting like I knew what I was doing). By speaking with these patients and their families, I am much more aware of the importance of communication in the medical profession. I know that participating in this program has given me a definite advantage for when I enter university. I am much more comfortable and familiar with the campus and I have had a chance to live on my own at Lister Hall. I certainly have met some interesting (and some very strange) new friends through this experience, and have gained valuable knowledge and experiences I could never have found in High School. I would like to thank everybody (Dr. Yacyshyn, Kasia, Salima, Dorothy, Margaret-Ann, and everybody else) for having the guts (unlike that poor guy!) to actually put up with me for 6 weeks.

Julie Andreotti



Life With the Bugs
by Marilyn Zinner

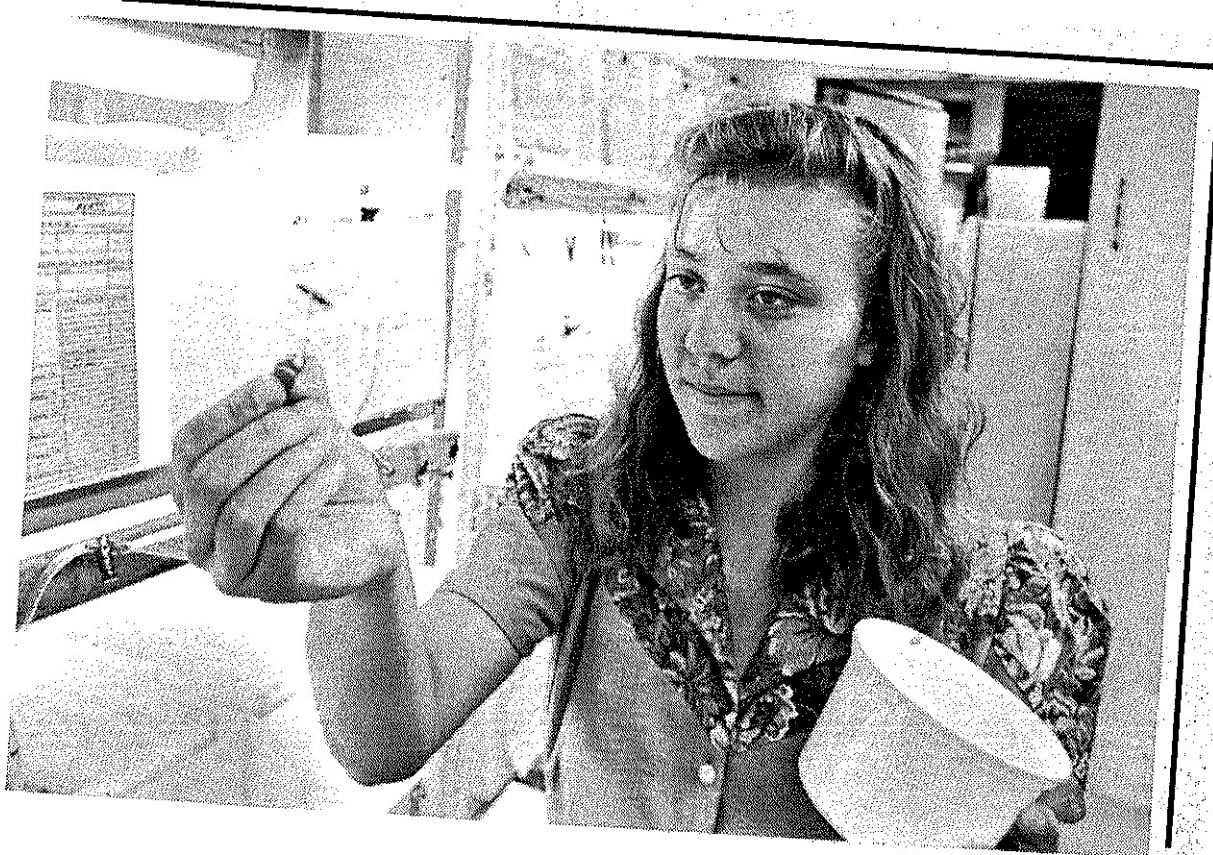
My summer research job with WISEST gave me the ideal opportunity to view science in action while working for Dr. John Spence in the department of Entomology. Not only did I have the opportunity to observe how research is done but I also had ample opportunity for hands-on experience.

During my six weeks of work I discovered what it was like to work with insects on a regular basis. This included sloshing around with chest waders in a swampy pond on a blustery, rainy day searching for elusive water water striders. We did this every Tuesday, no matter what the weather, at a University field site called George Lake. We had two separate research ponds out there that I spent time in. Each of the adult water striders which we caught was given either one or two dots of paint of a certain color for that week. The number of males and females of each species (there were three different species on the ponds) was recorded and then they were once again returned to the ponds.

Back at the University campus the project done on the water striders involved cleaning and feeding four rooms of water striders every Monday, Wednesday, and Friday morning. Tuesday and Thursday mornings were spent shutting down some tubs of the different cultures and making certain all the tubs were filled with water and clean. Throughout the six weeks at least three different experiments were conducted which involved many male/female pairs of a certain species of water striders. These pairs were left to mate and then the

eggs were counted and recorded as to whether they were fertilized and whether they had hatched.

Although this is a very brief description of life in an Entomology lab, I hope it does help the understanding of a quite different area of Science. Working in a lab with Entomologists helped me to see beyond life at our level to how life operates so intricately at such a small level. The experiences gained also helped me sort out how science can fit into my life and in what way I want to pursue Science in the future. I can now better understand how these areas of science operate and can now make an educated decision on the career I wish to pursue after grade twelve. I thank WISEST and Dr. Spence and those I worked with for this.



MEDICINE/CARDIOLOGY

Atherosclerosis. Canada's number one killer. More commonly known as "hardening of the arteries", atherosclerosis is the principal cause of heart attacks and strokes, and is responsible for fifty percent of all mortality in Europe, Japan and the United States. It is a progressive disease that often has a fatal ending as fatty streaks turn to fibrous plaque that restricts blood flow in arteries, starving the heart and other vital organs of needed oxygen and nutrients. Besides reduced blood flow, an additional danger of atherosclerosis is that there is a possibility of a portion of the plaque breaking off and completely obstructing an artery. Should this occur in the heart or brain, death is often a result.

My name is Jill Griffiths and I have been working on a project in Medicine/Cardiology, researching early atherosclerosis. The objective of this project was to investigate what effect, if any, the cytokine TNF (tumor necrosis factor) and TNF receptor homolog have on the initial stages of atherosclerosis. Very little is presently known about the effect of TNF on atherosclerosis, but it is thought to be an immune system mediator.

Before I arrived to begin research, the thoracic and abdominal aortae were removed from nine New Zealand white rabbits after a cardiac puncture was performed on each rabbit. Half of each aorta was damaged with either an angioplasty balloon or a scalpel, and the other half was left undamaged to serve as a control. After being cut into fragments and treated with either TNF, TNF receptor homolog or a control virus, the thoracic aorta was allowed to react with rabbit blood in a petri dish. The abdominal portions of each rabbit were treated with TNF, TNF homolog receptor or a control virus and then perfused with rabbit blood obtained from the cardiac punctures. Representative sections from each of the damaged and undamaged portions were then removed for histological examination.

I arrived at this time, when the tissues were ready to undergo immunohistochemical processing, embedding, cutting and staining so that the effects of TNF could be visually observed under the microscope. First, the tissue fragments were placed in plastic cassettes and were processed over a twelve-hour period through changes from formalin to alcohol to xylene and eventually to paraffin which coated the tissues, making them firm enough to be embedded. Using metal molds, we embedded the fragments in hot paraffin wax and cooled them to form blocks suitable for cutting. Using a microtome, we sliced the paraffin-surrounded tissue into sections three micrometers thick. The slices were then mounted onto microscope slides that had been coated with the adhesive "APTEX" (aminopropyltriethoxy-silane). ABC staining followed, using one of three different antibodies: Macrophage, Factor VIII or Actin, to observe its role in atherosclerosis. Actin was used to see if any smooth muscle proliferation had occurred in the intima of the artery. Factor VIII was used to show that the damage had actually been inflicted on the endothelium of the artery. The macrophage antibody was used to stain for the accumulation of macrophages within the intima.

The data obtained from this project has not yet been interpreted and so no conclusions regarding TNF's role in early atherosclerosis can be drawn, but hopefully

something valuable will be found as a result of our research that will in the very long run lower the threatening heart disease statistics.

I have thoroughly enjoyed my WISEST research experience this summer, and my only regret is that it has come to an end so quickly. While it has been tedious at times, this project has been a lot of fun and I feel extremely privileged to have had this wonderful opportunity. It has been great getting to meet so many new people and I have learned an incredible amount that I know I will be able to use in the future. A huge thank-you to Anees Chagpar, Dr. Alexandra Lucas and WISEST for making this a truly unforgettable experience.

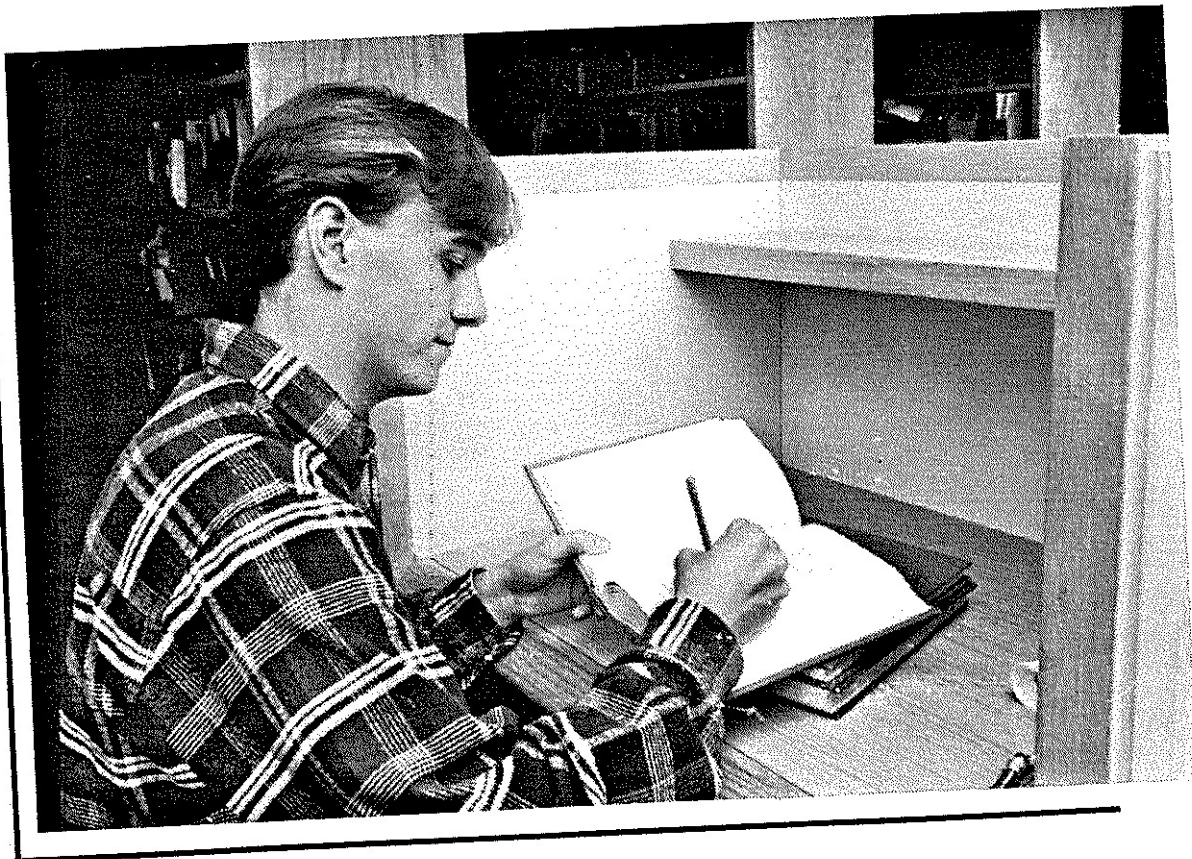


My WISEST Experience

The WISEST Summer Research Program was very different from what I had expected when I first learned about it. I wasn't sure exactly what I'd be doing (and to tell you the truth I'm still not sure I know what I have done).

I worked in the Faculty of Nursing, helping out in one of the research offices. I worked for three research nurses, Dr. Neufeld, Dr. Harrison, and Dr. Reutter. They each had separate research projects that they were working on when I arrived. I traded off working for a different person each week and was able to learn about each of the projects as I worked on them.

I began working with Dr. Harrison, helping her around the office with filing. I also worked on her project, the Parent-Infant Project. This Project examines the development of preterm infants compared to the development of term infants (I think). I cross-checked thousands of numbers a day so that the results would be the correct ones.

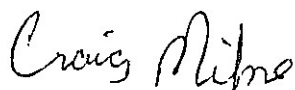


Next, I worked with Dr. Neufeld. Her project was about caregivers and their support networks. I helped by retrieving literature and information on topics that were of interest to her. I continued with these tasks when I worked with Dr. Reutter as well.

In my final week, I have been running Ethnograph searches on coded interviews and creating tables and graphs of the results of the projects.

The time spent at the afternoon sessions of the WISEST Program were the most enjoyable. We had a tour of campus, went to the Devonian Botanical Gardens and Butterfly House, and visited other research labs to name a few. After we went to the Botanical Gardens, we had a picnic in Devon. That was great, except for Salima's charcoal dogs. (Just kidding Salima, they were OK for your first time.)

My experience with WISEST certainly was an experience!



