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## Appendix A - Current Scholarship on Integrating Teaching and Research

There have been numerous studies in the past fifteen years examining and discussing the link between teaching and research at research-intensive universities in Canada, the U.S., Europe and elsewhere. Even previous to that, in the 1970s and 1980s, there were a series of studies that attempted to find statistical evidence analyzing the relationship of teaching and research quality. In the 1990s these studies were criticized "for failing to focus on the extent to which the substantive processes of teaching and research may be shared, and for failing to consider the particular institutional contexts" (Jenkins 2004, p. 7).

In his 1990 book *Scholarship Reconsidered*, Ernest Boyer was one of the first scholars to address the issue of the integration of teaching and research. He challenged academics and the higher education system in general to 'break away from the tired old teaching versus research debate' (Boyer 1990). This was followed up by the 1998 Boyer Commission report, "Reinventing Undergraduate Education", which has had a tremendous influence on the post-secondary education system in the United States. The Boyer Commission made a series of recommendations under ten separate categories that would help to facilitate the integration of teaching and research at research-intensive universities (see Appendix B for a full list of the recommendations). In 2001, the Boyer Commission was followed by a paper assessing the impact the recommendations of the report had on research-intensive universities in the US.

In 2003, Alan Jenkins et al. released a new book, *Reshaping Teaching in Higher Education: Linking Teaching with Research*, where the authors expand upon the work of the Boyer Commission to examine different strategies that can be used to link teaching and research in individual programs, departments, faculties, and institutions, as well the national and international contexts (see Appendix B for a summary of the strategies). In 2004, Alan Jenkins also released "A Guide to the Research Evidence on Teaching-Research Relations" through the Higher Education Academy in England, which is an exceptional summary of research to date on the integration of teaching and research and the best amalgamation of references on the topic. Below is a summary of some selected references on the integration of teaching and research.

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## **Appendix B - The Boyer Commission and Jenkins Strategies**

Early in the deliberations of the Working Group on Teaching and Research it was determined that a framework was needed to focus the discussions. The working group adopted the frameworks established by the Boyer Commission in the US and by Jenkins et al. in the UK. The Boyer Commission makes a series of recommendations under ten distinct headings. The working group agreed with this broad framework, and supplemented it with the strategies laid out by Jenkins (et al.) for linking teaching and research at the program level, the department/faculty level, and the institutional level. These recommendations and strategies are summarized for you below.

### **Boyer Commission Recommendations<sup>1</sup>**

#### **I. Make Research-Based Learning the Standard**

1. Beginning in the freshman year, students should be able to engage in research in as many courses as possible.
2. Beginning with the freshman year, students must learn how to convey the results of their work effectively both orally and in writing.
3. Undergraduates must explore diverse fields to complement and contrast with their major fields; the freshman and sophomore years need to open intellectual avenues that will stimulate original thought and independent effort, and reveal the relationships among sciences, social sciences, and humanities.
4. Inquiry-based courses should allow for joint projects and collaborative efforts.
5. Professional schools need to provide the same inquiry-based opportunities, particularly in the early years.
6. Provision of carefully constructed internships can turn inquiry-based learning into practical experience; internship opportunities need to be widely available.

#### **II. Construct an Inquiry-Based Freshman Year**

1. A student embarking upon a degree program at a research university should be adequately prepared to meet the intellectual challenges of that program; if remediation is necessary, it should be completed before entering the program.
2. All first-year students should have a freshman seminar, limited in size, taught by experienced faculty, and requiring extensive writing, as a normal part of their experience.
3. Every freshman experience needs to include opportunities for learning through collaborative efforts, such as joint projects and mutual critiques of oral and written work.
4. The freshman program should be carefully constructed as an integrated, interdisciplinary, inquiry-based experience by designs such as:

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<sup>1</sup> From the Report of the Boyer Commission: "Reinventing Undergraduate Education - A Blueprint for American Universities" completed in 1998.

- A. Combining a group of students with a combination of faculty and graduate assistants for a semester or a year of study of a single complicated subject or problem.
- B. Block scheduling students into two or three first-semester courses and integrating those courses so that the professors plan together and offer assignments together.
- C. If possible, integrating those courses with the freshman seminar, so that there is a wholeness as well as a freshness to the first year.
- D. Taking advantage of time freed by advanced placement to explore areas not studied in high school in order to encourage students to range as freely as possible before selecting a major.

### **III. Build on the Freshman Foundation**

1. The inquiry-based learning, collaborative efforts, and expectations for writing and speaking that are part of the freshman experience need to be carried throughout the program.
2. Thoughtful and attentive advising and mentoring should integrate major fields with supporting courses so that programs become integrated wholes rather than collections of disparate courses.
3. Mentorships should begin as early as possible and should be maintained, whenever possible, throughout a student's academic career.
4. New transfer students need to be integrated into the research experience with special seminars or similar courses comparable to the freshman seminar.

### **IV. Remove Barriers to Interdisciplinary Education**

1. Lower division courses should introduce students to interdisciplinary study.
2. Academic majors must reflect students' needs rather than departmental interests or convenience.
3. Customizing interdisciplinary majors should be not only possible but readily achievable.

### **V. Link Communication Skills and Course Work**

1. All student grades should reflect both mastery of content and ability to convey content. Both expectations should be made clear to students.
2. The freshman composition course should relate to other classes taken simultaneously and be given serious intellectual content, or it should be abolished in favor of an integrated writing program in all courses. The course should emphasize explanation, analysis, and persuasion, and should develop the skills of brevity and clarity.
3. Writing courses need to emphasize writing "down" to an audience who needs information, to prepare students directly for professional work.
4. Courses throughout the curriculum should reinforce communication skills by routinely asking for written and oral exercises.
5. An emphasis on writing and speaking in graduate courses will prepare teaching assistants for research, teaching, and professional roles.

## **VI. Use Information Technology Creatively**

1. Faculty should be alert to the need to help students discover how to frame meaningful questions thoughtfully rather than merely seeking answers because computers can provide them. The thought processes to identify problems should be emphasized from the first year, along with the readiness to use technology to fullest advantage.
2. Students should be challenged to evaluate the presentation of materials through technology even as they develop an increasing familiarity with technological possibilities.
3. Faculties should be challenged to continue to create new and innovative teaching processes and materials, and they should be rewarded for significant contributions to the technological enrichment of their courses.
4. Planning for academic units, such as block-scheduled courses for freshmen or required courses for individual majors, should include conscientious preparations for exercises that expand computer skills.
5. Active interchange between units on campus and through professional meetings should encourage and inspire faculty to create new computer capabilities for teaching and to share ideas about effective computer-based learning

## **VII. Culminate with a Capstone Experience**

1. Senior seminars or other capstone courses appropriate to the discipline need to be part of every undergraduate program. Ideally the capstone course should bring together faculty member, graduate students, and senior undergraduates in shared or mutually reinforcing projects.
2. The capstone course should prepare undergraduates for the expectations and standards of graduate work and the professional workplace.
3. The course should be the culmination of the inquiry-based learning of earlier course work, broadening, deepening, and integrating the total experience of the major.
4. The major project may well develop from a previous research experience or internship.
5. Whenever possible, capstone courses need to allow for collaborative efforts among the baccalaureate students.

## **VIII. Educate Graduate Students as Apprentice Teachers**

1. All graduate students should have time to adapt to graduate school before entering classrooms as teachers.
2. Graduate apprentice teachers should be assisted by one or more of the following means: seminars in teaching, thoughtful supervision from the professor assigned to the course, mentoring by experienced teachers, and regular discussions of classroom problems with other new teachers.
3. Graduate students should be made aware of their classroom roles in promoting learning by inquiry. They should not be limited to knowing the old modes of transmission of knowledge without understanding the role of student and faculty as joint investigators.

4. Graduate courses need particular emphasis on writing and speaking to aid teaching assistants in their preparation for teaching as well as research functions.
5. Graduate students should be encouraged to use technology in creative ways, as they will need to do in their own careers.
6. Compensation for all teaching assistants should reflect more adequately the time and effort expected.
7. Graduate students should be encouraged through special rewards for outstanding teaching. Financial awards should be established for outstanding teaching assistants. The permanent faculty should make it clear through these awards and through all they do that good teaching is a primary goal of graduate education

## **IX. Change Faculty Reward Systems**

1. Departmental leaders should be faculty members with a demonstrated commitment to undergraduate teaching and learning as well as to traditionally defined research.
2. The correlation between good undergraduate teaching and good research must be recognized in promotion and tenure decisions.
3. A "culture of teaching" within departments should be cultivated to heighten the prestige of teaching and emphasize the linkages between teaching and research.
4. Prestigious professional research meetings such as national disciplinary conferences and the Gordon Conferences should contain one or more sessions that focus on new ideas and course models for undergraduate education.
5. Sponsors of external research grants can and should promote undergraduate participation, as the National Science Foundation has begun to do, thus facilitating the research experiences of undergraduates.
6. Rewards for teaching excellence, for participation in interdisciplinary programs, and for outstanding mentorship need to be in the form of permanent salary increases rather than one-time awards.
7. Teachers capable of inspiring performance in large classes should be recognized and rewarded appropriately.
8. Committee work at all levels of university life should be greatly reduced to allow more time and effort for productive student-related efforts

## **X. Cultivate a Sense of Community**

1. Research universities need to cultivate a sense of place through appropriate shared rituals that are attractive to the widest possible constituencies within the student population.
2. The enriching experience of association with people of diverse backgrounds, ethnicities, cultures, and beliefs must be a normal part of university life.
3. Residence halls should nurture community spirit.
4. Commuting students must be integrated into university life by making their participation easy and attractive.
5. Collaborative study groups and project teams should be used as a means of creating customized communities for residential and commuting students.

6. Common interests, such as that in maintaining the beauty of the campus setting or supporting charitable or service projects, should be cultivated by creating teams that build community as they work toward a shared goal.
7. Major issues forums, multicultural arts programming, and other extracurricular sharing of ideas, opinions, and arts bring students together, particularly when groups or clubs sponsor or help sponsor the events.
8. Campus programming, such as lectures and performing arts programs, taken as a whole, need to touch the interests of as many audiences as possible.