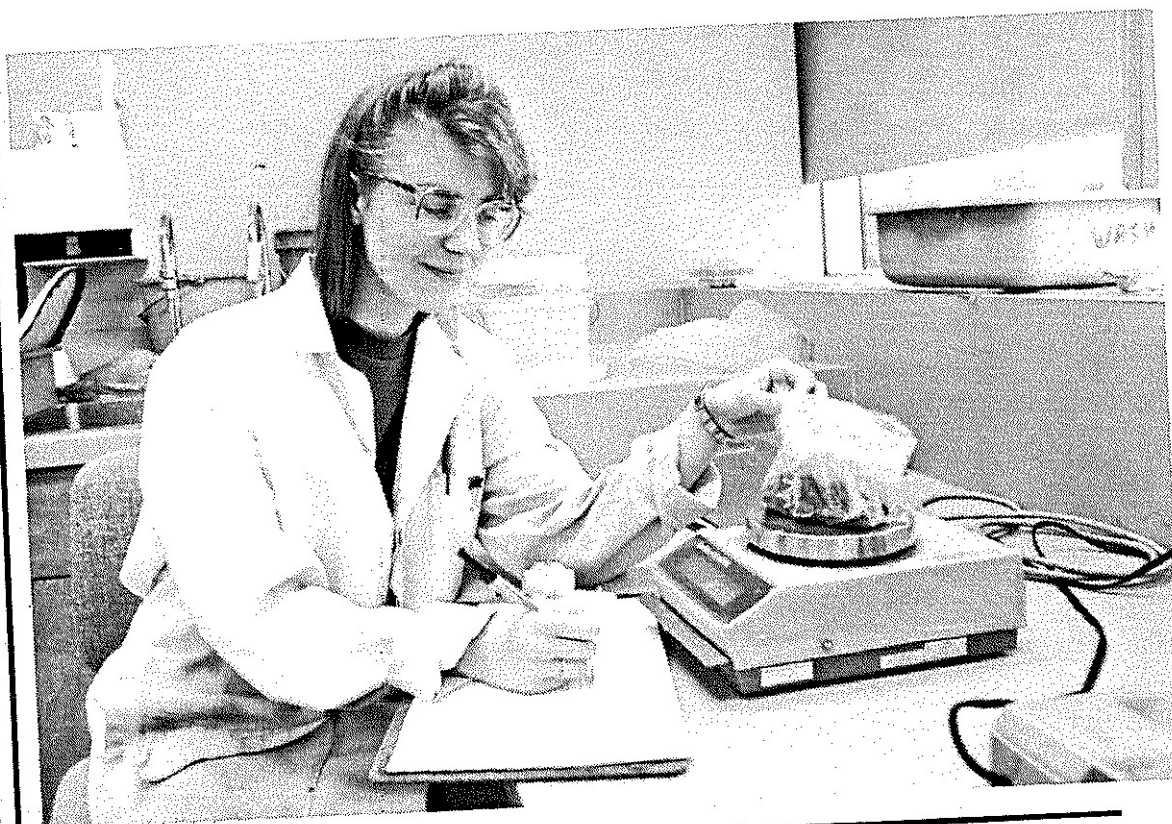
Craig Milne

Sensational Soil Sciences

Soil. Think about it. Poor soil means no plants, which means no oxygen (except for ocean plants) and no food (except for dead animals).

Now that that's over with, I really enjoyed working in the physical soil sciences department this summer. I did not have my own project, instead I worked on many projects, based on reclamation. That is to say we are trying to return the environmental conditions to their original state. Much of our work took place at the Trans-Alta Utilities Stripmine in Keephills, west of Edmonton.

Strip mining - everything above the coal seam is ravaged. The coal is removed, the ground is flattened, top soil is put on, and crops are supposed to grow. However, there are many problems involved, such as; soil compaction, disturbed ground water, disturbed soil layers, and loss of soil nutrients. We worked on trying to solve these problems.



The compaction caused by the heavy bulldozers levelling the land impedes root growth. An attempted solution involves "ripping" the ground by pulling 5 foot spikes behind a tractor. Peat and manure are added to some plots to improve fertility and texture. I had to measure and flag the plots, measure the height of the barley and litter, and do penetrometre work. The penetrometre is pushed into the ground by someone much stronger than myself. At different levels, I had to read the poorly marked dial which measured soil density. We had to do this 20 times for each plot, there were 14 plots. Yep, that's 280 times!! I learned how tedious research can be. Thankfully, the person I was working with was so funny I actually had fun.

I also filtered samples from runoff buckets placed on slopes of varying grades. By examining sediment and probe results, we will be able to determine which grade reduces soil erosion and increases available water. Many projects were derived from Flyash, which is a by-product of coal combustion. 3.2 million tonnes of Flyash were produced in Alberta alone, in 1990. Flyash contains trace elements such as arsenic, boron, and cadmium which are toxic in larger amounts. We hope that it can be beneficial in small amounts. Therefore in a field and lab study different concentrations are being tested. I had to measure plants grown in the soil mixtures, weed plots, and use probes to find the amount of water present at different soil levels.

I also did miscellaneous lab work, including tin engraving/weighing, data entering, dirt grinding, plant weighing and many other organizational tasks.

I feel honored to have participated in WISEST this summer. The people I worked with were terrific-funny, informative, trusting. I acquired work experience, became orientated with University campus, and procured beneficial University connections. I was also asked to work next year as a summer student. I was even paid! What more could I ask for? It was great!

E. Kimberly W. Malonik

WISEST at Devonian Botanic Garden

This summer I had the privilege of working at the Devonian Botanic Garden in the department of botany. My project involved finding the biodiversity of native species in the South Acres of the Garden, something that has not been done in this area before. After reading several books on native plants of Alberta, I learned that natural forests could be divided into several plant habitats such as pine woods, larch fens, willow thickets, and several others. The first step of my project was to go through the South Acres and mark all the habitats I could find on a map. Once that was done I was able to start collecting specimens from each habitat.

Before I could actually collect real plants, I had to learn the proper procedure with weeds. I spent almost one week in one flower bed learning how to properly dig up the plant with its root system, wash the roots, take field notes, identify the plant with its botanical name, and finally, how to press it. In the one flower bed, I collected over thirty species of weeds.

Now I was ready for the real plants. Each day I went to a new plant habitat and collected as many different species as I could, and applied the same procedure that I used for the weeds. I ended up with 194 specimens. After all the collecting and pressing was finished, I had to mount them on heavy paper for the herbarium. An herbarium is like a library of pressed and mounted plants arranged in alphabetical order by genus. My specimens were the first native species to be part of the herbarium since only the cultivated plants at the Garden were collected.

After analysing my results, I came up with a dominant plant for each habitat, and which habitat had the greatest biodiversity. I also discovered that some species grew in several habitats. However, they only grew really well in one of those habitats.

One thing I really liked about my project was how independently I was able to work. I was on my own for this project, but there was always someone there to help me if I needed it, especially the curator, Roger Vick. Throughout the six weeks I met many people at the Garden and got to know some of them well. At those times when working got too repetative and boring, these people made it all worthwhile.

For me, the WISEST experience was more than just summer employment. I learned a lot about what university

life is like and what to expect when I get there. The Wednesday afternoon sessions were very helpful, especially the visit to another lab where I got to spend the afternoon with a medical student. I don't think I will pursue a career in botany, But I know I will continue in science. Because of the WISEST program, I feel I can enter into any field I want to. This has been a very positive experience for me and surely one I will never forget!

Michelle Tubman
Botany



Being a part of the WISEST summer research program has been an incredible learning experience. This summer I worked in the department of Medical Microbiology and Infectious Disease under the supervision of Dr. Janet Robertson. The project I was involved in was harvesting a species of bacteria called *Ureaplasma Urealyticum* for the purpose of macrophage studies in Germany. The harvesting procedure included the preparation, filtering, and inoculation of supplemented media, as well as the use of pH as an indicator of the number of organisms growing. One harvest took a period of four days to complete.

The most important aspect of my project was using sterile technique. Since this bacteria will be tested for immune activation, it was vital that the cultures remain free of contaminants which might falsify future test results. All the cultures produced were tested on blood agar plates for contamination.

Throughout my project, I learned to use a variety of equipment in and around the lab, such as the autoclave, centrifuges, pH meters and eppendorfs. Working in the research lab not only introduced me to a dimension of science I was quite unknowledgeable of, but made me aware of the qualities one must possess to be a researcher--PATIENCE AND PERSISTENCE! I have realized that research can, at times, be very frustrating. It can also, however, be very rewarding.

My WISEST experience wouldn't have been complete without the Wednesday afternoon group activities or my stay at Lister Hall. I

met a lot of wonderful people and had a really great time. Thanks to all my Lister buddies for making the summer a memorable one!

I'd like to thank Dr. Robertson for allowing me to work in her lab and for the encouragement and guidance she gave me along the way. I'd also like to thank Christine Zinner and Paula Ostashevski for taking the time to answer my continuous bombardment of questions and for their smiling faces around the lab. I couldn't have done it without you!

Carla Geare



WISEST 1993: THE WONDERFUL WORLD OF BOTANY
BY NEELAM MAHIL

WISEST, WISEST, how are thee...let me count the ways. The reason I have left a blank in the above sentence is because there are a bountiful number of adjectives which could easily be used to describe the WISEST SUMMER RESEARCH PROGRAM. My personal experiences in the program have been educational, inspirational, and interesting. For six weeks I was given the opportunity to work with and learn from some terrific people; it was an experience I would not trade for anything -except maybe a brand new BMW. Anyone interested in sinking their teeth into the world of science should definately venture down the paths of WISEST.

For my research project, I worked in the lab of Dr. David Cass in the department of Botany. Other people in the lab which helped us, my partner Janet Lam and myself, and made things interesting were Dan Liu, Danny Fernando and John Laurie; thank you all for your time and effort.

The project which Janet and I were assigned to dealt with isolating embryos from Zea Mays (corn) ; the embryos ranged anywhere from one to eight days after pollination. At first, the task of producing partially isolated embryo sacs (PIES) brought on intense disappointment and frustration. The problem was that these embryos are extremely tiny and removing them from the corn kernels without causing death

or serious disorder was tricky business. Patience, however, prevailed and once we proved successful, our spirits rose. A question that needs to be asked is why were we isolating these corn embryos anyways? In hopes of producing in vitro or artificial fertilization of corn. Such artificial fertilization could lead to work with genetic transformations and inevitably help create a new and improved corn plant with all of the right genes and none of the wrong ones. If such a method proves successful in corn, it could be used on cereal plants throughout the world. AWESOME.

Our small part in this "vision" was to improve the medium in which the isolated embryos were placed in to grow. In an attempt to make medium improvements we added different amounts of a substance known as Corn Steep Liquor into the standard medium and observed embryo growth. It appeared that the petri dishes containing 1mL of the Corn Steep Liquor showed the greatest growth; however, different concentrations of the Corn Steep Liquor must be used before any conclusions can be made.

Apart from our research project, we also learned microscopy and the various techniques used to prepare specimen for observation. The microscopy dealt with ranged from transmission electron microscopy to scanning electron microscopy to fluorescence microscopy; you name it, we did it. It was amazing to prepare and examine images which I could before only gaze at in biology textbooks.

When I look back on this WISEST summer, I will remember

it as a summer job with a remarkable twist; not only was I being paid, I was being paid to do something I learned from and enjoyed doing. By the way, in case you are wondering what I am planning to do with my big paycheck, I am buying a cherry red Bmw...in the year 2010.



"MY SUMMER HOLIDAY"

Basically, I didn't have a summer holiday, so I'll just tell you about my experiences at WISEST instead, since they took up most of my summer. My name is Janet Lam, and my partner and I worked with Dr. David Cass in the department of Botany. Dr. Cass is doing research on maize.

"On WHAT?" you ask. Let me clear this up; maize is the European name for corn. "Oh."

"Wait a second, you did research on CORN?"

As hard as it may be to believe, yes, we did research on corn. It's difficult, too, because the little kernels are so small. But luckily, not all our work was on the minute cobs.

In fact, quite a bit of our time was spent learning microscopy. We dealt with light microscopy for the most part, but we were also able to visit the scanning electron microscope (SEM) lab in the Earth Sciences building and the transmission electron microscope (TEM) lab in our own building (Bio. Sciences), as well as prepare grids for viewing under the TEM microscope (more about that later).

We learned four different techniques under light microscopy: brightfield, phase contrast, differential interference contrast (DIC), and polarizing microscopy. As well, we prepared sections for viewing under the microscope. Wax-embedded sections are used for light microscopy, and plastic-embedded sections are normally used for electron microscopy, although they can be viewed under a light microscope (resulting in better resolution than wax-embedded sections, since they are thinner). For TE microscopy, you have to mount the sections on little round metal grids after sectioning; for SE microscopy, you spray the surface of the sections with gold (we didn't get to do that).

But microscopy, although it was an important part of our studies, was not the only part. We also got to learn quite a bit about the maize project. (Maize is corn, remember?) What Dr. Cass' lab is trying to do is to find an effective way of isolating corn embryos and sperm cells, then inserting DNA into the sperm cells, then microinjecting the sperm into the embryos (in vitro fertilization). This seems to be the easiest way to genetically alter the corn plant, because it does not mutate very readily by itself and is quite resistant to change.

My partner and I were trying to improve the medium in which to place the embryos. Specifically, we tried to determine whether the presence of corn steep liquor would aid embryo development. (Corn steep liquor is made partly from corn tissues, so hopefully it would be a more "natural" substance.) We prepared three different culture media, each with different concentrations of corn steep liquor in them, and put partially isolated embryo sacs (PIES) into them. Isolating the embryos was probably the hardest part of the whole project, because everything had to be sterilized and because the kernels were so small. (I think mine were only semi-partially isolated - would that make them SPIES?)

Unfortunately, something in the corn steep liquor or perhaps the way it was added to the media prevented the media from gelling properly, so the two media with higher concentrations of corn steep liquor were all runny. Also, the concentrations of corn steep liquor could have been too high. Probably our half-supervisor, John (he was only there half the time), will experiment some more with the corn steep liquor.

We also participated in other aspects of the maize project, and we helped a Ph. D. student to plant corn, pollinate corn cobs, and isolate sperm cells.

So even though I didn't really have a holiday, I still enjoyed myself working in the botany lab. I find the maize project very interesting, and the techniques I learned in the lab will no doubt be useful when I take science courses in university. The WISEST program is one that should definitely be continued because you can learn so much from working in a lab.

To all the other WISEST students: Good luck in Grade 12, and see you in university!

The WISEST program was a great experience for me. I learned a lot about genetics and DNA fingerprinting after spending six weeks in a lab in the department of pathology at the University Hospital. At the beginning of my six weeks I was very confused. The people working in the lab were always busy and I felt like I was getting in the way. However after a few days of becoming familiar with the instruments in the lab, I started working on my own project which allowed me to fit right in.

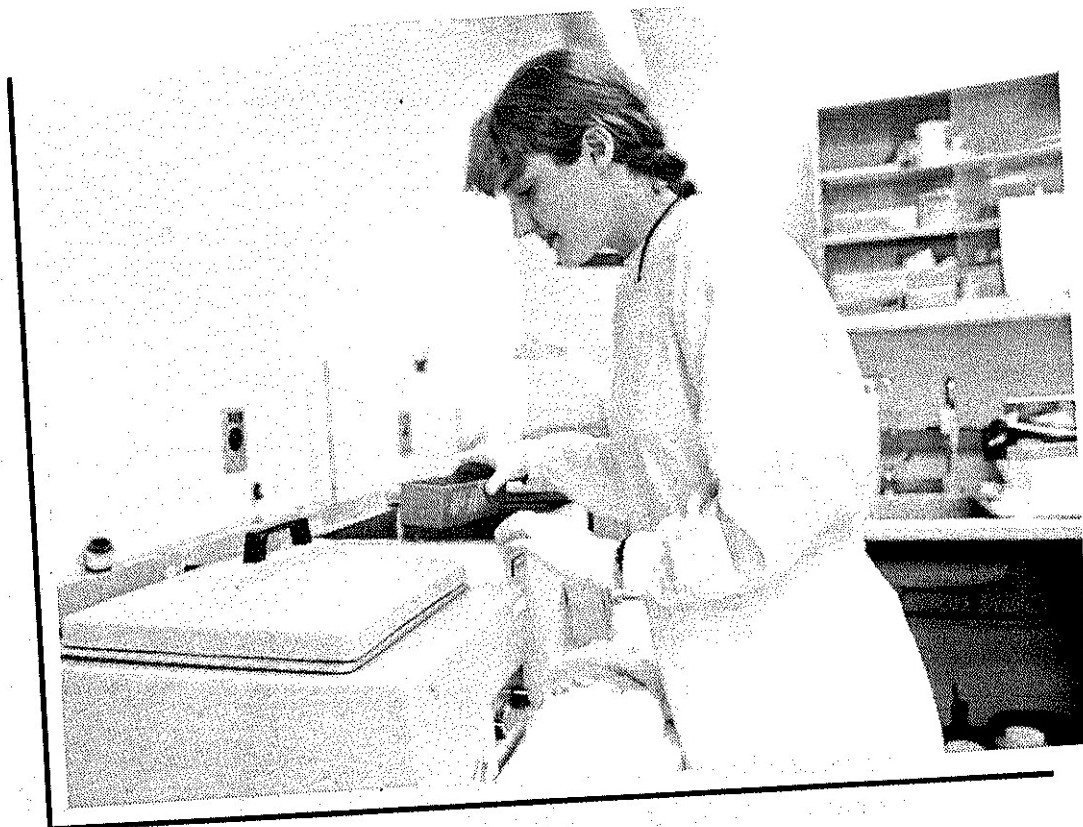
My experiment was to test a way to label and detect DNA non-radioactively. The doctor I worked for does zygoty tests to determine whether twins are identical or not and would like to find a way to do this without using radioisotopes. I really enjoyed working on something so important, even though it was quite frustrating at times. I also found it satisfying when I would get some results after a lot of hard work. The method that I was testing was not successful enough to be used regularly at the lab I was working at. This did not upset me however, because I learned that finding this out was just as important as achieving successful results would have been.

Everyone that I had a chance to work with was very friendly and patient with me. They were always willing to stop what they were doing to explain things or to give me some help if I needed it. Not only did I become familiar with the lab I was working in this summer, but I also had the opportunity to see many other areas of the campus and other labs, which was really interesting.

I was able to develop a better understanding of what interests me and what I would like to pursue in the future.

Unfortunately the time flew by and before I knew it my WISEST summer had come to an end. Even so the friends I made and the experiences I had will remain with me for a long time.

Hannah Piper



LEENA CHACKO
WISEST WRITTEN REPORT
CHEMISTRY DEPARTMENT

During the past six weeks, I worked in Organic Chemistry under the supervision of Dr. Margaret Ann Armour. Basically, the main goal of the research group I was working with was to study the various methods of breaking down toxic substances. However, before I could help this research group, I had to learn some of the basic labs needed to perform whole experiments. One of these labs included taking melting points of several substances. This lab was important because I could check the purity of a substance, or I could try and find the identity of an unknown substance by comparing the observed melting point and the literature melting point. But first, my thermometer had to be calibrated since every thermometer can be off by a couple degrees. I did this by constructing a graph comparing observed melting points and literature melting points of known substances. So from then on, when I wanted to check the melting point of a substance, I had to use the graph to determine the corrected melting point.

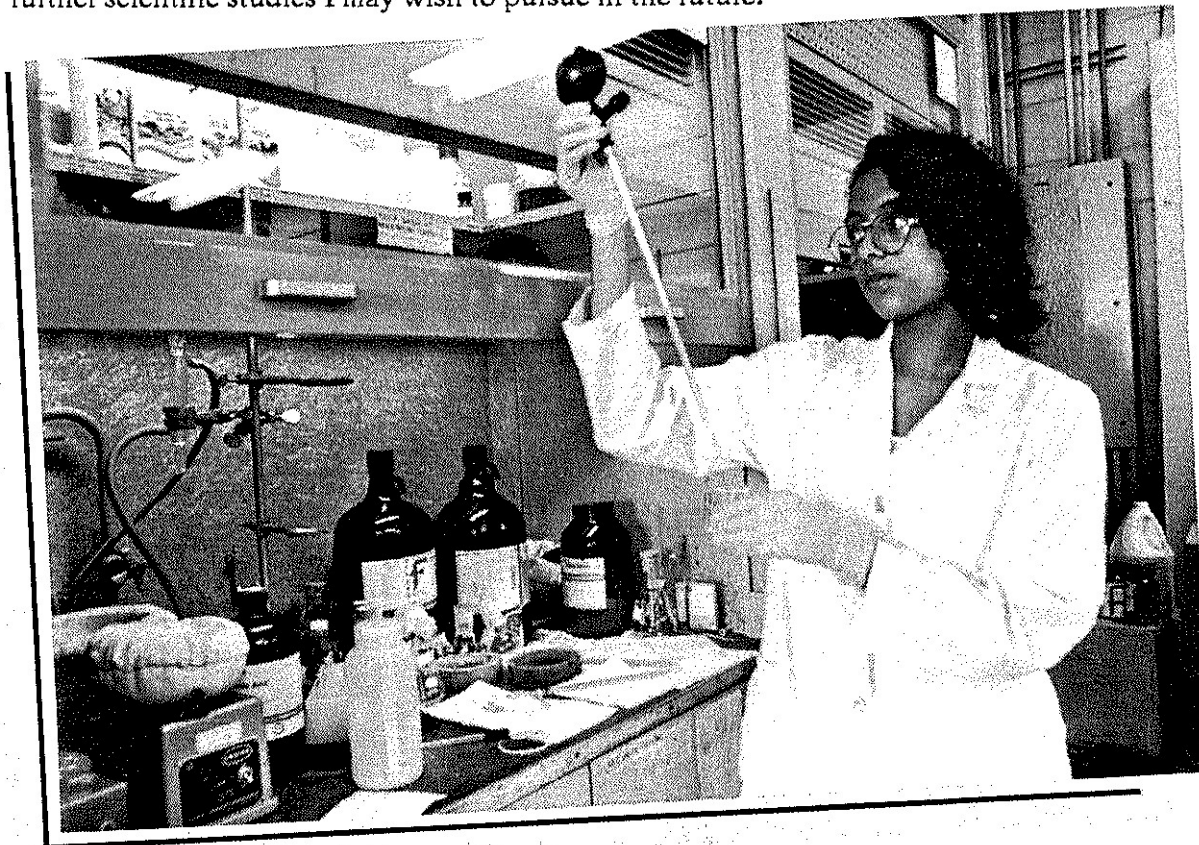
Another experiment I performed during our introductory week was the recrystallization of benzoic acid. It was simply done by boiling the benzoic acid in hexane until it was dissolved and filtering the cooled solution by gravity. To speed up the process, vacuum filtration was used and the crystals were washed with cold, fresh hexane to make them whiter. Then they were allowed to dry. I performed many other introductory labs to familiarize myself with laboratory materials (eg. Buchner funnel, Erlenmeyer flask, separatory funnel) and lab methods (eg. gravity filtration, vacuum filtration, reflux condensation, recrystallization, evaporation using rotary evaporator, distillation). Some of the other experiments I completed were extracting tryministin (a fat) from nutmeg and making soap from it, and separating a stock solution containing benzoic acid, naphthalene and p-chloroaniline in dichloromethane. After these labs, I was shown how to use some of the machines found in our lab and surrounding labs. These include equipment used for infrared spectroscopy, gas chromatography, and thin layer chromatography. Now I was finally ready to actually help the research group with my new knowledge and skills.

For the rest of the summer, I worked on converting dangerous acrylamide into a safer product called acrylic acid. Acrylamide is used in certain gels that separate proteins and often the waste is toxic. In order to convert acrylamide into safer acrylic acid, it was heated and magnetically stirred in a sodium hydroxide solution that was approximately 100 degrees Celsius for about 15 minutes. But this can be a bother for some labs to get this solution to such a high temperature, therefore, the possibility of leaving the acrylamide in the NaOH solution at room temperature for a certain number of hours was investigated. To do this, a sample of previously prepared NaOH solution with acrylamide in it was taken. The pH was adjusted to 1 by adding hydrochloric acid. Ether was used to extract any acrylic acid that might have formed because acrylic acid dissolves in ether. Chloroform was used to extract any remaining acrylamide because acrylamide dissolves in chloroform. Next, the two separate ether and chloroform solutions were dried using anhydrous sodium sulfate and filtered after about ten minutes. The rotary evaporator was used to evaporate most of the solvent to leave a more concentrated solution. This makes it easier to distinguish results using either thin layer chromatography or infrared spectroscopy. Thin layer chromatography was done by putting a spot of product and a spot of substance the product was being tested for on the same line of a silica coated paper strip. The paper was then immersed into a developing solvent when the two spots

were dry. After the solvent travelled by evaporation up to a line that was previously marked, it was removed from the developing solvent and allowed to dry. Finally, a beam of UV light was shone over the paper and the spots seen were traced and compared. If the spots were relatively the same in size, shape and distance from the starting position, it could be inferred that the substances had the same content. Also, an IR (infrared spectroscopy) could be run to specifically find different chemical groups present in a substance (eg. carbonyl group, hydroxyl group).

To this basic experiment of adding NaOH and using chloroform and ether for extraction, many variations were performed. For example, the amount of chloroform and ether used were changed during different experiments of the same nature. The amount of time the NaOH solution with acrylamide was left at room temperature was also altered. Different methods and materials were being experimented with in order to obtain an effective method of converting acrylamide into acrylic acid. I also investigated the detection limits for acrylamide and acrylic acid using TLC (thin layer chromatography). I tested how dilute of a concentration the TLC could detect by analysing different concentrations of acrylamide and acrylic acid solutions. I used more dilute concentrations each time and stopped when I couldn't detect anymore spots on the TLC. Thus, I was able to find out the least amount of concentration the TLC could detect.

My experiments have given me the opportunity to learn about various chemicals, lab materials and the relevant lab procedures. I began with limited experience in chemistry and left with an increased awareness and knowledge of the laboratory environment. I believe that this experience will prove to be invaluable to me during any further scientific studies I may wish to pursue in the future.



Beguiling Butterflies

Participation in the WISEST program has taught me a lot and increased my awareness of the limitless possibilities for women in all fields of study. This enlightenment took place in a relaxed and fun environment. The time passed very quickly and as I near the end I find myself feeling a little sentimental over leaving my job and all the great people I met who were involved with WISEST. I have to admit I am a little envious of whoever gets the pleasure of working at the Butterfly Showhouse this coming year.

Working with the butterflies was wonderful! They never complained or made a mess. What amazed me the most was their complex life cycle with all its intricacies from egg to larva to pupa to adult. It was so exciting to see a perfect butterfly emerge from its chrysalis, pump its wings to full size and then flutter off instinctively knowing how to fly. Rearing and caring for the butterflies in their "rainforest world" was only part of my job description. Another part was visitor interpretation and 99.9% of the visitors were kind and interested. Every once in a while someone would come in and not appreciate what you were trying to accomplish but that was bound to happen. I tend to be more introverted and shy but I overcame a lot of that by working with the public. The childrens' daycamps were fun to show the butterflies to. Their little faces would light up at the sight of a Blue Mountain Swallowtail and they would always have a string of continuous questions I would have to contend with. I gained a wealth of knowledge on butterflies and other insects from my learned supervisor Brent Karner and some well written books which I worked into a pamphlet for the visitors. I have even come to appreciate the creepy crawlers. All the people I worked with were friendly, helpful and made me feel comfortable. I don't believe many people can boast they got this much out of their summer job and I was constantly reminded of how lucky I was by visitors who would come up to me and say, "What a great job you have!". Everyone wanted to know how in the world I ended up working at the Butterfly Showhouse and that was my chance to extol the wonders of WISEST.

I had quite an eclectic experience this summer. Not only did I work at the Butterfly Showhouse but I also worked with the Botany department for four of the days out in the field. On these days I helped a student named Yenhung who was working on her PhD and an undergraduate Zoology student named Corinna conduct an experiment. Their research will ultimately lead to the preservation of peatlands. At two sites (one a bog, one a fen) we would water the control areas with 10L of rainwater and the treatment areas with 9.6L of rainwater mixed with 0.4L of nitrogen isotope stock solution. Later Yenhung will

collect the non-vascular plants and see how the nitrogen affected them and what part of the plant it was retained in.

This positive influence on my life has given me a significant edge as I enter grade twelve in preparation for University. It has also connected me with a lot of interesting, diverse people I won't soon forget. I cannot think of any negative aspects to this program that has enhanced and enriched me so much!