## **Strategies for Linking Teaching and Research<sup>2</sup>**

### **I. At the Module/Course Level For Both Undergraduate and Graduate Studies**

1. Develop students understanding of the role of research in their discipline (develop the curriculum to bring out the current or previous research developments in the discipline; develop student awareness of learning from staff involvement in research; develop student understanding of how research is organized and funded in the discipline)
2. Develop students' abilities to carry out research/consultancy in their discipline (develop the curriculum, in particular how students learn in ways that mirror/support the research processes in the discipline; assess students in ways that mirror/support the research processes in the discipline)
3. Provide training in relevant research skills/knowledge
4. Require all students to undertake some research
5. Develop student involvement in staff research
6. Perhaps restrict certain research opportunities to selected students
7. Manage the student experience of staff research
8. Evaluate/research student experience of research and feed that back into the curriculum
9. Support students in making clear to them the employability elements of research and consultancy

### **II. At the Departmental (Faculty) Level**

1. Develop disciplinary (and departmental) understanding of teaching and research relations
2. Make it a central consideration in hiring new staff
3. Ensure it is fostered through how staff roles are defined (balance between expected research/teaching/community service)
4. Ensure it is fostered through policies for appraisal and staff development
5. Develop effective synergies between research centres, course planning teams and postgraduate and undergraduate teaching
6. Audit/review department-based courses
7. Develop special programs or structures to foster the nexus

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<sup>2</sup> Based On: Jenkins A et al. (2003) Reshaping Teaching in Higher Education: Linking Teaching and Research, London, Kogan Page/SEDA

8. Pay attention to (and address) issues of departmental culture
9. Participate in national (and international) programs

### **III. At the Institutional Level**

1. State that linking teaching and research are central to the institutional mission
2. Make it the mission and deliver it
3. Organize events and publications to raise institutional awareness
4. Use the Boyer analysis to develop institutional conceptions and strategies to effect the teaching/research links
5. Develop/audit teaching policies and implement strategies to strengthen the teaching/research nexus
6. Develop/audit research policies and implement strategies to strengthen the teaching/research links
7. Ensure the nexus is central to policies on inducting/developing new staff
8. Ensure effective synergies between units and committees for teaching and research
9. Ensure teaching/research links are central to policies on promotion and reward
10. Publicize, celebrate, and share what has been achieved
11. Support initiatives through external sponsorship
12. Link with other related university strategies
13. Participate in national (and international) programs
14. Support implementation at the department/faculty level

### **IV. At the National (and International) Level**

1. Build the link into the statutory/legal definitions of Higher Education institutions, degrees, and professional requirements
2. Benchmarking
3. Ensure that there are limited negative impacts from research selectivity
4. Require research selectivity to support research areas that directly support the link between teaching and research
5. Build dissemination strongly into the criteria for receiving a grant
6. Research agencies should explicitly value/fund discipline-based pedagogic research
7. Competitive awards to institutions for programs that address the nexus
8. Selectivity build grant requirements for data from research studies to be widely available to teachers/scholars and students
9. Fund and support all institutions and staff for (discipline-based) scholarly activity
10. Develop external reviews of teaching and research which explicitly support the linkage
11. National and international disciplinary organizations can support the nexus
12. Develop national and international organizations and projects to support the nexus

## V. Model For Developing the Link in Departments<sup>3</sup>

<i>Investigation</i>	<b>Stage 1</b> Hold focus group/department meeting to identify staff perceptions of the nexus in their discipline and in particular in their department
<i>Mapping and Understanding</i>	<b>Stage 2</b> Carry out a SWOT analysis of the nexus in the department, drawing in particular on the analysis of the department meeting in stage 1 and on the wider literature on the nature of the nexus in your discipline
<i>Planning</i>	<b>Stage 3</b> i) Develop a strategic framework; ii) identify particular areas for actions at course team, department and perhaps at institutional level
<i>Implementing</i>	<b>Stage 4</b> Carry out targeted actions to further embed the nexus
<i>Evaluation and Monitoring</i>	<b>Stage 5</b> Monitor and evaluate

## VI. Questions to Ask

### *Curriculum and Research-based Learning<sup>4</sup>*

- What is your departmental (and disciplinary) understanding or conception of research 'led', 'based' or 'informed' learning?
- What forms of pedagogy and their assessment do you consider appropriate to support conceptions?
- Can you clearly identify where research-based learning is integrated in the program?
- Where is current research in your field presented in the program?
- Where is current research methods/skills/ethics taught and practiced?
- Is the research knowledge/skills the student will have acquired made clear in the module learning outcomes?
- Can/do students participate in departmental research projects?
- Where is the scope for students to conduct independent research in their programs?
- How are research skills and the links between teaching and research embedded in monitoring and review of modules and programs?
- How are students supported in making explicit how this research training/knowledge supports their employability?
- How are undergraduate students made aware of postgraduate research opportunities?

### *Management, Organizational Structure and Staffing at Departmental Level*

- How does the department's learning and teaching strategy articulate research and teaching/learning links?
- How does the department's research strategy articulate teaching and research links?
- How are the teaching and research activities organized, motivated, and resourced? Are all researchers involved in teaching? How are 'non-research active' staff mentored and

<sup>3</sup> Taken from: <http://www.brookes.ac.uk/schools/planning/LTRC/guidelines/model.htm>

<sup>4</sup> Questions taken from handouts provided by A. Jenkins at session on "Linking Teaching and Research" presented at the University of Alberta (Oct 2003).

encouraged to develop a research profile, and how are they valued for their particular contributions to the nexus?

- How do research teams and course teaching teams link with each other?
- Are research units also teaching teams?
- How are teaching staff managed in developing research capacity and vice versa?
- How are new staff acculturated into department values and practices?
- How are incoming students acculturated into department values and practices?
- How is the staff and student experience of the nexus monitored and the results fed back into policies and practices?

*Inclusive Culture*

- What are the mechanisms for disseminating and communicating research outputs and teaching practice development in the department?
- How is the research culture given visibility to students? How do students come into contact with departmental research?
- What are the strategies to disseminate research-based teaching experience from the module level?
- What profile is given to pedagogic research? How is this research disseminated and applied to programs?

*And Finally ...*

- Allow for diversity
- Remember it is individual's scholarly engagement with the subject and how this is brought to their teaching and research that mediates the relationship between teaching and research. You cannot tightly program the nexus.
- Recognize that the relationships between teaching and research are reciprocal.

# Undergraduate Research Experience

Faculty of Agriculture, Forestry and Home Economics  
University of Alberta

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*April 30, 2004*  
*Prepared by F. E. Robinson*

## 1. Introduction

The Faculty of Agriculture, Forestry, and Home Economics (AFHE) embraces a wide range of disciplines in the natural and social sciences. The Faculty's programs cover three major resources: the "natural resource" including soil and water; the "biological resource", including animals, crops, and forests; and the "human resource", including individuals and communities. We offer distinct Bachelor of Science degrees, including two jointly offered with the Faculty of Business, one with the School of Native Studies, one with the Faculty of Education, and one newly developed with Faculté Saint-Jean.

Research in various basic and applied social and physical science disciplines as well as in the arts is considered to encompass **"the creation and dissemination of new knowledge"**. Research is carried out in research laboratories on campus, in research laboratories at the Edmonton Research Station, in a variety of "field" research environments and in industrial settings. Research in the arts and fine arts is conducted in the Department of Human Ecology.

Our undergraduate students encounter University of Alberta research passively through shared knowledge and experiences of their professors. Many of our students also actively undertake "hands-on" research as part of a class, or through dedicated research projects courses. Undergraduate students in Human Ecology conduct original research using the unique Clothing and Textiles Collection which includes over 18,000 artifacts from a variety of time periods and cultures. Their research involves intense study of artifacts from detailed microscopic examination to broad historic and cross cultural frameworks. This report includes a listing of undergraduate courses that specifically have undergraduate research (UGR) components as well as program specific undergraduate research project courses. Some programs have a designated "capstone" experience which is designed to allow students to integrate their acquired knowledge. Summer student research experiences are available to several students each year. These experiences vary in scope and may include presenting research papers/posters at scientific meetings.

Several AFHE faculty members have promoted UGR in their teaching at the U of A (department workshops, UTS sessions), and externally (professional societies). Examples of such workshop materials are available to interested persons. In December of 2003, our Faculty Teaching and Learning Committee (FTALC) hosted a one-day workshop: ***"Enhancing Undergraduate Learning: Students Doing Research"***. The objectives and outcomes of this workshop are included in this report. In the past two months, two stories highlighting undergraduate research have been released through the U of A and AFHE websites. These stories are included in the appendix of this report.

The Faculty of AFHE are endorsing UGR with vigor as a form of **"value-added learning"**. In the winter term of 2004, a significant increase in UGR student contact hours occurred in AFNS as a result of an overhaul of AN SC 476 (Swine Production). In Human Ecology, a textile art exhibition "Chancay" which was based on Peruvian archaeological textiles was recently held. In Rural Economy students prepare posters of their research projects and compete internationally for student research awards. In Renewable Resources, students work in groups to develop recovery plans for endangered species or reclamation plans for degraded lands. Results are presented orally, or as poster sessions open to U of A people and government scientists and managers responsible for species recovery and reclamation. These are only selected examples of how AFHE students become acquainted with research in **"learning by immersion"**.

## 2. Courses

### a) Independent Study Projects

Most of the AFHE programs have a senior course that students can take as an approved elective that involves “independent study”. These courses typically are taken in one term, but may involve data collection during summer employment. Some of these projects result in peer-reviewed publications, scientific conference presentations or industry presentations. Projects can be primarily literature review based, and/or may include physical data collection and analysis. Some professors have 1 student every 2-3 years, while others have 2-3 students per term. Some students take more than one of these courses. The AFHE academic secretariat has put in place improved accountability for independent study courses on the part of the student and the academic mentor.

To provide an indication of how many of our students take undergraduate research courses, the average enrollment is provided below. Where students taking each course can be identified with a single program, an estimate of the percentage of the students in that program taking these courses is provided. Where students from a number programs (or faculties) take these courses, it is not possible to calculate this statistic.

Course	Instructor(s)	Extent of Undergraduate Research	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
<b>AN SC 400</b> <i>Individual Study</i>	Any AFNS Faculty Member	Some undergraduate students carry out undergraduate research under the direction of individual professors. Some students do more than one. Many are submitted for publication in journals and are presented at conferences.	Variable, some do not make presentations, others do to laboratory or seminar groups.	15-20 (20%)	100%
<b>NU FS 400</b>	Any Foods or Nutrition Faculty Member	Literature reviews in nutrition and food science which may lead to NUFS 401 (or in future to NUTR 401)	no	10 (15%)	100%
<b>AFNS 500</b> <i>Individual Study</i>	Any Faculty Member	Some undergraduate students (particularly plant science students) carry out undergraduate research under the direction of individual professors.	Variable, some do not make presentations, others do to laboratory or seminar groups.	1-5 (not easy to calculate)	100%
<b>REN R 401</b> <i>Special Topics in Renewable Resources</i>	A. Naeth	Student research projects on revegetation and reclamation. Often projects are part of ongoing work with consulting companies and government or Parks Canada. Data used by government and consultants in determining most appropriate reclamation procedures.	Papers are written and used for resources by other reclamation students, consultants and government.	1 (2%)	100%