Christy MacKinnon



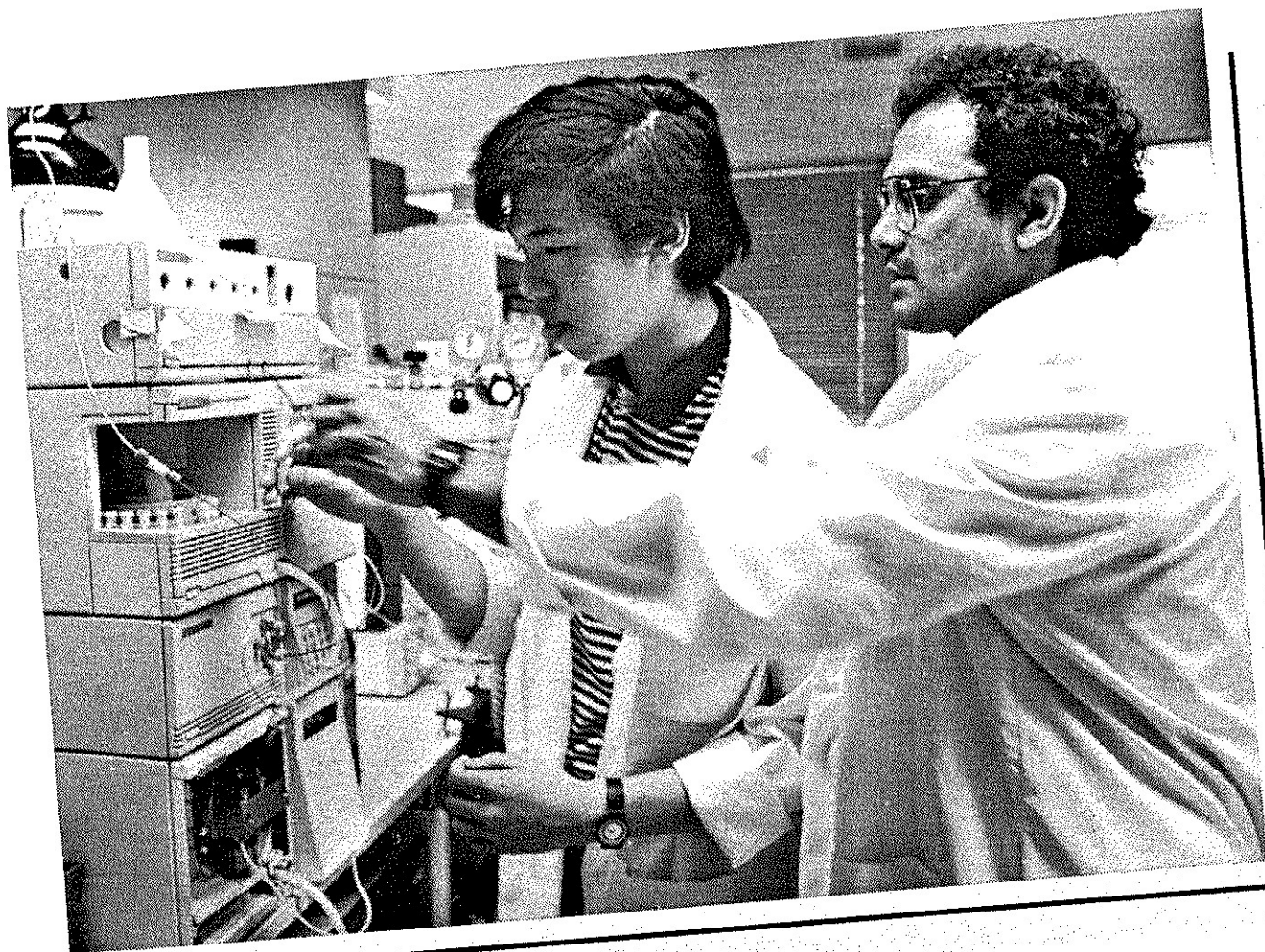
Laboratory Medicine

For the past six weeks, WISEST has given me an opportunity to learn what is involved in laboratory research, and the role that an animal technician plays in laboratory research. It opened my eyes to the organization, teamwork, and the amount of work that is needed for a research project to be successful.

The research that I participated in was involved in the effects of immunosuppressive drugs on intestinal glucose transport. The immunosuppressive drugs that were used were Cyclosporin A (CsA), Cyclosporin G (CsG), and Rapamycin. In this project, New Zealand white rabbits were used to test the effects of these drugs. The rabbits were divided into groups and exposed to each drug by daily dosing. I was assigned the job of dosing and monitoring these rabbits. I learned there are many ways of dosing. You could dose intravenously (injection into the vein), by subcutaneous injection (injection under the skin), or by oral means. I only had the chance to dose by subcutaneous injection and by oral means. But it took much practice and a lot of help to dose well by these two means. Monitoring the rabbits required me to keep a record of the intake of food and water, weight and health of the rabbits.

Besides dosing and monitoring, I had to draw blood from the rabbits. This became one of the hardest task I had to learn, because the vein in the rabbits ear was very delicate and the rabbit was usually agitated, so an successful entry into the vein with a needle was very difficult. The reason for taking blood samples from each rabbit is because the amount of drug that is contained in the rabbits needs to be monitored to provide accurate results for the study.

After ten days of dosing and monitoring, the rabbits are transferred to another lab where their intestinal tissues are tested for their permeability to glucose. The results from this research is very important, because Cyclosporin A, Cyclosporin G and Rapamycin are drugs that are going to be used for transplant surgery to suppress the recipient's immune system, so that the donor's organ could be retained in the recipient's body. The total effects of these drugs on other parts of the body are still being investigated. The research done on these drugs may save a life in the future.

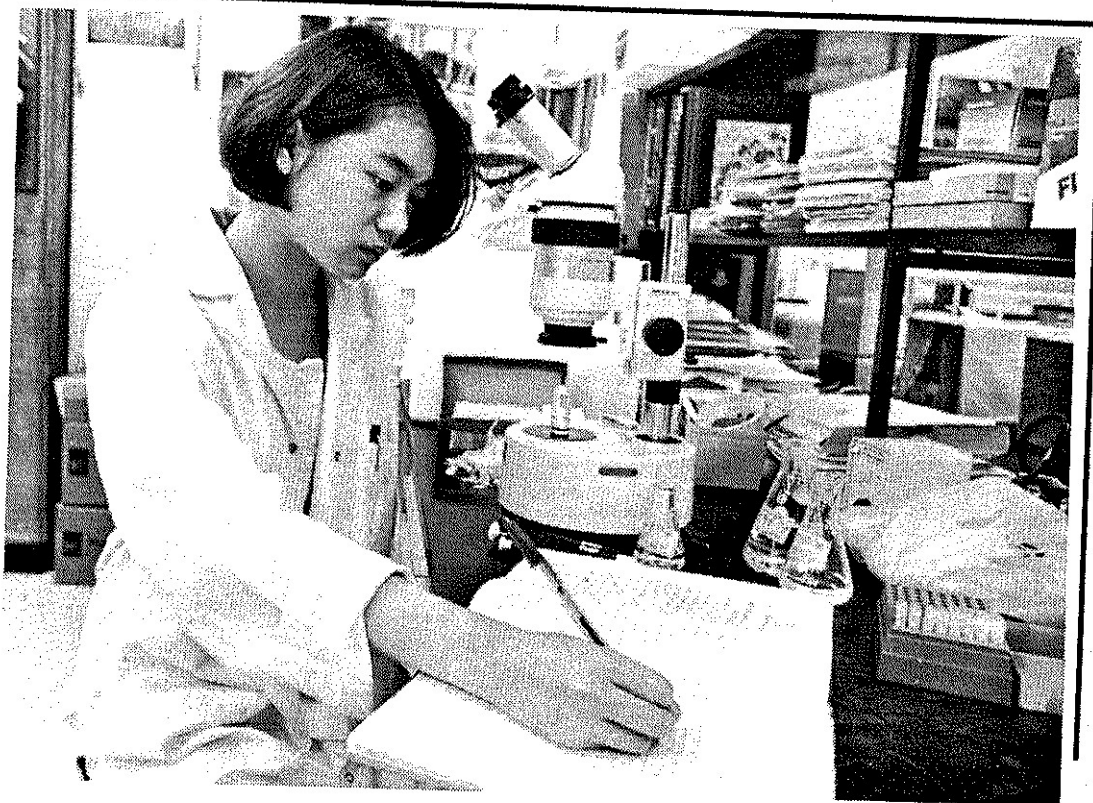


In these six weeks, the WISEST research program has allowed me to gain a broader option of what career choices are present in the university. It also allowed me to gain a vast amount of experience in laboratory research, and in the workings of the university. I would like to thank the WISEST program for giving me the chance to participate in this program. It surpassed all my expectation and gave me a rich summer of experience that I could not have gotten from any other summer job.

Henry Chui

Throughout the past weeks spent in a university biochemistry laboratory, I learned much about laboratory skills, research work and my project. My project was based upon an enzymatic protein called succinyl - CoA synthetase (a citric acid cycle enzyme from any respiring thing). I was to grow crystals with the protein from pig heart and the bacteria *Escherichia Coli*. With these crystals, the objective of the project, which is to find the active site of this enzymatic protein, could be achieved. There are a total of three reactions that occur at this site. The specific location of where one reaction takes place is known, but the other two are not. To find the other two locations in the site, soaks are done. First, the crystals are put into solutions with the substrates it reacts with. The two substrates are succinate and ADP. The crystals may crack or break - down because of the movements caused by the disturbances resulting from the reactivity. Analogues are also experimented. Analogues are chemicals which are similar to the substrates, so the the location will recognize the chemical but cannot react with it. Where the chemical is found on the protein, that is where the location is. Also with the crystals, they could be put through an x - ray machine and the spatial configuration of the protein can be achieved from the resulting diffraction patterns.

I worked mostly at the stage where crystals were tried to be grown. First, to prepare the protein for the experiment, the isolated protein must be centrifuged. To get rid of the salts, the liquid would be poured out and the remaining pellet would be dissolved in phosphate buffer (50mM (K)PO₄). Then the protein would be transferred to a semi - permeable dialysis tube and submerged in one hundred millilitres of phosphate buffer to rid of the remaining salts. After the protein would be taken out of the dialysis tubing and centrifuged again to rid of the dust and unwanted particles. Next the protein would be tested for concentration and reactivity with a spectrophotometer. The spectrophotometer would shine ultraviolet light through the protein solution and the amount of light emitted relative to the amount that shines through gives a number which can be plugged into a formula that accounts for the absorbance and volume. For reactivity the protein is mixed with some assay medium and GTP - CoA(for pig heart) and ATP - CoA(for *E. coli*). The spectrophotometer would draw a slope which is also plugged into a formula. Now the protein can finally be placed into the buttons and placed into salt solutions such as ammonium sulfate, ammonium citrate, potassium phosphate and others which would be mixed with chemicals such as MPD, CoA or others. Each combination would be tested at different concentrations and pH. The buttons would be submerged and observed. At each observation, when nothing has



crystallized, more of the salt solution would be added and the concentration would increase. With an increasing concentration, the pull of the salt would at some time overpower the pull of the protein and therefore, force the protein to crystallize. Buttons would be observed every second or third day and each addition and observation would be recorded. The information would then be summarized onto a chart which would include the addition amount and the calculated concentration and ionic pressure.

Not all crystals are useful. What would be needed would be a shape that is regular and structured such as cubes or rectangles, but often needle - like, board - like, nugget - like, blade - like crystals or precipitate forms. The other forms are too fragile and irregular to use, so whenever a cube or usable form crystallizes it would be reproduce. To do so, very careful observations must be taken

After explaining a little about my project, I want to say that this experience was very rewarding. It clarified what science, researching and graduate work was all about. It also open up future roads that I never thought of taking. New friends were made and interesting people were met. My supervisor and the graduate students in the lab had been very willing to show me what biochemistry really is. WISEST is a great opportunity for grade eleven students.

Connie Tang

My WISEST Experience
(In the Zoology Department)

The past six weeks has been really enjoyable and I learned a lot too! I was fortunate enough to spend my summer at Meanook Biological Research Station. Most of the time I was involved with the study of the effects of liming on Benthic invertebrates. With the liming project I was under the instruction of Dr. Ellie Prepas and my supervisor Karen Yee.

For this project we took samples from five lakes, three of which were controls and two which had each been limed once. We used an Ecman dredge to take samples of the bottom sediment of the lakes, then we sieved and preserved the samples. Once we brought the samples back to the lab we sorted and counted the different species of invertebrates in each sample.

During my stay at Meanook I was also able to spend time helping other graduate and undergraduate students with their projects. For a few days I learned how to monitor fish distribution using traps and nets and how to set traps to catch small mammals. In addition, I spent one day observing waterfowl and I also observed how to sample sediment using peepers. Some other lab procedures that I learned include testing for phosphorus, pH titration, and filtering chlorophyll.

Through the WISEST program I have met many new people and it has opened up other job opportunities for me. This summer I learned what

research is all about, I received some great advice, and also some insight into possible career paths for my future.

I would like to extend my thanks to Dr. Prepas, Karen Yee, all the residents at Meacock, and everyone involved with the WISEST program for making this such an enjoyable and enriching experience.

Theresa Winski.

Theresa Winski

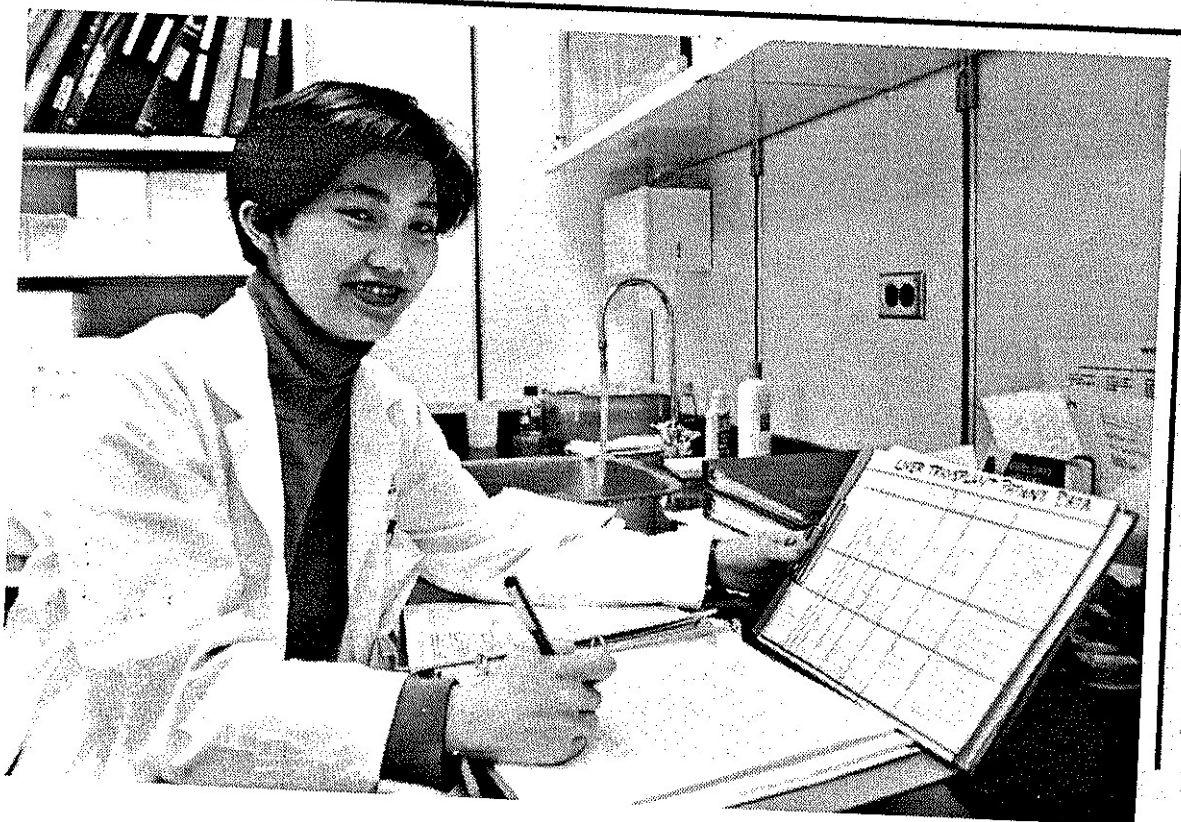


"Oh my...Oh my...I made it!!! I got accepted!!!" I pounced on my mom.

It was my first reaction after getting off the phone with the WISEST administrator, Salima Haiee. I was completely off the ground. I anticipated this summer to be a great learning experience and was it ever!

My project involved founding out how immunosuppressants, specifically cyclosporine which is a drug that inhibits organ transplant rejection, affects the lymphocytes (white blood cells---which consist of populations of B and T cells) of liver transplant recipients and answer as to why this relationship may exist. Lymphocytes play an important role in the production of antibodies and in transplant rejections. My project essentially collaborates with the multidrug resistance gene 1 product which is called p-glycoprotein. There is much which is unknown about how it works exactly in different cells or what may affect it, etc. This project, currently is involved in finding out the answer as to why the results that the lab technician, Kasia Matejko, is uncovering are occurring. P-glycoprotein is generally known to work in T cells (although it does exist in the B cells as well) as a functionally active transmembrane efflux pump. It can transport drugs out of the cell before cytotoxic effects occur, etc. To give you an idea as to what should happen with the drug cyclosporine and p-glycoprotein, I'd like to explain the major steps of the lab procedure. Once the lymphocytes are separated from the blood, they are stained with Rhodamine-123, a known fluorescent substrate of p-glycoprotein, and then they are drugged by cyclosporine which is known to bind to or block the pump, thus theoretically, retaining the stain within the cells. This is what is proposed to occur in the T cells but is generally known not to in B cells.

I began by gathering the clinical data of each patient such as their age, sex, lymphocyte percentage in blood, their underlying disease for transplantation, and their most recent cyclosporine levels. I then charted this with their lab results as to the percentage of different cell populations stained and blocked or unstained and thus, unblocked by cyclosporine. (Though the cells, for example, could be unstained for other reasons) I then graphed each population of lymphocytes stained and unstained with each patients' cyclosporine levels (as the Y value), producing a scatter diagram. The next step was to use a statistics program on a computer to figure out the linear regression which shows a straight line relationship between the cyclosporine levels of the patients and the particular population of lymphocytes. For instance, in one graph, linear regression implied a relationship such that as the cyclosporine levels decreased, the amount of B cells unstained increased. This may seem correct, but then again it is generally known that this trend ~~should~~ not work in B cells. The next step is to figure out why this relationship exists and why some of the patients do not have a straight line relationship to this trend. I looked at each patient individually and eliminated age, sex, lymphocyte percentage, and medications as bearing any impact in causing cell abnormality which may in turn affect the pump or other cellular mechanisms. However, the patients that were close to the line generally suffer from the underlying disease called Primary Biliary Cirrhosis while the patients whose correlation was fairly low suffer from various diseases such as Autoimmune Chronic Active Hepatitis, Fulminant non A non B Hepatitis, and endstage liver disease secondary to alcohol-induced cirrhosis. And finally, during the last few weeks, I lived in the library, hacking the computers for journal articles that would confirm that diseases affected the lymphocytes and explain the relationships. At the moment, the results are not specific. For instance, p-glycoprotein tends to have a preferential expression in CD8 cytotoxic T cells



and I've found that patients with Primary Biliary Cirrhosis and other liver diseases such as chronic active hepatitis, primary sclerosing cholangitis, alcoholic cirrhosis and steatosis have decreased proportions of suppressor/cytotoxic CD8 T subset cells. Though there are other results and interesting discoveries, my paper space is running out.

I'd like to take this opportunity to thank the WISEST administrator: Salima Hajee, the WISEST Co-ordinator: Dr. Dorothy Tovell and the WISEST Vice-Chair Dr. Margaret-Ann Armour for an incredible experience. I'd like to also thank my head supervisor Dr. Bruce Yacyshyn for giving me such an intriguing project and thanks to my immediate supervisor, Kasia Mateiko for showing me what actually goes on behind the "scenes" in the laboratory. Thanks to both of them for answering my questions and making my six weeks enjoyable.

I'd like to encourage those students who wish to apply for the program because it is an immense learning opportunity and it really makes us aware of what careers are open to us. It is also a way to meet new and interesting people. This program may also help discover things about oneself one never knew before or that one definitely wants to head down a certain avenue in science.

Being involved in the WISEST Summer Research Project made my summer!

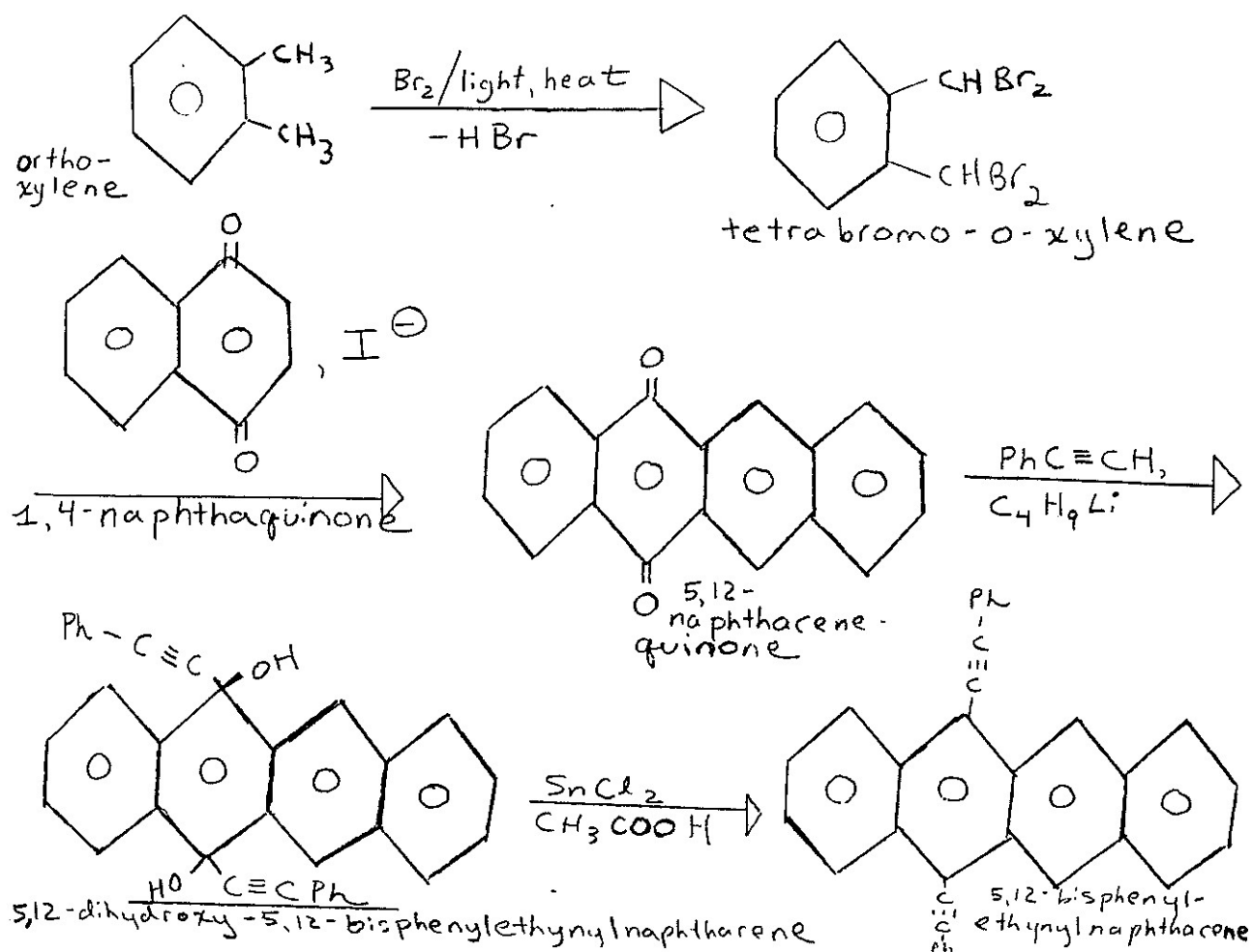
Karen Woo

Department of Gastroenterology

My name is Oksana Kotovych. I worked with Dr. Kopecky in the Chemistry Department. His research includes heating some organic peroxides in the presence of fluorescent molecules (that are easily oxidized) so that light emission may occur. My job was to make one of these fluorescent molecules.

In this project, I carried out four reactions. The first reaction was making tetrabromo-o-xylene by adding bromine to o-xylene. In the second reaction the tetrabromo-o-xylene reacted with 1,4-naphthaquinone, using sodium iodide as a catalyst, to form 5,12-naphthacenequinone. The third reaction was an organolithium reaction where Δ phenylacetylene ($\text{PhC}\equiv\text{CH}$) reacted with butyl lithium ($\text{C}_4\text{H}_9\text{Li}$) in an oxygen-free, water-free atmosphere to produce the diol 5,12-dihydroxy-5,12-bisphenylethynyl-naphthacene. This diol is then dehydrated using tin (II) chloride as a catalyst to form the final product, 5,12-bisphenylethynyl-naphthacene.

The techniques I learned are recrystallization, sublimation, filtration, distillation, chromatography, rotary-evaporation, and working in an oxygen-free atmosphere.





Being a part of WISEST has been a wonderful experience for me. I met many people, I got to know the campus quite well, and through the Wednesday afternoon sessions, I became familiar with other science careers and labs. I learned a lot about organic chemistry, and I saw applications of math other than in teaching. For example, math is used in nuclear physics, computing sciences, and engineering. Since there were university students in my lab, I found out a lot from them about university life. I am not so intimidated by it now, and I am definitely looking forward to coming here after grade twelve. I will definitely continue to study organic chemistry after high school, but I still have a strong interest in math and I want to make a career out of it.

I would like to thank Dr. Armour, Dr. Tovell, and Salima Hajee for accepting me into the WISEST program. I would also like to thank Dr. Kopecky and everyone in his lab for all their help. Finally, I wish everyone in the WISEST program the best of luck in the future.

*Atsana
Kopecky*

Immunology in Six Weeks

by Claudette Rondeau

These past six weeks I have been working in the Immunology Department under the supervision of Dr. Linda Pilarski.

My project was to test the white blood cells from umbilical cord blood to identify which populations of leucocytes have the p-glycoprotein transport pump, and to see how effective cyclosporin A is in blocking the activity of this pump. After doing the experiments I must also analyze the data collected.

The p-glycoprotein transport pump is an active transport mechanism on the surface and in the membrane of the leucocytes. It is able to transport drugs out of the cell. The activity of this pump depends upon the type of leucocyte and its stage of maturity. Cyclosporin A is a drug which is able to inhibit the action of this pump, and thus prevent it from being able to transport substances out of the cell.

There are two parts to my experiment. The first part is to test the leucocytes for the multi-drug pump and the second is a procedure named immunofluorescence (IF). In this last procedure we identify certain populations of leucocytes. IF can be done on cells that have been tested for the multi-drug pump or on cells that have not been tested for this pump.

To test for the multi-drug pump we incubate the leucocytes in a drug called rhodamine (RH123) for ten minutes. RH123 is a fluorescent dye that diffuses into the cell, but it is able to be pumped out by the p-glycoprotein pump. Then, we split the sample in two and add cyclosporin A to one sample. These two samples must then be incubated for three hours, because this is the amount of time needed for the pump to efflux the RH123. After the three hour incubation we run the sample through the FACSCAN machine. This machine picks up fluorescence, and as RH123 is a green fluorescent dye, the machine will be able to show on graphs the amount of cells who have retained RH123, and the amount of cells who have pumped it out. The effectiveness of the cyclosporin A can be measured by how much RH123 has been retained by the leucocytes in the sample containing cyclosporin A as compared to the sample without cyclosporin A.

Each population of white blood cells have specific surface markers and these surface markers will bind to specific antibodies. Therefore, to identify a certain population of white blood cells, we will add an antibody to the sample, one that we know will bind to a specific population of cells. The antibody is also tagged with a red fluorescent marker. This way, when we run the samples in the FACSCAN machine, the machine will be able to identify the different populations of cells, by picking up on the fluorescent marker. This is the immunofluorescence procedure. The machine is also able to tell which populations of leucocytes have retained RH123 by picking out the cells with a green fluorescence and a red fluorescence.

The results of my experiments were that in umbilical cord blood there is a small amount of monocytes and small B cells. The pump is not very active on these two populations. However, there is a larger population of small T cells which express much pump activity. Other summer students are working with children's and adult's white blood cells, and by comparing the results of the three experiments, we will be able to understand more about the multi-drug pump.



I have also tested a mouse thymus and spleen (two organs which produce white blood cells) to see if they contain a p-glycoprotein pump. The results were that the thymocytes had a minimal expression of the multi-drug pump, and the spleen cells had a stronger expression of the multi-drug pump. A human thymus had 30% of cells which expressed an active pump. This is interesting to note because medical procedures are tested on animals before they are applied to humans, but if the cells of an animal being used as a comparison to a human behave differently than human cells, than that animal cannot be effectively used as a comparison. The experiment shows that mice are more susceptible to drugs than humans are. This explains perhaps why chemotherapy works well on mice and is an unpredictable procedure on humans.