<b>Course</b>	<b>Instructor(s)</b>	<b>Extent of Undergraduate Research</b>	<b>Do the students present results in a public forum?</b>	<b>Approx. No. of students per year (and % of students in program)</b>	<b>% UGR of final grade</b>
<b>REN R 401</b> <i>Special Topics in Renewable Resources</i>	L. Foote	Student research projects on endangered species of the Cook Islands, South Pacific. Primary studies on endangered flycatcher population in a National Park. 3-month study tours. Data used for Park management and as outreach to visitors.	Papers are written and will eventually appear on websites.	3 (6%)	100%
<b>FOR 501</b> <i>Special Topics in Forestry</i>	J. Zwiazek	Individual study course. From time to time undergraduate Biological Sciences students in the final year of their study program ask me to supervise their research project, which is part of their program requirement. The course is a one-term research project on a plant physiology research topic. Research results are presented in the form of a research paper as it would be submitted for journal publication	Yes: presentation to U of A faculty and students.	1 (not easy to calculate)	100%
<b>NU FS 401</b> <i>Undergraduate Research Project</i>	Nutrition and Food Science Professors (will change in fall 2004 to be primarily Food Science Professors)	Students work one-one with a professor in a research project in the professors research program. Students learn research techniques and are involved in compiling, analyzing and interpreting data.	Variable, some do not make presentations, others do to laboratory or seminar groups.	20 (30%)	100%
<b>NUTR 401</b> <i>Undergraduate research project (to start fall 2004)</i>	T. Clandinin (All nutrition professors contribute)	Required course. Students work one-one with a professor in a research project in the professors research program following a research proposal that they developed in the course Nutr 400 (pre-requisite). Students learn research techniques and are involved in compiling, analyzing, interpreting and presenting data. Students meet as a group weekly with the coordinator.	Yes, it is planned that they will present in a public form	Estimated 30-40 (100%)	100%
<b>HECOL 490</b> – <i>Independent inquiry in human ecology</i>	L. Capjack	Individual art to wear research projects for individual or groups of students. Students do a literature review, experimentation, critical analysis of techniques, and original design work to produce art to wear. They must prepare a submission for a juried design competition. Several students have been successful in getting designs accepted and have shown them in national and international design competitions.	Yes, they might enter them in a juried design competition and also may be involved in a public exhibit.	1-10 (10%)	100%

Course	Instructor(s)	Extent of Undergraduate Research	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
<b>HECOL 490</b> <i>Independent Investigation in Human Ecology</i>	B. Skrypnek	This was an independent study course tailored to allow the student to gain some research experience in the area of intimate relationships. The student read the existing literature, prepared an annotated bibliography, under the direction of the professor and a graduate student coded qualitative data (that had been collected as part of the professor's research program), and drafted a mini-manuscript (7 pages) that was submitted for presentation at an international conference.	Paper presented at an international conference—the annual meeting of the National Council on Family Relations (held in Huston, TX). (15-20 attended the session)	1-3 (10%)	100%

**b) Upper Year Courses with Original Research Group Projects**

Some AFHE courses have involved UGR for the past 15 years. For example, Animal Science 471 (Applied Poultry Science) attracts approximately 15-20 students per year. In this class students select a group project from a pre-approved list, write a proposal, carry out the research project, assist with data analysis, write a scientific paper, write a non-technical paper and present a 15 minute conference presentation to faculty and industry personnel. Each year 2-3 research papers are accepted for publication in scientific journals.

In the Department of Rural Economy, students participate in undergraduate research in several courses (AREC 313, AREC 482 and ENCS 410). Students in this program have won International awards for papers and poster presentations based on their UGR in the area of agricultural resource and environmental economics.

Capstone courses are an integral part of the senior year of all AFHE students. In some programs, group research projects are carried out using existing data, farm consultations, or library investigations. In other programs, student design an original food item, from concept to scale up and consumer acceptability (NUFS 450). In Animal Science 476 (Swine Production and Management) groups of students work with swine producers to look at the management of swine operations. Animal Science 472 (Applied Dairy Science) has used on-farm projects as a major component of the course for 15 years. Students are challenged with the task of making recommendations that would enhance the overall profitability of the dairy farm by 20%.

<b>Course</b>	<b>Instructor(s)</b>	<b>Extent of UGR</b>	<b>Do the students present results in a public forum?</b>	<b>Approx. No. of students per year (and % of students in program)</b>	<b>% UGR of final grade</b>
<b>AN SC 471</b> <i>Applied Poultry Science</i>	G. Fasenko	Group research projects, with proposal development, data collection and analyses, preparation of a scientific paper and a 15 minute presentation to industry. Some projects published in peer reviewed journals	Yes: end of year symposium for U of A students and faculty as well as poultry industry people (n=100)	16-20 (50%)	100%
<b>AN SC 472</b> <i>Applied Dairy Science</i>	R. Khorasani	Group project, 4-5 students, carryout a comprehensive evaluation of current practices (nutrition, disease control, breeding program, housing, management practices, etc.) on the assigned dairy farms. Each group presents a written report to the farmer, which this must result in a significant improvement in the overall profitability of the dairy farm.	Oral presentation to the farmer and staff for their approval; in addition to the class for a discussion and improvement of the suggested changes. Due to the confidential nature of the farmers' practices, this cannot be presented to the public	16-21 (50%)	30%
<b>AN SC 474</b> <i>Applied Beef Cattle Science</i>	E. Okine	Group project, 2-3 students, carryout a comprehensive evaluation of current management, nutrition and cost of production on the assigned beef farms. Each group presents a written report to the farmer, which this must result in a significant improvement in the overall profitability of the beef farm.	Oral presentation to the farmer if possible. Continuous feedback from team of AAFRD experts on suggestions to be made to producers. Due to the confidential nature of the farmers' practices, this cannot be presented to the public	20-30 (75%)	30%
<b>AN SC 476</b> <i>Swine Production and Management</i>	A. Shoveller	Group research projects with data collection and analyses, preparation of an industry technical report and a presentation to industry, government and academic staff involved in the swine industry. The research is of direct relevance to Hypor™ to accumulate information on herd performance with specific focus on sow piglet performance.	Yes: End of the semester for U of A students and faculty, industry representatives, and government representatives.	23 (50%)	55%
<b>AREC 482</b> <i>Cooperatives and Alternative Business Institutions;</i>	E. Goddard	Individual research projects using data developed in professor's research program. Students select topic and undertake literature review, empirical analysis, produce research paper. Results have been presented as undergraduate papers and posters in	No public forum at the University of Alberta	7-15 (50%)	25%

Course	Instructor(s)	Extent of UGR	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
		professional meetings.			
<b>AREC 313</b> <i>Statistical Analysis</i>	S. Cash; Dept Team	See AREC 482	See AREC 482	25-30 (100%)	25%
<b>AREC 484</b> <i>Strategic Management in Resource Businesses</i>	D. Ng	See AREC 482	See AREC 482	5-8 (20%)	25%
<b>ENCS 356</b> <i>Principles of Rangeland Management and Habitat Conservation</i>	E. Bork	Students attend a 1 day field trip which serves as a reconnaissance trip for the development of a comprehensive range management plan developed throughout the remainder of the term. Students are required to generate an ecologically, socially, and economically sound management plan for the area they visited.	No public forum at the University of Alberta.	50-60 (not easy to calculate)	32%
<b>ENCS 471</b> <i>Case Studies in Rangeland Management and Habitat Conservation</i>	E. Bork B. Irving	Students attend 5 days of field trips where they visit research sites, conduct field exercises and collect data, and meet researchers, producers, government specialists, and other professional staff working in areas related to the field. Students synthesize this information with that gathered from the literature into summary papers or management plans.	A minimum of 1, and often 2, in-class presentations are made. Students also have the option of presenting contrasting viewpoints (debate style).	5-10 (not easy to calculate)	100%
<b>ENCS 464</b> <i>Conservation and Management of Endangered Species</i>	F. Schmiegelow	Group projects; students conduct research to develop a recovery plan for endangered species. Primarily synthesis of existing work (some unpublished), rather than research through original data collection. Requires significant interaction with active researchers and government biologists. Recovery plan is presented in written and oral formats; some years a poster is also presented.	Oral and poster sessions are open to UofA students and faculty, as well as government biologists responsible for species recovery.	50-60 (50%)	30%
<b>ENCS 410</b> <i>Methods and Applications in Environmental Economics</i>	P.Boxall	Group research projects with proposal development, empirical research on real data, research paper and posters produced. Results have been presented as undergraduate papers in professional meetings (winning publication published in journal) and as posters at other professional meetings	No public forum is planned by Department although students are encouraged to present at other meetings	5-15 (not easy to calculate)	100%

Course	Instructor(s)	Extent of UGR	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
<b>ENT 280</b> <i>Forest Entomology</i>	J. Spence	Throughout the term students collect emerging insects weekly from bolts of different species in a range of decay classes. Toward the end of the term we do a species x decay class analysis and work the data into presentable written form.	An in-class presentation is made.	20 (100%)	10%
<b>FOR 340</b> <i>Forest Fire Management</i>	P. Woodard	Developing or proposing an original ideas, solutions or technologies, which are accomplished by looking at past solutions and/or information (usually published) and from that information new solutions have been produced. Students have contributed to the scientific literature, new equipment design and more efficient prevention methods.	No	18-44 (100%)	25%
<b>HECOL 170</b>	B. Crown	Project on Functional Design – clothing for special needs and special purposes. Students research clothing and textile problems based on consumer needs and suitable textiles to suit those needs	Class presentations	30 (100%)	30%
<b>HECOL 210</b> <i>Intimate Relationships</i>	B.Skrypnek	The professor designs a mini-study (data collection / questionnaire) as replications and extensions of classic studies in the field of intimate relationships. Students had 2 or 3 acquaintances anonymously complete the questionnaires. A graduate student entered the data and the professor analyzed the data and presented the findings to the class. The class findings were compared to the classic study findings. The instructor prepared a mini-introduction and methods section of a research paper and students wrote up the results and prepared a mini-discussion section of the paper which was turned in for grading. Students learned about: <ul style="list-style-type: none"> <li>• the research process</li> <li>• ethical issues in conducting research</li> <li>• interpreting data analysis</li> <li>• the reliability of research findings (our findings always closely replicated the classic study)</li> <li>• writing a research report</li> </ul>	no	100-200 (not easy to calculate)	Variable (10-15%).