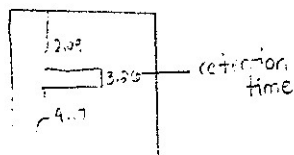
I had a wonderful experience this summer participating in the WISEST program. I enjoyed working in Dr. Pilarski's lab- everyone was friendly and very helpful. I learnt many things, I was taught many lab techniques and about how it would be like to have a career working in a research lab. This summer has been memorable and I will not likely forget it soon!

HOW I SPENT MY SUMMER VACATION.

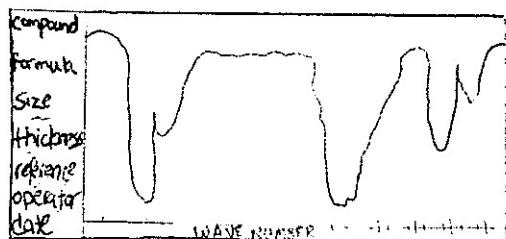
This summer I had the privilege of working in the Organic Chemistry Department at the University of Alberta under the supervision of Dr. Margaret-Ann Armour. The chemist I was working with was interested in the recycling and safe disposal of chemicals.

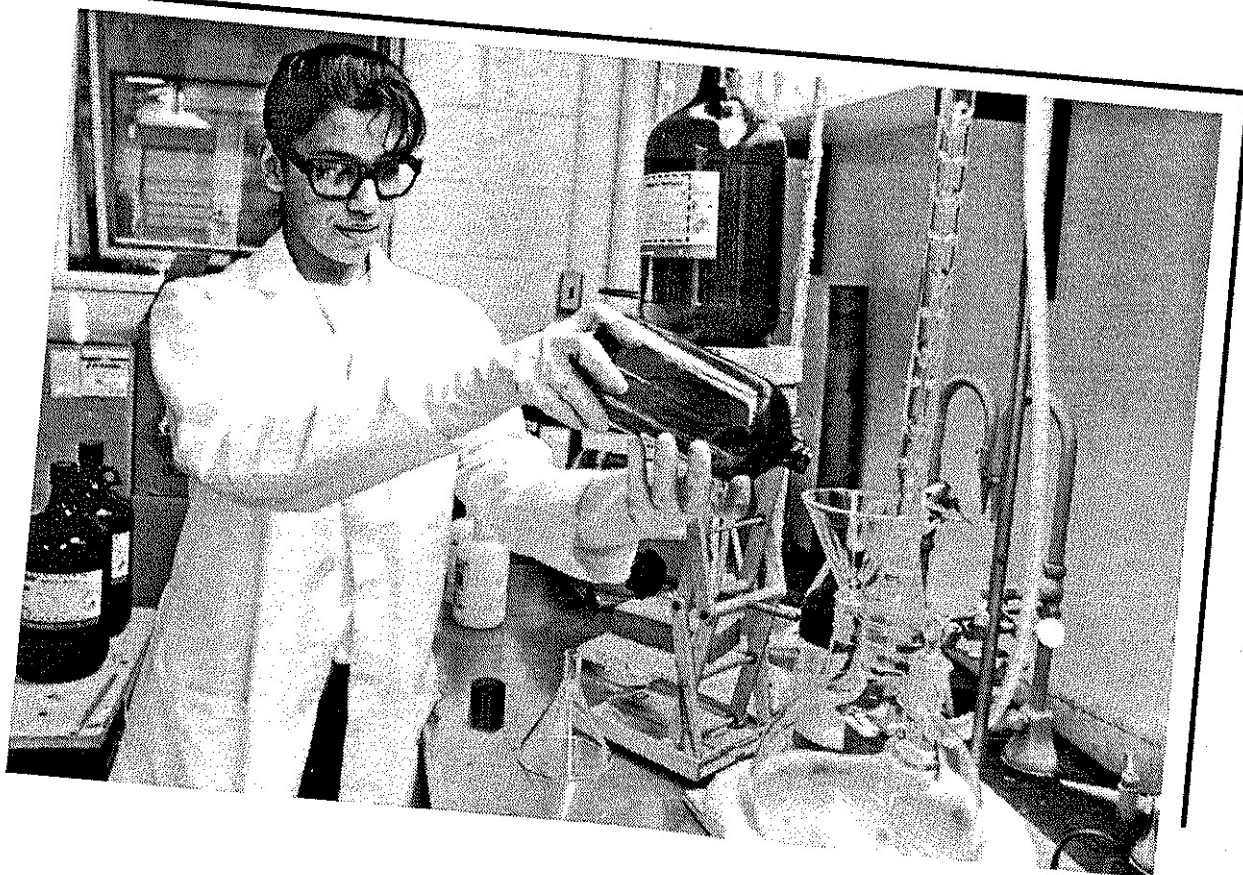
Before I started the actual work of disposing chemicals, I needed to learn some of the basic skills and became familiar with the equipment used in organic chemistry. Some of the techniques I learnt included melting point determination using a Gallenkamp Melting Point Apparatus, recrystallization, extraction, filtration, neutralization, gas chromatography and infrared spectroscopy.

When I completed the "Introduction to Organic Chemistry" I began helping with the recycling and safe disposal of chemicals. The recycling part of my job basically involved the distillation of waste liquids from graduate and under graduate labs. The liquids which were recovered by distillation, acetone (C_3H_6O), methanol (CH_3OH) and dichloromethane (CH_2Cl_2) then had to be checked to ensure that they were pure. This was done by using a gas chromatography apparatus (GC). The GC was set at the appropriate temperature according to the boiling point of the liquid to be analyzed and then a small amount of the liquid was injected into the GC with a needle. The printer attached to the GC gave a print out which looked like this:



Every liquid has a specific retention time (RT), thus the RT can be used as a means of identifying various liquids. Included in the printout are the percentages of the areas that the peaks cover on the chromatogram. If the distilled liquid's peak covers at least 98% of the chromatogram, the liquid can be reused. If not, the liquid must be re-distilled. Because of the chlorine in the dichloromethane, it could not be analyzed using the GC. The GC can not detect chlorine, thus an infrared spectrophotometer (IR) had to be used. A typical IR printout looks like this:





Different chemical bonds absorb the infrared light at specific wavelengths, which are converted to wave numbers on the printout for the sake of convenience. These differences in absorption are reflected in the peaks. Dichloromethane has two C-H bonds which show peaks in the 3000 wave number range and two C-Cl bonds which show peaks in the 800-625 wave number range. These peaks should be the only ones on the IR printout, if there are any extra peaks on the printout, it can be inferred that the dichloromethane is not pure and has to be redistilled.

The chemicals which could not be recycled were disposed of in a safe manner. If a chemical was in a labelled container, I would look it up in a Hazardous Waste Disposal Guide and follow the disposal procedure in it. The procedures basically told me what to react with the chemical to make it safe to wash down the drain or throw into the garbage. If a known chemical was not in the disposal guide, it was dissolved in water, neutralized to a pH of 7 and washed down the drain with 50X its volume of water. Chemicals which were not labelled and unidentifiable were dissolved in acetone and thrown into a flammable waste container which will be sent to Swan Hills for proper incineration when it is full.

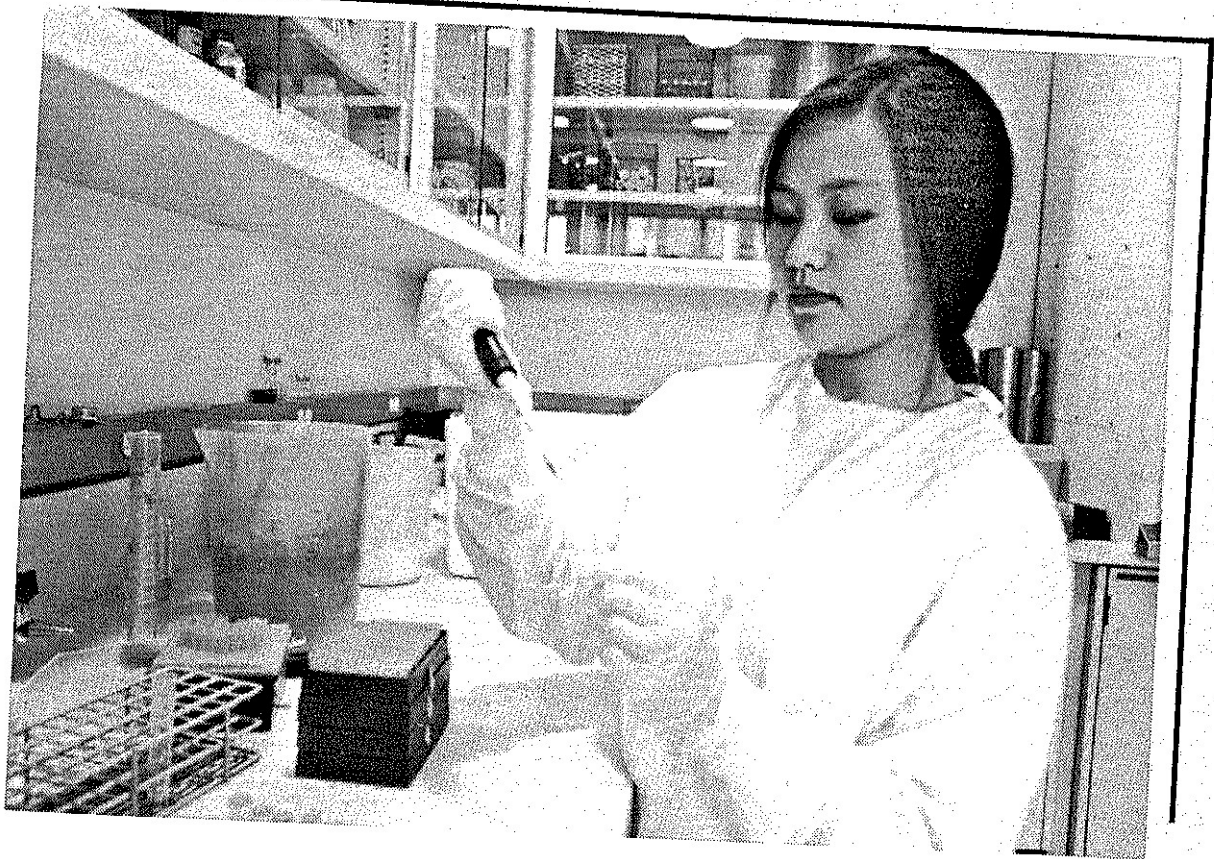
When I first started my job, I was reluctant to handle some of the toxic chemicals because I was afraid that they would eat away at my skin or their unpleasant odors would linger with me for the whole six weeks. However, after going through six pairs of rubber gloves and two pairs of safety glasses, I realized that although some chemicals can be dangerous, they are not that bad if they are handled in a responsible manner and are disposed of properly when they are done with.

Wow! What a summer! I can't believe it's over already. It seems like only yesterday I was being introduced to my supervisor Laurie Dixon, a sixth-year University student who is working on her thesis. We worked in the Provincial Laboratory under the supervision of Dr. William Albritton in the department of Medical Microbiology and Infectious Diseases. When I first arrived, I was pretty intimidated because I had no experience whatsoever in laboratory research. Luckily, Laurie was great to work with. Throughout the whole six weeks, she was thoroughly patient as she tried to give me a crash course in microbial genetics. To be perfectly honest, I didn't understand exactly what my research project was until the third or fourth week. Since then, it has been a little bit more interesting.

To begin with, this research project is trying to find a specific plasmid DNA which could be modified into a vector system. Plasmid DNA is extra non-chromosomal DNA which carries genes that are beneficial but not necessary for the survival of bacteria. A vector system is a system to clone genes into another species. Basically, what I'm doing is taking plasmid DNA, called pLS88, from the bacterium *Haemophilus ducreyi* and putting it in another species of bacteria and finding out how much of that bacteria will replicate and also how it replicates. When we discover how this plasmid works, we can then attempt to change it so we can clone it.

Before I could start this project, I first had to learn the proper techniques of how to plate, inoculate, cultivate, and incubate bacteria. Then I had to learn how to use various pipettes, what it means to vortex, centrifuge, and suspend, and also how to handle and dispose of biohazardous materials. After that, I began the meaningful work. First, I had to prepare the pLS88 (the plasmid DNA), before I could work with it. This is achieved by a method called lysis with alkali, which is a way of bursting the bacterial cells open with various

solutions, leaving you with the RNA, the chromosomal DNA, the proteins, and the plasmid DNA. Then I had to purify the pLS88 by precipitation with polyethylene glycol, which gets rid of most of the chromosomal DNA, the RNA, and the proteins. After that, I had to purify the pLS88 again by isopycnic centrifugation in a cesium chloride gradient. This just separates the different types of DNA by its buoyant density. Then I could extract the pLS88 and clean it. Now that I finally have the plasmid, I have to do a ligation, which attaches the ends of the pLS88 to a different band of DNA with polynucleotide ligase so it could survive in a bacterium. After this is successfully completed, I can then proceed to electroporate the pLS88 into a different species



of bacteria such as *Haemophilus influenzae* Rd nov, which is responsible for causing pneumonia and meningitis. I then have to plate them and let them incubate. After a day, I check the plates for any mutations or contaminants. If they're okay, I have to count every single colony. Then I could use those plates to prepare mini-preps, which is a long and tedious process that requires a lot of pipetting. I then make an agarose gel and run the mini-preps through electrophoresis. After that, I photograph the gel using UV light. This tells me if the pLS88 that I put in is there or not. And this, ladies and gentlemen, is recombinant DNA technology in a nutshell. Besides working on this project, I have learned how to make specific strands of DNA (called oligos) with a special machine called a DNA Synthesizer and also learned how to make buffers and solutions.

I would like to thank WISEST for giving me the opportunity to participate in this program. It has been a truly remarkable experience. I have gained a greater understanding of the University of Alberta and of scientific research while meeting many interesting people. This is one summer job I won't forget!

WISEST SUMMER RESEARCH PROGRAM

1993

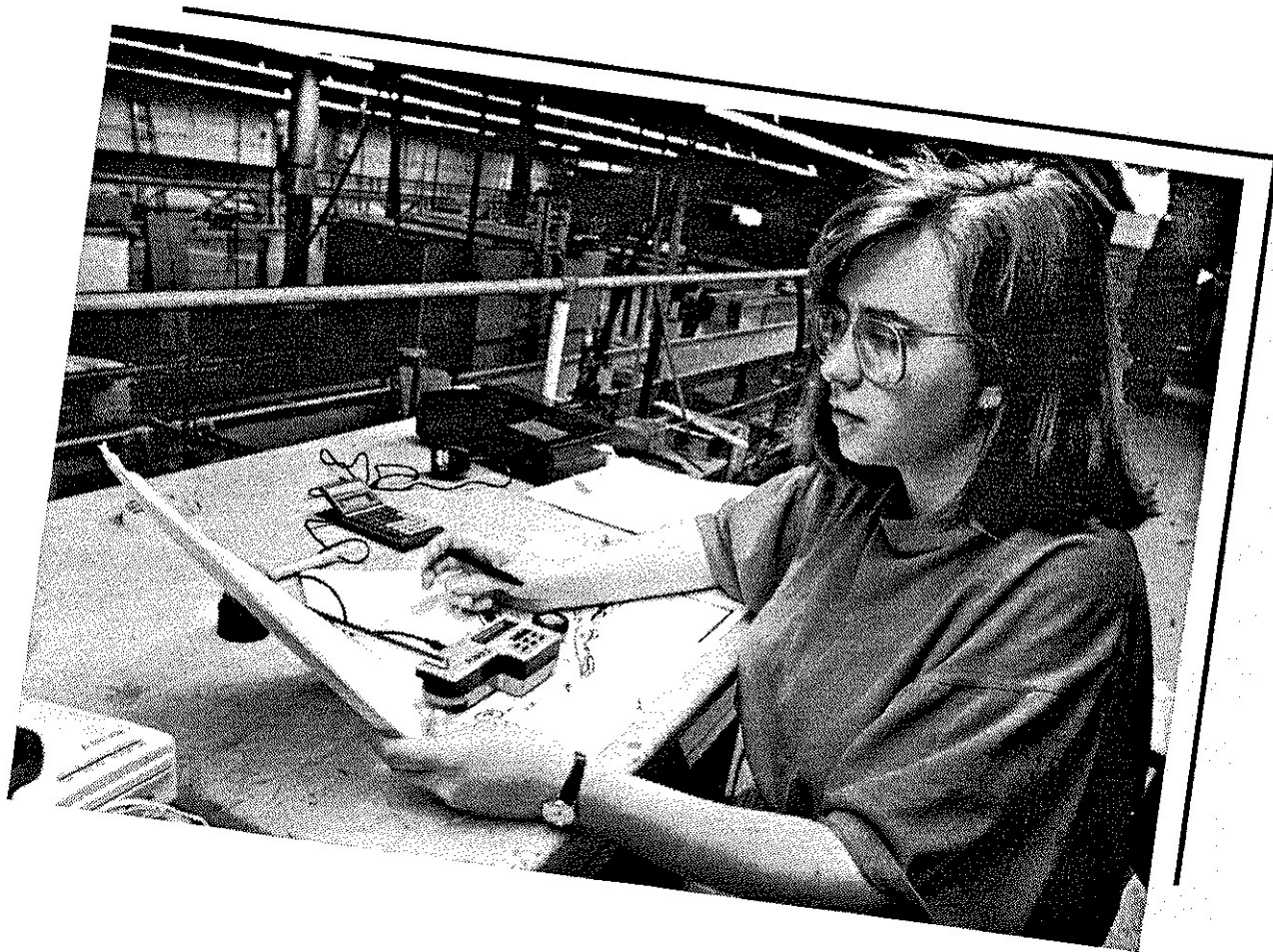
BY LISA POOKE

My experiences with this program has been everything I expected and more. I heard about WISEST and their summer program when I was in the middle grade ten. I was really disappointed that the program was only for grade eleven students, but in knowing that it gave me something to look forward to. It also created high expectations which it has more than lived up to in the past six weeks.

For the six weeks I worked in the Department of Civil Engineering on a project headed by Dr. Faye Hicks. This research is a study of how the spring break up of the Mackenzie River (NWT) at Fort Providence could be predicted. The answer to this question is quite an valuable one. Fort Providence is where the Yellowknife Highway crosses the Mackenzie River. This highway is the route to Yellowknife. Passage is fine during the summer and winter but is limited during break up. A ferry is used during the summer and an ice bridge is used during the winter. The problem is during break up, when the ice bridge can no longer used, but it is too early to put in the ferry. When this happens, a helicopter is used to transport goods and vehicles. This is an inconvient and expensive solution. If the break up of the river could be predicted, then the ferry could be put in and taken out early enough to avoid major ice movements.

There are many different factors to take into account in when looking for the answer. Such factors are water levels, ice thickness and depth, solar radiation, atmospheric temperature, major ice movements and the development of open water areas. It was the development of the open water areas that I worked on. The signifigance of open water development is that the sun warms up the water that is flowing down river. The warmed water flows under the ice melting it from below. This makes it so that ice is being melted from above and below increasing the rate at which the ice melts. From maps made during break up, I calculated the areas of open water and then put this data into the computer. The main focus of the work was to convert huge amounts of raw data into a useable form.

My experiences this summer has shown and taught me many new things. I'm not talking just about things concerning science and engineering only. During these six weeks I learned a lot about myself and life in general. I have found out that the city environment doesn't agree with me



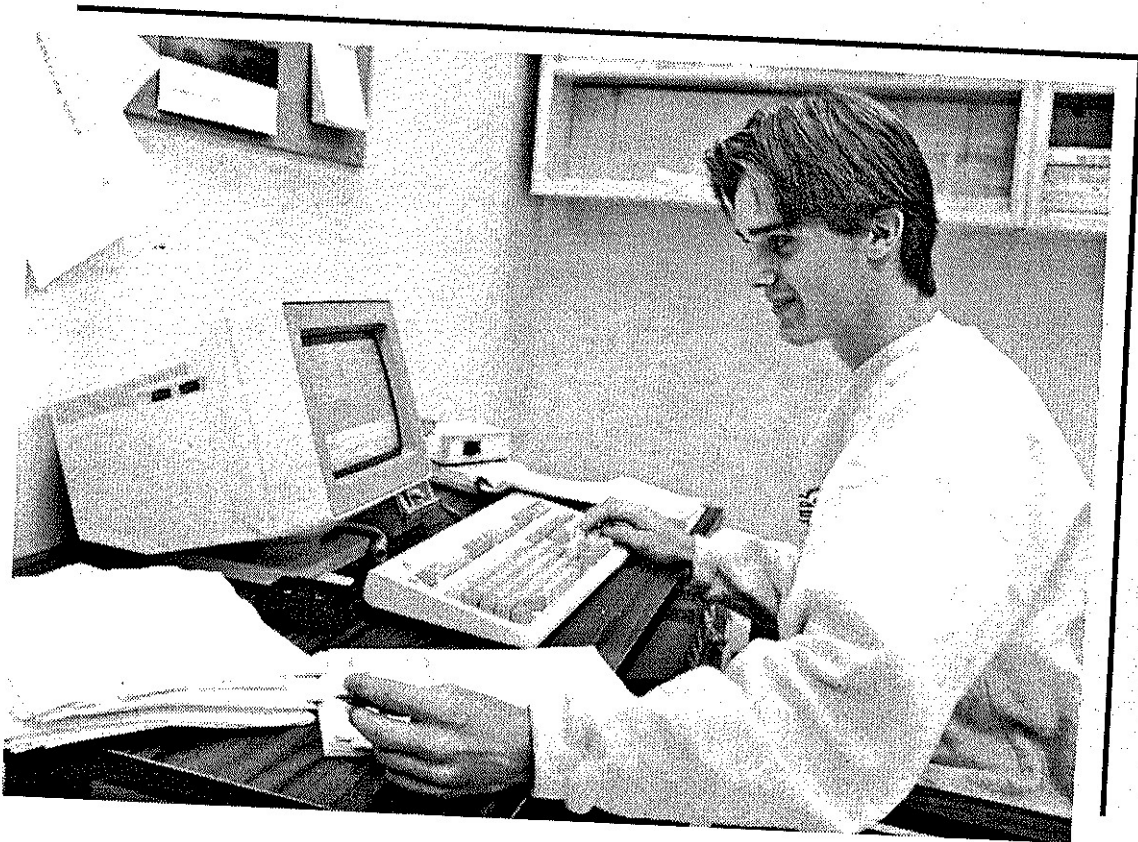
and that if I chose to enter engineering I have the option of having a career that doesn't require me to be in a city constantly. I now have strong idea of what direction I want to go careerwise and what I need to do to get there. It was also fantastic to see other aspects of science and meet people from these fields. It was great to meet people my own age that were interested in science.

I am very glad that I had this opportunity and I have enjoyed it completely. I thank the organizers of WISEST, all those at the T. Blench Hydraulics lab and Dr. Hicks for this.

My summer of 1993 was spent in the faculty of nursing, under Dr. Janet Ross Kerr and Dianne Godkin, working on the Adult Day Program study. Adult day programs are a place where people (clients) who are isolated or dependant on a caregiver, because of sickness, disability, or lack of mobility, can go to socialize, receive therapy, and deal with professional caregivers. Another purpose is to give the caregiver a break from his/her dependant. The study is to find if the programs are of benefit physically or mentally to the clients and to the caregivers, and how the program could be improved. The clients and caregivers are interviewed and given questionnaires five times and this was the raw data. My job was to enter the data, clean the data of entry mistakes, and do some analyzing of it.

Entering data kept me in front of a computer most of the time using SPSS-X, a statistical analyzing program. That part was easy just really long because there were over 2000 questionnaires to be entered. Finding mistakes that were made entering the data was the most boring, tedious part of the whole job but it had to be done. After the data was all in and correct the analyzing could begin which was just programming what to do into the computer and looking at the numbers, graphs, and charts that were printed out. The study will be going on for another year still so the only results that seem to be showing up is the programs are of great help to the caregivers and the clients are able to socialize with some others than their caregiver.

In addition to the research, time was spent with nurses in other areas. Two areas were at the University hospital, the heart and lung transplant and the neonatal intensive care unit (NICU). The Camsell hospital was the site for two other expeditions. The emergency ward was really slow the morning we went so we did other things like put casts on and use the machines in emergency. Two weeks later we were back at the Camsell to see minor OR. We watched eyelids being shortened, extended, and turned right side out.



Another trip was made to Alberta (psychiatric) hospital which is really a small town on its own. The main focus was the Young Offenders area where we talked with one of two male nurses I saw in six weeks. One morning was travelling around with a homecare nurse. Watching all these nurses showed me how much the nurses deal with the people and how important it is to have the patient comfortable with his/her knowledge of what's happening.

The last six weeks were interesting especially seeing the patients and their nasty incisions. I really enjoyed the chance to be around the University and find out what research is like. Overall I'm glad I was in the program and had a great summer job.

Kevin Worth

Kevin Worth

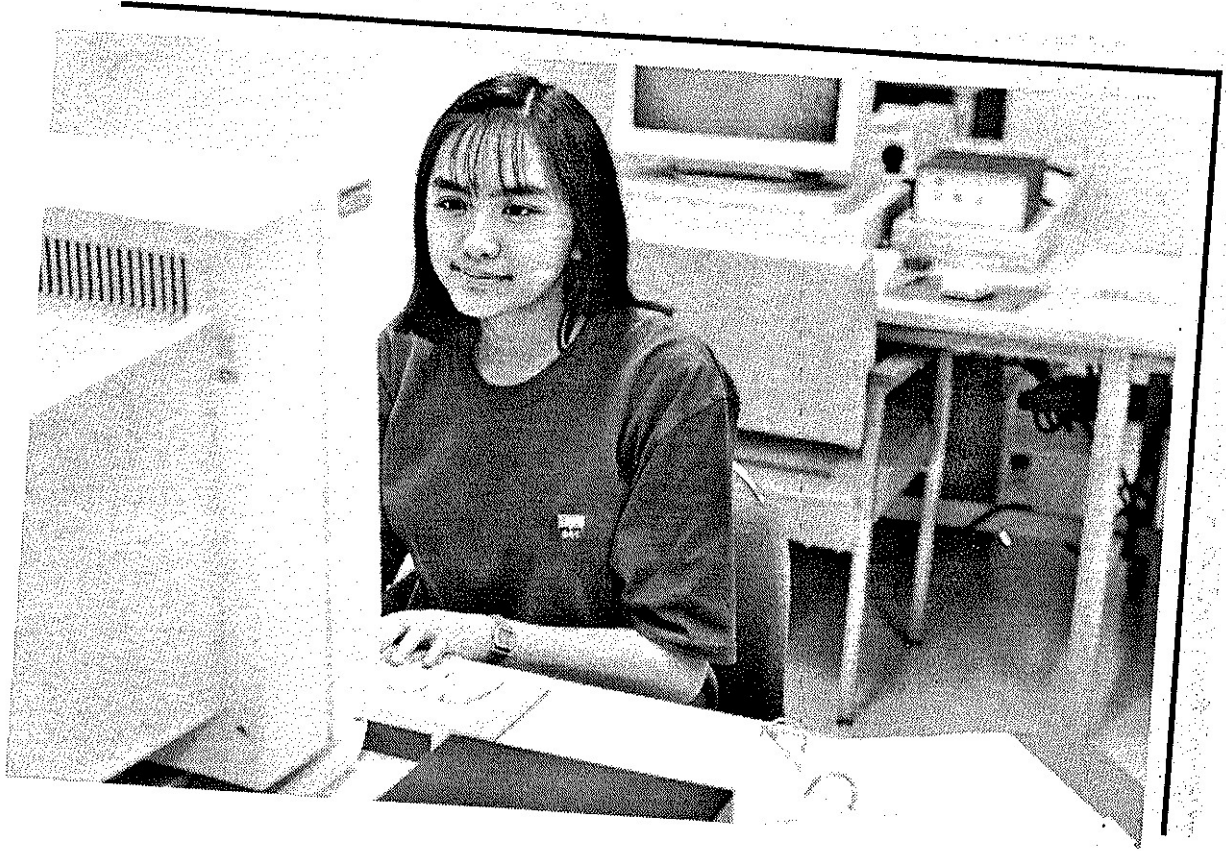
My Summer at WISEST
Department of Computing Science
by Michelle Balce

During my six weeks at WISEST, I have been working in the Department of Computing Science under the supervision of Dr. Catherine Descheneau. I was not given a specific research project to work on. However, my sole purpose of being there was to work through and to give them my opinion on the material that they give to first year Computing Science students. I was also exposed to some of the interesting things that computers are able to create.