Course	Instructor(s)	Extent of UGR	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
<b>HECOL 310:</b> <i>Parent-Child Relationships</i>	B. Skrypnek	Optional projects which can involve an observational "study" of parent-child interaction. Students submit a "mini" 1-2 page proposal, obtain ethical approval conduct and record their observations, and submit a paper for grading. The paper is to describe their observations and then interpret observations in terms of theories and concepts covered in the course.	No	2 (5%)	Variable (up to 30%).
<b>HECOL 353/453</b> Textile Design	CoxBishop	Both courses have a major component of research/creative activity and almost always involve the sharing of the results of student work in a public forum. "Witness" the HECOL 353 exhibition, "Chancay: Contemporary Hand Dyed Textiles Inspired by Pre-Columbian Peru" which opens Feb 20, 2004 in the Faculty Extension Gallery. "Kalamkari: India by Design" was a hugely successful juried exhibition of undergraduate student research/creative activity held in the McMullen Gallery, University of Alberta Hospital in 2002. There are many more examples.	Yes, they might enter them in a juried design competition and also may be involved in a public exhibit.	20 (75%)	100%
<b>HECOL 460:</b> <i>19<sup>th</sup> and 20<sup>th</sup> Century Dress</i>	A. Lambert	Results are published in the University Museums and Collections database on line and/or in the written documentation records of the clothing and textiles collection	No	20-25 (75%)	100%.
<b>NU FS 450</b> <i>Food Product Development</i>	L. Ozimek	This is the required capstone class for all Nutrition and Food Science, Food Processing Business Management and Food Service Business Management programs. Students work in groups of 3-4 and design a new food product. They formulate the product and make a prototype which undergoes sensory evaluation.	Yes, students, faculty and industry partners are invited to the presentation of the product at the end of the term.	15 (will increase to 30 with changes to major) (100%)	80%

Course	Instructor(s)	Extent of UGR	Do the students present results in a public forum?	Approx. No. of students per year (and % of students in program)	% UGR of final grade
<b>PL SC 324</b> Field Crop Physiology	J.R. King and D. Spaner	In groups of two or three students carry out a research project in the greenhouse. Students are responsible for all aspects of the project including establishing the plants, weekly data collection, using a range of equipment, and final destructive harvest. Students analyse the data, prepare a journal format paper, and make an inclass presentation.	In class presentation.	6-12 (35%)	30%
<b>PL SC 499</b> Cropping Systems	L. Hall	Group project. 3-4 students do a SWAT Analysis of a specific cropping system located in widely varying agro-ecological regions to illustrate the influence of climate on crop diversity and abiotic and biotic threats. The project is supported by experts in soils, plant nutrition, weed science, economics, plant pathology and entomology. Considerable discussion of the project process is also included.	Each group presents the results to the producers and agronomists who work in the cropping system and provide a written report to them.	10-20 (35-50%)	100%
<b>PL SC 352</b> Weed Science	L. Hall	Group project. 2-3 students investigate the weed biology of a specific weed. This must be an indepth report that covers all life phases and discusses control options.	Oral presentation and written report presented to the balance of the class.	20-30 students (50-75%)	10%
<b>RenR 475</b> <i>Revegetation</i>	A. Naeth	Individual projects; students conduct research to develop a revegetation plan for a realistic or actual disturbance. Primarily synthesis of existing research and industry practice, rather than through original data collection. Requires significant interaction with active researchers, government managers and scientists, environmental consultants and industrial business managers (such as seed and amendment suppliers). Revegetation plan is presented in written and oral formats.	Oral sessions are open to UofA students and faculty.	30 to 50 (40%)	70%
<b>RenR 485</b> <i>Land Reclamation</i>	A. Naeth	Team projects; students conduct research to develop a comprehensive reclamation plan for a realistic or actual disturbance. Consists of synthesis of existing research and industry practice (some unpublished), rather than research through original data collection. New ideas and strategies are often developed that are not common practice. Requires significant	Oral and poster sessions are open to UofA students and faculty. The poster session is also open to the public and numerous invited people from government and industry attend,	30 to 50 (40%)	100%

		interaction with active researchers, government managers and scientists, environmental consultants and industrial business managers (such as seed and amendment suppliers, equipment operators and suppliers). The reclamation plan, presented in written, poster and oral formats is of the quality and caliber equivalent to what would be used for major industrial planning and government and board approvals.	question and evaluate the student projects.		
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### C) Capstone Projects

A capstone course is a finishing course in a degree program. Capstone courses will be interdisciplinary/multidisciplinary and will provide students with the opportunity to integrate and synthesize information and knowledge from more than two disciplines. The objective of a capstone course is not to introduce substantive new material to students but rather that students apply past and present learning (knowledge and experience) from two or more disciplines in the analysis of real life problems as the basis of acquiring relevant knowledge, skills and attitudes. Each of the undergraduate program committees of AFHE oversee one or more capstone courses. These courses are currently under review. The current (March 2003) procedures are presented below.

#### **Terms of Reference**

- All students will be required to take one capstone course in their program.
- One capstone course will be designated for each program. Alternatively individual capstone courses may be designated for majors within a program.
- Students will not have choices in which capstone course they will take and there will be no substitutions allowed.
- Students will normally take their capstone course in the last year of their program.
- Capstone courses may have several prerequisites.
- Ideally two or more Faculty members from different disciplines will be involved in the instruction of capstone courses. If more than one Faculty member is involved, one will assume the role of course leader or coordinator.
- Capstone courses would normally be initiated by the Faculty Program Committees. These committees would approach potential course instructors and/or Department Chairs. Alternatively, interested academic staff, in consultation with their Department Chairs, could submit a capstone course proposal to the Faculty Program Committees.
- All capstone courses will be approved by the Academic Coordinating Committee.
- A capstone course will not be offered for more than three years without a review by the appropriate Faculty Program Committee and the Academic Coordinating Committee.
- Capstone courses will normally be three units of course weight.
- The spirit of capstone courses will be to foster cooperation among students rather than competition. Thus, although independently undertaken papers or projects may be a part of the course, cooperative efforts would be encouraged.
- Each capstone course will include a project and/or team experience.
- Grading and evaluation within capstone courses will be decided by the course instructor(s).
- All capstone courses will be 400 level.
- Ethics should be included as a component of a capstone course.

## Protocol

- A number of courses that meet the Capstone Course criteria will be designated as Capstone Courses for the Faculty
- Capstone Courses will be reviewed each year by a Capstone Course Task Force to ensure they meet the current criteria
- These courses will be proposed by the Program Committees to the review Task Force each year
- If individual instructors wish to have their courses considered as a Capstone Course they will submit it to the appropriate Program Committee(s)
- Program Committees will specify one or two Capstone Courses from the approved list for their programs or will allow students to choose their Capstone Courses from the approved list or a designated portion of the approved list
- All AFHE students will be allowed to take any Capstone Course other than their required one as Approved Program Electives or Free Electives provided they meet the course prerequisites and space is available

### 3. Public Forums / Events

Undergraduate students in the Department of Human Ecology undertake research which involves intense study of artifacts from detailed microscopic examination to broad historic and cross cultural frameworks. The results of their research are presented in a variety of formats including collection databases, exhibitions, exhibition catalogues, museum publications, historic site plans, and interpretive programs.

Contemporary designers use their artifact research to inform and inspire their original clothing and textile designs which are exhibited on runways and in galleries. One current example is the textile art exhibition “Chancay” which was based on Peruvian archaeological textiles.

In some courses, commodity-specific forums are held to showcase undergraduate research. Examples of this include AN SC 471 and AN SC 476. In these courses, the respective poultry and swine industries are invited to technical symposia in which short research presentations are made by students. In other courses, poster sessions are scheduled late in the term to allow students to present the results of their research projects to classmates and student peers. In several 4<sup>th</sup> year independent study courses, a 45 minute seminar is held, followed by an open period of questions in the format of a “mini-defense”. Further examples of specific forums are presented earlier in this report in the “courses” section.

In several cases, undergraduate students have the opportunity to present their UGR findings externally. Regional discipline-specific research workshops (eg. Prairie Poultry Conference) have provided students an opportunity to showcase UGR. Some students compete in undergraduate competitions at scientific societies. The department of Rural Economy has been particularly proactive in making it possible for students to travel to such meetings. The Alberta Poultry Industry Council has funded undergraduate travel for several years, and a recent endowed scholarship will provide further support. In January of 2004, a 3<sup>rd</sup> year student, Janet Montgomery, was awarded a graduate student certificate of excellence for her poster presentation at a SPSS conference in Atlanta.

### 4. Undergraduate Teaching

#### a) Our Teaching Researchers

The faculty of AFHE has approximately 100 academic staff. All professors are expected to contribute to undergraduate teaching, regardless of academic rank. Despite this expectation, in some cases (administrative duties, staff wellness issues) a small number of faculty members have minimal contact with

undergraduate students. In 2004, there is a renewed vigor in having all professors teaching, including those in administrative roles. The use of sessional instructors is relatively minimal, usually seen to cover off sabbatical leaves or temporary vacancies arising from personnel changes.

There are several “chair” positions which make significant contributions to undergraduate teaching. These individuals and the undergraduate courses which they teach are listed below.

#### **Department of Agricultural, Food and Nutritional Science**

Dr. S. Narine (*Alberta Value Added Corporation – Professorship in Rheology*)

Teaches NUFS 201 and 50% of NUFS 283

Dr. R.. Ball (*Alberta Pork Producers’ Research Char in Swine Nutrition*)

Teaches AN SC 476 and AFNS 512

Dr. G. Foxcroft (*Canada Research Chair in Swine Reproductive Physiology*)

Teaches AN SC 410 and 50% of AN SC 311

#### **Department of Renewable Resources**

Dr. L. Fuller (*Chair in Environmentally Sustainable Agriculture*)

Teaches REN R 450

Dr. V. Liefvers (*NSERC/Weldwood/Weyerhaeuser Industrial Chair in Enhanced Forest Management*)

Teaches FOR 423

#### **Department of Rural Economy**

Dr. W. Adamowicz (*Canada Research Chair in Resource, Environmental and Forest Economics*)

Teaches INT D 565

Dr. E. Goddard (*Co-operative Chair in Agricultural Marketing and Business*)

Teaches AREC 473/573, AREC 482 and AREC 485/585

Faculty members add value to undergraduate teaching in classroom settings in several ways.

- Introduction of students to their own research journey and resulting new knowledge. This can be optimized by incorporation of textbooks and learning modules developed by the particular instructor. In AFHE several classes use text books with material contributed by the instructor.
- Introduction of other researchers to class (added faces to reading assignments).
- Instill critical research questioning in students (problem solving, critical thinking).
- Familiarity with current research and thinking.
- Provide opportunities for students to participate in the professor’s research.
- Expose students to research as a career path.

One reality is that our students take most of their first and second year courses outside the Faculty of AFHE. We also have many students who transfer into AFHE after first or second year. Hence, the contact with our students in first year is often limited to one or two introductory courses. The opportunity for UGR in these years is practically limited to contact in courses in the faculties of Arts and Science.

#### **b) Graduate Student Teachers and Mentors**

Graduate students are often the lifeline between undergraduate students and time-constrained faculty members in courses with a heavy UGR component. In some classes, graduate students have the opportunity to be research mentors is a role that parallels the role that their M.Sc. or Ph.D. supervisor provides to them. These mentors cover day-to-day student queries involving experimental design, data collection and statistical analyses. This can provide graduate students with valuable expertise in people

management that can serve them well later in their own academic careers. In other cases, some undergraduate students are allowed one “free read” of their research manuscripts by a graduate student, who serves the role of an external reviewer of a research manuscript submitted for publication.

Many of our graduate students take part in University Teaching Program (UTP). This program provides graduate students with opportunities to develop an ethical, philosophical and practical basis for careers in post-secondary teaching and to record this on their transcripts.

### c) Our Teaching Laboratories

Our undergraduate students have access to these facilities through laboratory sessions, practicum experiences, sites for volunteering for research experience and through summer employment. Other students use our research facilities in specific research projects, or in independent study. The Faculty of AFHE has experienced a renewal of some existing facilities and the construction of several new ones in the past 5 years. With our existing facilities and with several new laboratories being planned or constructed, we have excellent facilities for UGR to take place.

- Rose Creek Research & Education Forest (*FOR 322, REN R 401*)
- Woodbend Forest (*FOR 322 REN R 120, 401, ENCS 510*)
- Crosley Forest (*REN R 401*)
- Forest Genetics Lab (*REN R 401*)
- Spatial Information Systems Lab (*REN R 401, REN R 410*)
- Soil Biochemistry Lab (*SOILS 430*)
- Wildlife Heritage Interpretation lab (*ENCS 201, 510, REN R 401*)
- Tree Physiology Lab (*REN R 401*)
- Fire Simulation lab (*FOR 340*)
- Forest Hydrology Lab (*REN R 401*)
- Ecophysiology Lab (*REN R 401*)
- Ellerslie Research Station (*ENCS 455, REN R 401*)
- Human Nutrition Research Centre (*NUFS 400, NUFS 401, NUFS 468, NUFS 476*)
- Biotechnology Centre (*AN SC 400, AFNS 500, BIOL 499*)
- EMEND site (Ecosystem Management Emulating Natural Disturbance) (*REN R 401*)
- Clothing and Textiles Collection (*HECOL 268, 460, 462*)
- Textile Conservation Laboratory (*HECOL 477, 478, 460*)
- *Human Ecology Gallery* (*HECOL 268, 460, 462, 360, 353, 453*)
- Focus Group Research Suite (*HECOL 490*)
- Textile Surface Design Lab (*HECOL 490*)
- Textile Flammability Lab (*HECOL 490*)
- Breton Plots (*REN R 401*)
- Plant Growth Facilities (green houses) (*PL SC 324*)
- Bovine Genomics Research Centre (*AN SC 400*)
- Kinsella Research Ranch (*AN SC 400*)
- Food Microbiology Lab (*NUFS 401, AN SC 471*)

- Sensory Evaluation Laboratory (*NUFS 401, AN SC 471, AN SC 400*)
- Edmonton Research Station  
 Alberta Poultry Research Centre (*AN SC 400, AN SC 471*)  
 Swine Research and Technology Centre (*AN SC 400, AN SC 476*)  
 Dairy Research and Technology Centre (*AN SC 400, AN SC 472*)  
 Laird W. McElroy Metabolic Research Unit (*AN SC 400, AN SC 471*)  
 Composting Facility (*ENCS 455*)

#### **D) Internship Programs**

The faculty of AFHE has a relatively new (5 years) internship program in which students can spend 8 or 12 months working in an external environment. Some students have traveled outside of Alberta and Canada for these initiatives. A limitation of this program is obtaining high numbers of student applicants. Approximately 7% of students have signed up in 2004 for this fledgling program. There are 1305 students in the Faculty, however, only students between their 3<sup>rd</sup> and 4<sup>th</sup> years are eligible to apply (20 of approximately 300 eligible students). Since the inception of the Internship Program in 1999, 25 students have completed the program. Each of those students had varying levels of research integrated into their internship experience, from direct lab work in new food product production to monitoring field experiments and consultation. For more information about the AFHE internship program see [www.afhe.ualberta.ca/internship/index/asp](http://www.afhe.ualberta.ca/internship/index/asp).

#### **E) Distance Education**

Within AFHE, distance education is seen as a means of making large enrolment courses more available to students. One example is Nutrition 100. This course is offered several times per year on line. Other courses have course materials provided on the web and/or rely heavily on web-based communication. A list of them follows:

- Asthma Educators
- GPS / GIS Online International - Health and Disease
- GPS / GIS Online International - Visualization
- Human Ecology Graduate Research Seminar
- Review of Issues and Trends in Family Ecology and Practice
- Review of Issues and Trends in Textiles and Clothing
- Textiles for the Consumer
- Theory in Family Ecology
- Theory in Textiles and Clothing
- Ways of Knowing in Human Ecology
- Wildlife productivity and management

#### **F) Establishing the Undergraduate Community – Student Clubs**

The undergraduate students enrolled in programs in AFHE have a well established and in some cases a historical gregarious extra-curricular life in student clubs. These clubs which have a social and an academic focus are often lined to philanthropic endeavors, as in the case of Bar None. In some case, students can join these clubs regardless of their home faculty or program.

## AFHE Clubs

- Agriculture Club
- Human Ecology Student's Association
- Environmental Conservation Sciences Association
- Forest Society
- Nutrition and Food Science Student's Association
- Pre-Veterinary Club

These clubs are integrated in the Faculty with the appointment of a AFHE Student Liaison Officer, who is in frequent communication with the AFHE Dean.

## 5. Summer Research Experiences

Individual researchers, as well as research units, employ many undergraduate students for summer positions in AFHE. The scope of the projects varies from limited research exposure in working in animal units (animal care technicians) to fully research-dedicated positions in applied basic science settings. Some students are given responsibility for a component of a project, while others work along side researchers as a “pair of hands and an open mind”. The number of these positions varies directly with research funding levels available to Professors in the Faculty of AFHE. Summer NSERC programs typically fund some students.

Some students have gone to other research laboratories through the Institute for the Advancement of Science, Technology and Economics (IASTE). Through the involvement of Dr. Pavel Jelen, our faculty has had strong and viable connections with institutions in European Universities. Some of these students have had little exposure to research until their experiences at the University of Alberta. These programs require that visiting students be paid at the same salary that we would pay our students. Some AFHE undergrads spend time at other European universities in a reciprocal agreement.

Our faculty typically has several summer students funded by Women in Scholarship, Engineering, Science and Technology (WISEST). We have had some of these students enroll in our undergraduate programs and eventually into graduate degree programs based on the initial introduction through the WISEST program. Many of our faculty members provide role models and outline career possibilities that young women many not have been familiar with prior to acceptance into this program.

Some students take advantage of competitive industry based funds to cover the costs of traveling to another Canadian Research institutions for four months. For example the Canadian Broiler Hatching Egg Marketing Agency offers summer research scholarships for undergraduate students to cover travel costs for undertaking research, or for travel to attend a North American conference to present their results.

These are excellent opportunities to assess the suitability of undergraduate students for graduate school. For example, in Plant Science, summer research is frequently used as a gateway to graduate studies. Potential M.Sc. or Ph.D. students have an opportunity to determine their aptitude for field research by conducting preliminary research trials that may form a basis for their M.Sc. or Ph.D. These opportunities are particularly relevant where students are not formally trained in crop science or have limited experience in the field environment. These experiences build confidence, team spirit and increase the success of students starting an advanced degree. Salaries are not competitive to what students can make in industry, but some forfeit a high paying job for experiential learning value. Some faculty value summer research experiences as part of the education of students with an aptitude for research. Some students carry out individual research projects for course responsibilities during summer employment.

A limited number of students are taken to scientific conferences. Several students have won awards at such meetings, sometimes in direct competition with graduate students. Funding to support such travel costs are borne by researcher grants, industry-based funding and by the students themselves.

## 6. Recent Initiatives

### a) Leaders in Learning Workshops

The "Innovative Instructors Institute" was an informative and innovative 5-day symposium held **April 28 to May 2, 2003 at the University of Alberta**. Sponsored by [Academic Technologies for Learning](#) (ATL) and the Department of [Agricultural, Food and Nutritional Science](#) (AFNS) the symposium explored several web-based technologies currently being used to develop, enhance, and deliver curriculum and enhance communication between students and instructors. Through active participation in the symposium participants enhanced their skills and knowledge in the latest educational technologies. They had the opportunity to:

- put theory to practice by developing or enhancing course web sites
- discovered which components of a course can be transferred to the web and why you would want to do so
- apply principles of andragogy/pedagogy and active learning strategies to develop interactive course materials
- explore the design and development processes that is used when planning to move a course on-line
- attend discussions where experienced instructors and students related their experiences with on-line instruction
- discover how these new skills could save time and increase ones effectiveness as an instructor

### b) Enhancing Undergraduate Learning: Students Doing Research Workshop

The AFHE Faculty Teaching and Learning Committee (FALC) recently hosted a 1-day workshop (December 5, 2003). All instructors in AFHE were invited. Approximately 25 AFHE instructors, 10 undergraduate students and 2 U of A staff members participated in the workshop.

#### **Workshop Objectives:**

1. **To highlight current undergraduate research (UGR) experiences in AFHE.** This objective was pursued through presentations by students and faculty which profiled recent group projects, as well as individual study experiential learning opportunities.
2. **To enhance future opportunities for undergraduate research initiatives in AFHE.** This objective was pursued by identification of real and perceived restraints, advantages and challenges for implementation of undergraduate research initiatives. Brainstorming in small group settings provided a background to base these discussions.
3. **To identify factors and actions which may help in advancing undergraduate research in AFHE.** This objective was pursued by group discussions around "what if?" scenarios. A plan for follow-up from these discussions later in 2004 was suggested.

## **Objective #1. Highlight Current Undergraduate Research Experiences AFHE.**

There is a vast range in the scope of UGR experiences offered to students in AFHE. In addition to the material presented below, a follow-up questionnaire was circulated within AFHE (January, 2004) to obtain more detail about the extent of UGR. Data were collected on the extent of student presentation (oral or poster) in the projects, as well as the percentage of the term grade that was assessed based on UGR activity.

These data were presented earlier in this report (Sections 2 and 3).

## **Objective #2. To enhance future opportunities for undergraduate research initiatives in AFHE.**

*What are the positives that can result from implementing undergraduate research in AFHE teaching?*

### **1. Benefits to Students**

- **Increased Student Satisfaction:** Some students refer to “contagious enthusiasm” in UGR experiences. Students perform better when they are highly motivated.
- **Team Work Experience:** Some UGR opportunities involve groups rather than individuals. This can provide experience in selection of team players, allocation of responsibility, conflict resolution, and enhance communication skills. In some cases where students assign marks to fellow group members it can provide “grading” experience. Learning from peer interactions may be a new concept for UGR students.
- **Enlarge Student Contact Sphere:** Some students learn to network within and beyond the university which can have a profound effect on the students in terms of new contacts. Where students actually present their research data to professional conferences, this is particularly significant, as they learn to put faces with names they cite. Some students have been offered summer jobs, permanent positions or graduate student acceptance based on UGR reports and presentations.
- **Introduce Students to the Research Environment:** Few students are familiar with what research is all about, until they get involved. In AFHE, this first introduction to students in research can happen in UGR experiences as part of required or elective classes. Students initially may think that research is always exciting and rewarding, but they soon learn that components may be tedious and very time consuming. In some cases students pursue research with vigor and in others they realize that research is not what they want to do in the future. In other cases, formerly lackluster students “catch fire” when involved directly in the discovery of new knowledge. Students have commented that UGR gave them an idea about what professors really do, which can result in increased respect.
- **Gain Skills in Research Technique:** Students gain skills in many areas (hypothesis building, accuracy in data collection, need for a controls, statistical analyses, respect for human or animal ethics considerations, scientific writing, effective data presentation and research data publication).
- **Integrate and Reinforce Concepts Covered in Other Courses:** While laboratories play this role for some courses, UGR projects can often be better learning experiences as there are no “pre-determined outcomes”. In AFHE, some capstone courses try to integrate material covered in the previous 3 years of the program. Some of these capstone courses are based solely on UGR for grading. Students have commented that UGR “makes knowledge meaningful”. Other students indicated that they finally understood the relevance of statistical significance when they analyzed their own quantitative data.