The first thing they introduced me to was Multimedia which involves the creation of animation, music, games and movies using the computer. After going through a demo disk on Multimedia, I was told that I was going to be a TA (Teaching Assistant) for a Summer Youth University (SYU) class on Multimedia. The class was quite large and they all seemed so eager to explore the demo disk. But there was one big problem. There were too many students using the disk at the same time. Consequently, the system crashed. To solve the problem, we put the students in groups to lessen the load on the system.

The second thing they introduced me to was UNIX which is an internationally used operating system. I attended a couple of SYU classes and went through a disk on introductory UNIX. This is the operating system I used to do my programming in Pascal. I worked on a Computing Science 114 assignment which is designed to create a game called the Arithmetic Adventure Game. It involves developing a program, where after each exercise, the program is added on to, containing more complicated sequences. With the use of procedures and functions, the program is able to do many little tasks, depending on what conditions stand. The result is a game, similar to a "choose-your-own-adventure" that takes you through different rooms while gaining or losing tokens along the way.

The solutions to these exercises needed to be corrected because it was necessary for all of the reserved words to be in upper case and all of the identifiers to be in lower case. The debugger (a tool that points out the errors in a program) would not accept a reserved word or an identifier if it was typed in the wrong case. If I ran the program through the compiler, the compiler would be able to pick up all of the incorrect words. The solution is corrected if it is able to compile and run properly. I also worked through and revised an exercise on the introduction to the Motif Window Manager.



Being part of the WISEST program has been a valuable experience for me. Working with the Department of Computing Science has opened my eyes to a more complicated side of computers. The knowledge and the experiences I have gained during the past six weeks will stay with me always. I would like to thank Carolyn Morris for her time and patience (It has been great working with you!) and Dr. Catherine Descheneau for her guidance. I would also like to thank Salima Hajee, Dr. Dorothy Tovell and Dr. Margaret-Ann Armour for giving me the opportunity to explore possible career choices in non-traditional fields.

WISEST Summer Research Program
Student Report

Being in the WISEST Summer Research program has been a worthwhile and rewarding experience for me. I have been working in the field of botany with Dr. Mark Dale and two other WISEST students. Over the six weeks, I have learned numerous things about plants and research in general. I have also had a chance to meet other people and familiarize myself with the University. Participating in the WISEST summer program has been a real benefit in terms of being able to meet new people and gaining valuable experiences.

During the first three weeks of the WISEST program, I had the opportunity to experience taking a University course. Coincidentally, as our summer program began, a Field Botany 304 class was just commencing. As an introduction to our research work, the two other WISEST students and I attended the lectures daily and took useful notes to refer back to when necessary. We also went on the various trips to the river valley, Devonian Botanical Gardens and the Wagner natural area where we learned to identify some common plants. It was quite a joy to attend a class and not have to worry about handing in labs, doing oral presentations and writing the mid-term or the final. Best of all, I did not even have to pay for the course.

During the three weeks that we attended the class, we were also harvesting an experiment planted the previous year. We worked with a rare plant, the Chamaerhodos erecta (at least that's the conclusion we reached after looking through Biological Abstracts dating from the 1960's to 1990's and finding only one paper which dealt with the plant, and that wasn't even written in English). We had at least fifty pots to harvest, some containing over fifty plants in each. It was almost impossible trying to excavate each individual plant without losing too many roots. In addition to this, we had to count the number of florets in twenty of the flowering stalks. The numbers ranged from 200 to over 1000.

We also did some field work during the remainder of our six weeks. As part of a twenty year study, we were required to examine the vegetation in an abandoned hay field by the use of permanent quadrats. If the harvesting sounded monotonous, this was even more so. We had seventy five quadrats with one hundred sub-quadrats within each quadrat. This routine was very time-consuming. We spent over two weeks in the hot sun with mosquitos and wasps attacking us constantly before we completed the project.

In addition to our work, WISEST organized Wednesday afternoon sessions in which we got to meet other students. In one session we were shown around the campus. In another, we had a chance to talk to people in non-traditional careers, and best

of all we had a chance to visit another lab of our choice. It was exciting visiting an anatomy lab. We came very close to seeing a cadaver, but unfortunately there weren't any set out at that time.

I felt very fortunate to be accepted for this summer program. Taking part in the program has taught me many things; not only about research, but about the responsibilities and the hard work involved in taking a job, and also, of course, the joys of receiving a paycheck. This was not only a summer job, it was also a great learning experience. I had the opportunity to explore a field of science which I might be interested in taking in the future. Throughout the six weeks, I was able to work in a comfortable atmosphere with very pleasant people. Although research work can be tedious, the immense feeling of satisfaction that comes with the completion of the job makes it all worthwhile.

Karen Wong '93



Wisest Summer Project
Written report
Submitted by Kirstin Jahns

When I heard that I was accepted for this year's WISEST Summer Program I was ecstatic: it was a dream come true! But when I heard I was going to be placed in a botany lab studying secondary succession my excitement diminished somewhat. Ecology wasn't exactly my favourite unit in biology. Little did I know that this was going to be an experience unlike any other.

The first day at work I was full of questions: how many other students will work with me? Will I have a nice supervisor? Am I going to understand everything? These questions and more were soon answered as my name and two others were called to meet "The Supervisor." Dr. Mark Dale introduced himself with a pleasant smile and lead us to his lab on the top floor of the Biological Sciences building. It was a small lab, holding one person - Dr. Dale himself - but it soon would become "home" for three others for the summer.

Jennifer Elkow, Karen Wong, and I timidly entered the room and sat down. None of us really knew anything about plants, but that would soon be remedied. One of the projects we would be working on later required the skill of plant identification, so we were to sit in on Field Botany 304. This three week course was intended to help us to look at plants so we would be able to identify them. During the first week and a half we learned about the different parts of plants and the main characteristics of several plant families. We learned more than I ever wanted to know about plants, and I know I will never look at a plant the same way (although the only things I remember from the families are that sedges have edges, and that there is a family called cupressaceae). During the next week and a half Dr. Dale was teaching the course. His topic dealt more with ecology and secondary succession. During the three weeks of the class we also got to sit in on several of the labs, and go on several of their field trips.

Also during the second and third week we helped Dr. Dale with an experiment that was in the lab. We were working with a plant called Chamaerhodos erecta. It is a biennial plant which is native to the North. It develops a rosette of leaves in its first summer, and may or may not produce a flowering stalk in its second summer. This experiment is to aid in determining how well plants of the same species grow together, i.e. the effects of interspecific competition. The success of the plants was based on whether or not the plant flowered in its second year. Our task was to harvest and take the mass of each plant. Imagine sixty pots with an average of six plants in each pot, and each plant has to be dug up, salvaging as much of the roots as possible. Then its mass has to be taken...twice: fresh mass and dry mass. Very tedious. After that we chose twenty flowering stalks at random and counted the flowers on each stalk. The numbers ranged from 150 to 1500! Even more tedious! But at least the effort wasn't wasted: we discovered that there is a positive correlation between the number of flowers on a stalk and the dry mass of the above ground growth of the plant. It was very exciting to see these results, even though it was only a small portion of the project.

For the last three weeks of the summer our main project was to study the secondary succession of an abandoned hay field. For those of you who aren't ecologists here is a brief explanation:

The site that we are working at probably began as bare rock. Lichens began to grow on the rocks and their acids began to break the rock down into soil. Eventually more things were able to grow there until one species permanently dominated the area. This process is called primary succession. The area was then taken over for farming. When the farmer abandoned the area, plants were again allowed to grow naturally. Eventually the area will again possess the same dominant species, but there still must be many years of growth before this occurs. This process is called secondary succession and is the topic of the study. This is a twenty year study which is now in its third year. We are trying to determine how it occurs, as there are several hypotheses about secondary succession. First there is question whether growth advances from the side (frontal advance) or if seeds fly into the middle, and growth disperses from there (nucleation). Second, scientists question whether growth of the first species helps to make the soil more fertile for the later species to help them grow (facilitation model), or if the first growth makes it harder for the later species to grow as there is too much competition (inhibition model).

We examined sixty permanent .5 x 2m quadrats to help determine which hypotheses are correct. The quadrats were divided into a hundred 10 x 10cm squares over and in which we recorded the height of the vegetation. Also somewhat tedious, but hopefully the collected data will help in the final analysis seventeen years from now.

We also had the opportunity throughout the six weeks to enter data into the computers for analysis, and also to use the library for research.

Though I still don't think botany is the career for me it has been a very enjoyable summer, and I have learned many new things, some of which are transferable, some of which are not (plant identification, for instance). All in all I can definitely say this has been a wonderful experience and learning opportunity, and I sincerely hope many other girls get the opportunity to have a similar one.

My Experiences With WISEST

This past year, my biology teacher gave me a pamphlet about a WISEST seminar and suggested that I attend. I did and had a great time. After the seminar she informed me about the Summer Research Program. It sounded very interesting so I decided to apply. Then came the hard part, having to wait to find out if I was accepted. Soon everybody I knew that had applied, had either been phoned or had received a letter. I had heard nothing. Finally I decided to give the WISEST office a call. Salima returned my call later that evening and I finally found out that I had been accepted. After I finished talking with her I immediately went to have a little talk with my brothers about the importance of remembering phone messages.

Well, school finally finished, exams were over and it was time to start work. I was extremely nervous about my first day. I was afraid of getting lost on campus, of not knowing anybody and of having to work in Botany. I was not an "outdoors" person, I did not like dirt and I was terrified of bugs, wasps and almost anything else that moved. However, despite these fears, I did show up and had a great first day.

I was fortunate enough to attend a Field Botany course for three weeks along with the two other girls that I was placed with. It was a great experience to see what a university class is like, even if I was lost at times. For the first week I attended a two hour lecture and then went with the class in the afternoon to numerous sites to look at plants.

During the second and third weeks I attended the lectures and worked for Dr. Dale in the afternoon. The three of us had to harvest this plant called *Chamaerhodos erecta*. This involved getting our hands dirty and to my surprise I enjoyed digging in the dirt! First we had to dig up each plant with its roots. Then we separated the roots from the rosette and flowers. We also had to measure their widths and heights and had to take their wet and dry mass. Then I had to enter it into the computer so that Dr. Dale could analyze it. This was definitely tedious.

For the last three weeks we went out to the Wagner Natural Area. There we collected data for another project. This work was also tedious but we still had fun. We had to identify all the plants rooted in a 10 centimeter by 10 centimeter micro-quadrant and then all the plants covering it. This had to be done for 7500 micro-quadrants. At first it was very slow, but we became really good at recognizing plants by the end. In the end, even the bugs did not bother me and I did not run from every wasp I saw which is a big accomplishment for me.

The entire WISEST experience was very enjoyable. I was able to meet new people with similar interests and I was able to learn about plants. The Wednesday sessions were fantastic! I especially enjoyed the visit to another research lab. I now know that science is definitely what I want to take. Thanks to the WISEST Summer Research Program, this summer will not be one that I will easily forget.

-Jennifer Elkow-

The 3 - Dimensional Computer Reconstruction of Fetal Specimens

Our project involved the 3 - dimensional computer reconstruction of human fetal specimens. The fetuses used in this research had been spontaneously aborted due to various disorders that occurred during their development. The purpose of this research was to identify and understand these disorders --- primarily concentrating on the head region. The team researchers (including Dr. Sperber, a dentist/professor, Dr. Machin, a pediatric pathologist and June Dabbagh, a fourth year dentistry and masters student) have been working on this research for a number of years and we were fortunate enough to participate in the study of their fifth fetus.

Most of the fetuses we worked on had anencephaly, a condition in which the brain hasn't formed, and as a result the shapes of many facial structures were affected. The fetus we worked with was considered to be a severe case because it was anencephalic (no brain), it possessed only one eye orbit (although it had two lenses), and most importantly the blood supply to the brain atrophied and certain arteries in the head did not form. Therefore, the other purpose of this research was to observe and record abnormal changes that occurred during their development.

The procedure began when Dr. Machin brought the spontaneously aborted fetuses from the University of Alberta Hospital. The lab technician then embedded the fetus in a block of paraffin wax in order to section it into very thin layers (micrometers in thickness). The paraffin wax helped to keep the tissues and organs intact because they were very fragile. Once the fetus had been sectioned, each layer was mounted on a slide and stained. We became involved in the project by helping to study the slides through a microscope. The reason for studying the slides was to determine what significant and/or abnormal changes occurred, with respect to organ shape or presence. We then magnified, photographed and developed the slides. Later, we outlined organs onto transparencies, concentrating only on those organs important to us. Once the structures had been traced we then retraced them, layer by layer, onto the computer using the program AutoCad 12.

The importance of producing the true-to-life, 3-dimensional, shaded computer images was to allow us to visualize organs which were normally not seen because of their small size. By visualizing the organs we were then able to speculate what went wrong.



Being in the WISEST summer program was definitely a rewarding experience --- both intellectually and socially. Not only were we exposed to a lifestyle of research and science, but also able to share common interests with people our own age. We appreciated the opportunity, which helped us to make decisions about our own futures. Aside from many learning experiences, we also had many great times to remember!

Dahlia Malchenko

Aleksandra Stefanović

Index of Student Reports:

	page #		page #		page #
Aleksandra Stefanovic	106	Jennifer Elkow	105	Michelle Tubman	66
Anna Lee	50	Jennifer Snart	41	Neelam Mahil	70
Beryl Koshy	20	Jennifer Wagner	32	Oksana Kotovych	88
Carla Teare	68	Jill Griffiths	60	Philina Lee	26
Catherine Masters	38	Joanne Zapisocki	28	Sandeep Tamber	92
Charlene Ericksen	17	Julie Andreotti	56	Sinead Collins	48
Christy MacKinnon	78	Karen Woo	86	Stacy Gallaway	24
Claudette Rondeau	90	Karen Wong	102	Theresa Winski	84
Connie Tang	82	Kevin Worth	98	Tinh Phung	30
Craig Milne	62	Kimberly Ross	34	Vivian Mak	36
Dahlia Malchenko	106	Kimberly Malonik	65	Y-Le Ho	51
Erin Burrell	41	Kirsten Kidd	15		
Gabrielle Deagle	46	Kirstin Jahns	104		
Gloria Hsi	52	Leena Chacko	76		
Hannah Piper	75	Lena Schofield	22		
Henry Chui	80	Lisa Pooke	96		
Jackie Ham	54	Lorraine Howard	17		
Janet Lam	73	Marc van der Wekken	40		
Jay Kormish	44	Marilyn Zinner	58		
Jeannie Mao	94	Michelle Balce	100		