- **Personal Growth of Students:** Students gain confidence in acquiring expertise in an area and communicating this knowledge to fellow students, faculty and in some cases to professional endpoint users (e.g. Industrial players). Other benefits include gaining skills in time management and communication with new people. Some students feel that they gained life-long skills that in UGR projects that they did not encounter any other place in their undergraduate program.
- **Places Emphasis on Critical Thinking Rather on Regurgitation:** Many students are not committed to memorization of facts, and they would prefer to “learn by doing”. Such students often do not have very high GPAs, yet they obtain very high marks in UGR projects. Several students commented that UGR projects made them realize how they learn, and that their marks have improved in other courses since undertaking a UGR experience. Opportunities for self-directed learning appeal to some students, particularly those that may not have excelled in earlier fact-based courses.

## 2. Benefits to Faculty and the U of A

- **Better Teaching and Learning:** Faculty members may develop a stronger relationship with students as a result of a more personalized learning environment. Some very collegial faculty-student teams have originated with UGR projects where faculty work together alongside undergraduate students. Some faculty members indicated that UGR projects help them to get to know all students, not just those at the very top and those at the very bottom.
- **Increased Instructor Satisfaction:** Professors can feel very committed to UGR due to the personal satisfaction that arises from providing high-quality learning experiences, that in some cases change the career path for students.
- **Increased Research Productivity:** This can also increase their research output as UGR projects can be submitted for publication or presented at conferences. This may not always be realized, as significant inputs of mentoring time for UGR students may be seen.
- **Identification of Potential Graduate Students:** Students who undertake UGR and excel will likely become high quality graduate students. In AFHE, some students have been encouraged to apply for graduate programs based on UGR outcomes (and others have not!).
- **Enhanced Visibility in the Outside World:** When UGR students make high quality presentations to professional or industrial groups, strong positive relationships can develop. In AFHE we have experienced positive development opportunities based on increased rapport (and a demonstrated relevance) with industrial partners. With increased emphasis on external relations at the U of A, there is value in seeing a strong link between programs and the real world. Some external stakeholders may gain valuable information, questions answered, or personal value from participating in UGR as an industrial mentor.
- **Allowing Individual Faculty Members to Do What They Do Best:** Some faculty feel they are better equipped for research than they are for teaching. Some people are excellent UGR mentors, but are not our strongest undergraduate classroom instructors. Having such faculty members interact with students through UGR is the best scenario for some people.
- **Enhancement of collaborations between faculty members.** Particularly newly-appointed faculty members can benefit when undergraduate research can foster a link between disciplines.
- **Provides an opportunity for graduate students to continue the cycle of high quality teaching.** When graduate students have the opportunity to act as mentors, they may retain this teaching philosophy and put the learned skills to application in their own subsequent teaching careers.
- **Setting the U of A Apart From Other Alberta Universities:** In all AFHE undergraduate programs, some coursework can be taken at other colleges and universities in

Alberta. However, very few of these institutions can provide the research experiences that students will get at the U of A.

- **Recruitment and Retention of Undergraduates:** Opportunities for UGR can be used to attract new students, and to help retain others.

### *What are the constraints to implementing undergraduate research in AFHE teaching?*

- **Research Regulations:** Timelines of approvals required for animal ethics (Faculty Animal Policy and Welfare Committee) and the Faculty Human Ethics Review Board) are a serious limitation to UGR. In some cases UGR does not happen, as the timelines are too tight for a student to accomplish much in one semester. With advance planning, some UGR projects are able to be carried out, but students have little if any input in to project design. Students must enroll in short courses dealing with animal handling, radioisotopes and/or bio-hazards.
- **Faculty Investment of Time:** Student contact hours are very high in many UGR experiences. In some cases, UGR is only feasible when enrollments are relatively low. Some UGR courses involve 4-8 “mentors” who work with groups of students. Faculty time can be spent in all aspects of a project, or be limited to grading. Some individuals felt that that faculty involvement in the organization of UGR experiences was unrealistic. This is a significant barrier to several AFHE faculty members undertaking UGR. There was general consensus that UGR experiences must be properly staffed so that the experiences remain positive. It was also mentioned that some people would not make time available for UGR, and that this be recognized upfront and an alternate mentor be identified.
- **Faculty Burn-Out:** The work load of UGR courses may not always be positive. Some over-ambitious faculty may spend too much time with this activity.
- **Non-Faculty Personnel:** With cuts to departmental base budgets, there is little or no technical support in departments to support UGR. Some faculty members use their trust-funded technical people to assist in UGR, but this is not always possible or always appropriate. Without reinvestment in technical positions, some faculty members indicated they would not increase their commitment to UGR.
- **Investment of Resources:** Some UGR courses do not incur much cost, while others incur significant financial costs for project materials. Shrinking department budgets means that project costs are assumed by the faculty members. When student projects are designed to fit into part of a research program, research grants have been used. On other cases, specific industry partners have willingly picked up in-kind costs and/or budget items. Financial costs were cited by AFHE faculty as a serious factor standing in the way of increasing UGR opportunities.
- **How to Grade UGR Experiences:** Historically, UGR project courses have a high level of instructor-student interaction. Typically students become very highly motivated. In some cases UGR students generally are high-GPA students. These factors work together to result in a situation in which grades in these courses are often significantly higher than the suggested grade range. This has resulted in a difficult situation which needs to be discussed. There have also been some problems in UGR group projects where it is difficult to assign students different marks, when the output is a single research paper or presentation. Assignment of individual participation points can be challenging.
- **Realistic Work Loads for Students:** Some UGR experiences have been too ambitious (in hind-sight). Some students become highly motivated and spend too much time on the projects to the detriment of other courses. How do you determine what is a realistic time line? Perhaps some projects should be \*6 instead of \*3. Progress has been made in predicting work-load with improvements to independent study paperwork in the Dean’s Office.
- **Funds for Travel and Publication:** In many cases, students do not publish their research, or present it at a conference due to a lack of costs to support these activities. In some cases,

departmental funding is allocated to student travel. In other cases faculty members take some students to meetings if they are presenting data. The Faculty has developed some scholarships based on donations, to support undergraduate travel to conferences.

- **Identification of “Do-able” Projects:** A few faculty members indicated that they could not identify any potential projects that could involve undergraduates. Some constraints included seasonal research programs, long-duration projects, specific expertise requirements. There was considerable opposing sentiment.
- **UGR is not Ideal for All Faculty Members:** Individual faculty members vary in their interest in involving undergraduates in their research, or independent research. People who are not interested in UGR should not be coerced into it, even if a Faculty or department is seen to endorse it.

### **Objective #3. To identify factors and actions which may help in advancing undergraduate research in AFHE.**

#### **What could AFHE and/or the U of A do to enhance effective implementation of undergraduate research in AFHE teaching?**

- **Increase Awareness about UGR Experiences:** Potential students and the public should be made aware of opportunities for UGR. It is interesting to note that the U of A is doing this at the present time. Perhaps host a “UGR Gala” faculty-wide or University-wide. Celebrate diversity in approach and have it become a parallel to the University Celebration of Teaching and Learning.
- **Increase Funding to Support UGR Experiences:** Have a University-wide fund pool that could be applied to by students or faculty members. Specifically target some fund development for this area in the faculty.
- **Develop UTS – UGR workshops:** Focus on potential problem areas (developing a project, formation of student groups, time management, how much help is too much help, grading groups of students). Invite experienced UGR people from across the University, including students).
- **Educate Second and Third Year Students about Research:** Develop a faculty-wide second or third year course that deals with research design, human ethics, animal ethics, scientific writing. UGR opportunities across the faculty could come out of this class.
- **Convince FEC that UGR Involvement is a Large and Valued Commitment:** Efforts in this area need to be recognized by evaluation committees. Courses heavily committed to UGR may count more in assigning teaching loads.
- **Consider an AFHE Honors Program:** This may serve as a gatekeeper for entry into these courses.

#### **Questions for further discussion:**

- **How do you establish and reinforce “quality” in UGR experiences?** Knowing that risk associated with “bad” opportunities can be a factor, how do you pre-screen UGR opportunities in advance to avoid potential problems?
- **Who among undergrads, should have first class research opportunities?**
  - Any student who is interested (may turn on a lower GPA student)
  - NSERC summer students?
  - Is this a rationale for developing an honors program?

- When a course becomes oversubscribed (relative to resources) who do you decide who gets in?
- **What is the Appropriate Level of Support for UGR Courses?** When UGR is incorporated into a course, what level of \$ support should the University (department?) provide?
- **Can we think big about providing UGR learning experiences outside the U of A?**
  - Study abroad (technically possible).
  - Research internships (technically possible now).
  - Study at Elk Island or in Jasper for a term.

## 8. Appendix

a) **Faculty of AFHE Undergraduate Enrollment (2003-2004) by Year and Program.**

b) **Recent U of A Stories Relating to AFHE Undergraduate Research**

- i. **Making the Grade**  
([www.afns.ualberta.ca/Index.asp?page=Stories&stories=79](http://www.afns.ualberta.ca/Index.asp?page=Stories&stories=79))
- ii. **Learning with Dirty Hands Takes Ag Student Around the World**  
([www.afhe.ualberta.ca/Index.asp?page=News&news=85](http://www.afhe.ualberta.ca/Index.asp?page=News&news=85))
- iii. **Incubating Young Researchers**  
([www.afhe.ualberta.ca/Index.asp?page=News&news=483](http://www.afhe.ualberta.ca/Index.asp?page=News&news=483))
- iv. **Real-Life Learning**  
([www.afns.ualberta.ca/Index.asp?page=Stories&stories=85](http://www.afns.ualberta.ca/Index.asp?page=Stories&stories=85))
- v. **U of A Range Team Dominates International Field**  
([www.rr.ualberta.ca/Index.asp?page=News&news=479](http://www.rr.ualberta.ca/Index.asp?page=News&news=479))

## Appendix

a) Faculty of AFHE Undergraduate Enrollment (2003-2004) by Year and Program.

<b>Program</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Total Registered Fall 2003</b>
Agriculture	121	77	54	35	<b>287</b>
Pre-Vet Medicine	51	41	8		<b>100</b>
Forestry	9	20	12	23	<b>64</b>
Ag/Food Business Management	2	12	8	13	<b>35</b>
ENCS	34	91	79	104	<b>308</b>
ENCS/Native Studies	2	4	N/A	N/A	<b>6</b>
NUFS	99	115	78	65	<b>357</b>
Human Ecology	70	55	42	30	<b>197</b>
Forest Business Management	N/A	7	4	11	<b>22</b>
Human Ecology/Education	15	5	8	1	<b>29</b>
<b>2003 Total September</b>	<b>403</b>	<b>427</b>	<b>285</b>	<b>290</b>	<b>1405</b>
Special/Visiting					<b>46</b>
<b>Grand Total</b>					<b>1451</b>

## Appendix D - Faculty of Arts

### *Undergraduate Research Experiences in the Faculty of Arts, University of Alberta*

#### *A. Introduction*

Over the past decade, the research profile of the University of Alberta has grown significantly. While we are generally aware of how graduate students have benefited from this increased research activity, we have had, until now, only limited information about the extent to which undergraduate students have been directly involved. This report describes the various ways in which Arts undergraduates are currently involved in research and creative activity within the Faculty, as well as some of the other means by which they are exposed to some of the Faculty's best researchers and creative artists.

It is clear that the education of many Arts undergraduates is significantly enhanced by participation in and exposure to the wide range of world-class research and creative activity taking place in the Faculty. Even so, there is also room for improvement and innovation. This report provides a general overview of how undergraduate students in the Faculty of Arts at the University of Alberta are able to experience, either directly or indirectly, the various types of ongoing research in the extremely diverse areas covered by the social sciences, the humanities, and the fine arts. It describes the many positive learning opportunities being provided in the Faculty's classrooms, laboratories, studios, stages, and concert halls and includes successful examples of research-enhanced learning.

Overall, the interconnectedness of teaching and research has always been part and parcel of the liberal arts learning experience, yet it must be acknowledged that in a Faculty such as ours, there are some critical differences that limit to a certain extent the direct experience Arts students can have in relation to research. While the research designs and methodologies employed by researchers in some departments within the Faculty of Arts are quite similar to those used in many other Faculties, there are also some critical differences that must be noted at the outset. In addition, we must acknowledge the different working environments across campus that might increase or limit opportunities for professors to bring students into their research programs. Hence, we preface our discussion of research opportunities for undergraduate students in the Faculty of Arts with the following three key observations.

- The average teaching load in the Faculty of Arts continues to be higher than what is ordinarily required of professors in most other Faculties on campus. In addition, average class sizes in Arts (for undergraduates and especially undergraduates in the first two years of their program) are frequently larger. This may be explained in part at least by the large service teaching function the Faculty of Arts provides to others. In any case, smaller classes or labs that might easily enhance the "teaching-research" link in some Faculties or the reduced teaching loads that might allow professors more time to mentor undergraduate (as well as graduate) students, tend to be less available, given our large class sizes (an economic necessity) and higher teaching loads.

- In each of the three divisions of the Faculty of Arts (humanities, social sciences, and fine arts) a significant number of researchers/creators work as a matter of course *independently*—in libraries or archives, in their offices or studios, or in the field, in a manner that is simply not as conducive to undergraduate student participation in research as are labs in engineering or agriculture or science. The tradition of the solitary scholars (especially among practicing artists and text-based humanists or social scientists) who do their research and writing in isolation (rather than working as a member of a research team comprised of research colleagues, graduate students, and even undergraduate students) is a long-standing one, and one that has been demonstrated to be highly effective in the fields in which it is the norm. It is of course possible to share this kind of research experience with undergraduate students, but often there is simply no opportunity to invite an undergraduate student to participate directly in a research project.
- In the fine arts especially, many undergraduate students are commonly involved in creative activity and performance activity that is certainly equivalent to research activity that takes place in other disciplines. Given that in the Faculty of Arts research and “creative activity” are given equal weight for professorial evaluation, the experiences of undergraduate fine arts students are to be given equal weight with opportunities available for students in the humanities and social sciences.

***B. Projects and/or Courses in the Faculty of Arts Containing a Research Experience Component***

In each division of the Faculty of Arts (Fine Arts, Social Sciences, Humanities) and within each department (Anthropology, Art & Design, Drama, East Asian Studies, Economics, English, History & Classics, Linguistics, Modern Languages & Cultural Studies, Music, Political Science, Psychology, Sociology, Women’s Studies) and within each interdisciplinary program (Comparative Literature, Religious Studies, Science and Technology), all professors regularly bring their ongoing research interests and activity as well as their research results into the classroom. In addition, faculty members holding research grants (mostly from SSHRC, but sometimes from NSERC or CIHR) use their grants to hire students as research assistants. Most often those hired are graduate students, but undergraduates have had limited possibilities to work with researchers, especially during the summer. Even the smaller internal granting committees (EFF-SAS, for example) have seen applications that include requests for personnel costs related to the use of undergraduate students as summer research assistants. Occasionally undergraduate students have become co-authors on conference papers and published articles. Obviously when these kinds of possibilities exist, students benefit enormously from hands-on, direct experience of research. It would be wonderful if more such opportunities were made available. It is unfortunate that working directly in research as an undergrad student in the Faculty of Arts is difficult when your average class-size (speaking optimistically) hovers around 40. However, the “average” Arts student does write more than most students.

Every department in the Faculty of Arts reviews its curriculum on a regular basis (with English, MLCS's French Language Division, Comparative Literature, and Drama's Theatre Design being the most recent examples). The Faculty reviewed the pedagogical basis of the BA degree in 2003 but was unsuccessful at passing any proposed changes through Faculty Council.

### ***Fine Arts***

***Drama:*** The curriculum for undergraduate students in the Department of *Drama* is deeply influenced by our creative activity and research. In addition to foundational courses in each aspect of the theatre discipline, the BA and BFA programs offer an innovative stream of performer-created work. The concepts for this series of courses are anchored in the research and creative activity of several researchers who develop theatre from community-based research and/or who specialize in collaborative methods of theatre creation.

The Honours program is grounded in the theoretical work pursued by our critical theorists. A measure of the influence of the researcher on the curriculum is to track the curriculum changes when there is substantial faculty turn over. In our critical courses the curriculum has been extensively reviewed and renovated in recent years, as the next generation of researchers define what is critical to the undergrad education in this area. Certainly the whole BA stream has shifted towards the interdisciplinary theoretical interests that have impacted the humanities over the last 15 years. This vigor comes from the current and active research programs of the faculty.

In Drama undergraduates are taught the foundational skills needed for research in the earliest years, then students synthesize and *independently apply* these research skills in upper end courses. These courses require research, research proposals, presentations, papers based in substantive research, and/or performances where student artists synthesize and independently apply the research and performance/production skills developed in earlier years.

The primary introductory course for majors provides a comprehensive inquiry-based first year experience. The course moves through research and theatre creation/development skills to an expectation of collaboratively, independently created theatre performances based in source material. The inquiry process works as follows: what do you want to express, explore, communicate? Why? What do you need to find out in order to do so (research)? What skills (theatre forms) do you need to do this (skill and artistic development)? Now, demonstrate/communicate what you have found out, in an original creation/presentation/performance.

Drama directly teaches both option students and its majors communication skills as an integral part of our courses and fundamental part of our discipline:

**DR 247 Oral Communication:** students learn about varying forms of oral communication, and develop and practice these skills

**Theory, analysis and history courses:** teach writing and oral presentation skills

**Performance courses:** teach expressive, interactive communication

**Design courses:** teach visual communication skills

Drama is interdisciplinary in its nature: the sub disciplines interact in performance processes. For example, a visual artist (designer) interacts with a performance artist (actor) who interacts with a historian/critical theorist (dramaturg) and so on. Drama research involves work in many disciplinary areas: it is our norm to work with theory from the

humanities as we interrogate text; social science concepts as we investigate audience reception; while performance and performative theory, in turn, contributes to investigations and theories in the social sciences. Drama researchers and creative artists bring this attitude and skill set to everything we do, and to every class. Guests from varying disciplines often join us as we research an era, a theatrical style, another culture.

BA performer created work deliberately makes the subject relevant to another discipline, with theatre as the mode of expression; the cross disciplinary works via the students from varying disciplines and interests as well as via community based and academically focused research.

There are many opportunities for undergraduates to pursue opportunities for hands-on research. Here are a few examples of various kinds of research/creative activity:

*Honours Seminars:* Students in Drama Honours take a seminar each of the two final years that involves investigating, proposing, and pursuing a research area of their own particular interest. At the end of the first term of their final year, Honours students present a research topic and proposal to their classmates and invited faculty and then field questions, suggestions, and responses. This readies them to develop the full research project and paper in their final term.

*Honours Presentations:* Near the end of their final term, Drama Honours students present part of their major paper in a public forum, which is attended by grad students, honours students and major students and faculty. This is a very lively event.

*BFA Designers:* Design students in Drama collaborate with faculty artists and develop their research and creative skills via this collaboration. As assistant designers in Studio Theatre (main stage) productions, they pursue related research for the production as well as interacting with guest artists and faculty directors and designers throughout the creative and production process. They also design their own productions (in the Media Room), with the supervision of design faculty. The design process involves research into the period, social conditions, and style of a play; a creative engagement with the play and director as the space, costume or light is conceived; producing the construction and design elements visually; developing the design as it is created for the stage, in interaction with the other designers, actors, technicians, and the director.

*BFA Actors:* Acting students research the period, social, political and economic conditions, themes, and style of a play and the period in which it was both written and set. This gives them the background for the decisions they must make as they create roles. Their final year involves four such projects and the results appear on the Studio Theatre stage.

*BFA Technical Theatre Students:* Culminating research projects consist of research and investigation of a specific material, process, or approach to a problem. Results are communicated in a variety of forms, including papers, CD-ROMs, etc.

*BA Majors and Honours:* The culminating project for BA majors and honours students involves collaboratively selecting, analyzing, researching (production history, playwright and his/her world, aesthetic and style issues), interpreting, staging and performing a play. This culminating course, DR 457, asks them to fully link theoretical and historical research with the practice of theatre.

*Community-Based Research in Drama.* Two examples within this area include Community-Based Theatre and the GeriActors. In Community-Based Theatre (DR 327), a research course in Canadian and International community-based theatre, each student researches a particular case study, company, or practitioner: the group's context, intentions,

theatrical process, theatrical forms, and social analysis. Students then present a workshop, providing experiences and examples from the researched group's theatrical processes. They then prepare a paper on the same group. Papers are traded among class members and discussed in seminars. In the world of the GeriActors, undergraduate students collaborate with a faculty researcher/creative artist and a seniors' group as they develop, create, revise, and perform scenes and plays about seniors' experiences and concerns. They perform for other seniors as well as people who work with seniors. Undergraduate researchers gain experience in both new play dramaturgy and community research.

In the BA Drama stream, undergraduate actors work with two of the top vocal coaches in the county (Moulton, Ley), who coach at the Stratford Festival, the premier North American Shakespeare Festival, and the Colorado Shakespeare Festival when they are not teaching classes. Undergraduate students of directing work with nationally known directors and dramaturgs (Weiss, McCaw) as they develop their own artistic expression. Designers work with faculty members who design nationally and internationally for theatre companies and productions.

In the BFA stream, because of the excellence of the artist/teachers who are in this department, students in this department have the opportunity to work with artists who are active across the country in new work, in alternative and main stream theatre:

- Faculty designers are active locally (most theatres), nationally (Stratford, Theatre du Nouveau Monde, Centaur, Soulepper, etc) and internationally (currently, for the Abby Theatre, Ireland.)
- Acting teachers work across the country and beyond as voice coaches (Stratford, Denver Shakespeare Festival), movement teachers (Brazil, England, as well as The Citadel, etc), and as directors and actors (Manitoba Theatre Centre, The Citadel, Theatre Network, London (theatre name to come if you need it))

There are a number of specific examples in the Department of Drama that demonstrate the link between teaching and research:

- David Bernet's research is located with a group of seniors (part of Society for the Retired and Semi Retired). He works with them (now called The GeriActors) to develop and perform theatre about life as a senior and this is performed to other seniors, people who work with Seniors, etc. The group comes to his and others' Drama classrooms (courses which examine theatre in community) and performs and discusses the theatrical processes (methodology), the impact, the issues raised, etc.
- Piet Defraeye researches and publishes in the area of Performance Studies. His areas of specialty, for example, theatre of provocation, are in the classroom as case studies for approaches to performance-based research (methodology) and for approaches to interdisciplinary use of theory at the honours level (applications of theories from several disciplines as they relate to examining theatrical events and theatrical performance). Without this level of research, the theatre theory and history courses he teaches would run the risk of working at too elementary a level and not introducing the latest theoretical and theatrical debates to our students. This is true for DR 101, Intro to Theatre as well as to upper level Honors courses.
- Jan Selman's research is related to using theatre in community processes, for example, with women's development, self help and action groups. She visits courses in Theatre and Community (DR 327) and Theatre of Provocation and talks about issues that arise in this work, theories that interact with this practice, and demonstrates methodology

for using theatre with groups who exist not to make theatre but who want to use theatre to make change. This work must be grounded in community practice and experience.

- Kim McCaw's creative activity falls mainly into directing and dramaturgy. He is nationally recognized in these fields, with awards to show for it as well as a distinguished career as Artistic Director of institutions that focus on these. He works with playwrights as plays go through the writing and workshop stages. He brings this to the classroom: to Playwriting, Directing and Dramaturgy courses, graduate and undergraduate. He provides practical examples to illustrate methodological points, and to assist student artists to examine their process and creative pieces with the perspective of other examples and case studies. He mentors students who are working on dramaturgy, playwriting and direction of new work.
- David Ley's major creative activity and research areas are Vocal Coaching and Dialect definition and acquisition. He pursues these in many settings, including the Stratford Festival. He brings this professional artistic experience into the classroom in many ways. He changes what he teaches and how, due to discoveries made with top end actors, such as those at Stratford. He develops his strategies, theories and methodologies for vocal development through his technical work at Stratford, and brings that to the BFA classroom; conversely, through the sustained teaching of voice with student actors, he has discovered and developed additional methods that he uses in the professional theatre work.
- David Ley's work across the country with dialect (in many regions) and his research into roots and social influences of dialect, comes directly to the classroom, where he teaches specific dialects, approaches to character through understanding of dialect, and approaches to dialect development.
- Linda Rubin's creative activity is in dance and in stage movement. Her work with, for example, a dance company comes back into her movement for actors courses as exercises, new stimulation for dance scores and physical development. Her work in Stage Movement, for example at the Citadel, comes back to the classroom as professional orientation for our acting students. Additionally, it influences the curriculum: what do actors have to be able to do for directors of today; how do we ready the actors for this? Instant and long term Curriculum impact ensues.

*Art and Design:* In the Department of *Art & Design*, there are also numerous demonstrable links between teaching and research. For example, in a recent class of 26 students (DES 570) the following project involved all the undergraduate students in an exhibit being held at the Edmonton Art Gallery. Titled “Designing with Children: A Collaboration between Elementary Children and Industrial Design Students,” this exhibit is the result of collaborative work among the Department of Elementary Education (Faculty of Education), the Department of Art & Design (Arts), and the Edmonton Public Schools. The curriculum area is design technology, a recent addition to the Alberta Elementary Science Program of Studies (1996). Design technology involves having children learn appropriate concepts, skills, and attitudes through designing and making models of products such as furniture, electrical devices, and model vehicles. In this particular research project, each child was asked by his/her teacher to design a piece of furniture featuring at least two functions and was required to complete three initial planning sketches. Then each child was randomly paired with a university industrial

design student and the two worked together at the university during three separate hour-long sessions. Each child-student used discussion, drawings, and computer graphics to improve and refine the child's initial drawing and ideas into a final design acceptable to the child. The school children benefited from the mentoring, the role modeling, and the opportunity to improve their design and computer skills. The design students benefited through working with a client and being exposed to the imaginative, freewheeling ideas of the children. The drawings in the exhibit represent the final drawing and representation of the Grade Three pupils' projects.

In visual communication design (in Art & Design) much of the work of undergraduate students fits a community-learning model in that community members are consulted in order to appropriately tackle design problems that affect the lives of people. The following list of courses and relevant projects is indicative of how undergraduate students can gain first-hand research experience in this area: in DES 396 (Introduction to Research and Theory in Design), one project involved working with a student in applied developmental science to design test materials to study Grade 2 children's misunderstanding of equivalence in math. These materials, which also include training materials, will be used in the near future for pilot studies involving children in elementary school. Other projects include the design of medicine labels and sustainable city planning projects. In DES 483 (Seminar in Design Issues) and DES 490 (Concepts and Systems in Design), some students have treated the social marketing project as a real-life project and have developed materials in consultation and collaboration with community members that have been produced for actual anti-drinking and environmental campaigns.

*Music:* In the Department of *Music* as well, undergraduate students are fully involved in performance (both vocal and instrumental, solo, small and large ensembles) throughout the academic term and in the Centre for Ethnomusicology undergraduate students are actively engaged in projects relating to that area of research (interviewing and recording local community groups and choirs, for example).

### ***Humanities***

*Modern Languages and Cultural Studies, East Asian Studies, and English and Film Studies:* In both the Department of *Modern Languages and Cultural Studies* and in the Department of *East Asian Studies*, students as active participants in language courses are often invited to participate as voluntary research subjects in studies conducted by language professors or graduate students in these departments and others (*Linguistics*, for example). Honours students typically prepare an independent research project in their final year. This allows them to work one-on-one with a faculty researcher in their area of interest. Honours students in the Department of *English and Film Studies* also take the Honours tutorial, allowing them to pursue an independent research project under the supervision of a faculty professor.

*Comparative Literature and Religious Studies:* In the *Comparative Literature* program and in the *Religious Studies* program, undergraduate students with special interests have often participated in conference presentations or helped a professor with research tasks relating to

publications. The Honours thesis is also a tradition in the Comparative Literature program. The Comparative Literature program is by definition interdisciplinary, bringing together work in different aspects of literary studies in the context of multiple languages and cultures.

In the Religious Studies program Professor Landy recently taught a course in biblical poetry, in which he brought samples of his own work in Isaiah. Students chose topics on which to give oral presentations, some of which were on subjects the professor had already published on (for example, the Song of Songs and Ecclesiastes 12). The students and the professor had a chance to rethink the entire area of biblical poetry work—and is an example of how one prof's work is directly used in the classroom. Religious Studies also offers a course entitled "Introduction to Community Action in Christianity" which is taught twice a year and usually attracts about 60 students, involving students in community issues.

In Religious Studies, there is an intermeshing of many different areas of research into history, psychology, literature, sociology, the fine arts, as well as the particular discipline of religious studies—the study of the nature and phenomenology of religion. Students in this program are continually exposed to the connection between what is "taught" in courses and what is being "researched" by instructors. There is a desire to develop an inquiry-based first-year course, by revising the first-year introductory course from a general survey to an introduction to the study of religion. This idea has, however, met with considerable resistance from students, who tend to want easy answers and are intolerant of ambiguity and indeterminacy.

*Philosophy:* In the Department of *Philosophy* the Honours program includes an Honours essay (in the final semester). Writing an extended essay of this type and working one-on-one with a faculty member researcher, allows undergraduate Philosophy Honours students to participate in the primary form of research activity in Philosophy, namely writing original essays that contribute to the field. PHIL 498 enrolls about 10 students on an annual basis.

Curriculum changes have been undertaken in the department to adjust to research interests and expertise of faculty members, among other things. In Philosophy that means cutting back on history of philosophy, aesthetics, and philosophy of law and developing curriculum in feminist philosophy, philosophy of biology and mind and computing. Increasing interdisciplinary research by faculty members has been the chief stimulus to breaking down barriers to this kind of work. Students are always reading original sources and developing critical thinking skills, even in their first-year. Students in the department write a lot of papers and constantly engage in group discussion.

Technology is also present in the department's course offerings. For example, Wes Cooper's Philosophy of Computing courses (PHIL 365 and PHIL 366) employ lots of computer resources—MOOs and the like—and the PHIL 101 supersection has students writing journals, engaging in discussions, etc., as well as getting course materials from web pages.

### ***Social Sciences***

*Anthropology:* The Department of Anthropology offers several courses in which each year small numbers of students work one-on-one with an archeology or physical anthropology professor on research that requires a major lab component. In other courses students work

with a professor on library-based research, and the Department offers at least one, and sometimes two, field archeological field schools each summer, in which students obtain hands-on experience in archeological research (in Alberta, in Siberia, for example). Each summer professors on archeological or physical anthropology research projects employ several undergraduates.

*Economics:* Honours students in Economics can choose an Honours Essay stream in which they are required to write a research essay under the supervision of a faculty member. Several students choose this option every year. All Economics majors take ECON 399, which requires them to write a paper based on the econometric analysis of data.

*History & Classics:* The Summer Archaeological Field School in Cortona, Italy, continues to offer incredible research experiences for senior undergraduate students who receive credit in CLASS 475/476 (Practical Methods in Classical Archeology/Advanced Field Techniques in Classical Archaeology). The field school involves excavating a large Roman complex of the 1<sup>st</sup> century BCE to the 5<sup>th</sup> century CE. The course is taught in six modules, including lectures, museum and site visits, excavation, laboratory, and interpretation of finds. The field school is usually limited to 20 students.

In both the History and Classics divisions of the Department, Honours students are required to write an Honours essay in the final semester. Writing an extended essay, working one-on-one with a faculty member researcher, allows Honours students to participate in the primary form of research activity in History or in Classics, namely, working from original sources and writing original essays that contribute to the field.

In several 400-level History courses students prepare major term papers making use of primary materials. For example, in HIS 452 (Slavery and Antislavery in the United States) students may use WPA interviews or the CD-ROM version of the vast Official Records of the Rebellion or one of the many microfilmed collections, such as the papers of Abraham Lincoln, abolitionist newspapers and pamphlets, or the state secession debates of 1860-61. One recent paper was written by an undergraduate student who elected to focus his term paper on the phenomenon of black slaveholders in the antebellum South and who carried out his own original quantitative analysis of 1830's census data. This term paper will eventually become a collaborative publication between the student and his professor. Even in some 200-level History courses, undergraduate students are required to write critical evaluations of books and articles relevant to the course, thus providing them with a further direct practical experience of research in History. Other researchers in History & Classics report that being active in research has allowed effective partnerships to be established with undergraduate students (for example, one collaborated with a student to develop a research website for HIST 490/646 on the Library's "subject" pages).

*Political Science:* In the Department of Political Science POLY SCI 499 is the year-long partial credit Honours seminar, in which fourth-year Honours students spend the year conceiving research and presenting and revising their Honours theses. Each student has his or

her Honours thesis supervisor, who guides the specific project and reads the final manuscript. In POLY SCI 499 students critique each other's proposal, bibliography and methodology.

Often courses in Political Science on media and politics, local government, urban politics, the politics of Alberta, health care policy, or women and politics have very direct community, agency, and NGO-oriented research. The respective professor's contacts in Alberta government, Edmonton city government, NGOs, local media, and political parties often give them and their undergraduate students access to interview subjects, as well as the opportunity to attend meetings and observe. Each spring a number of Political Science undergraduate students approach professors seeking STEP positions as researchers or indeed seek sponsorship for the Undergraduate Student Researcher positions in the Faculty of Arts. Thus every summer a number of undergraduate students in Political Science are actively "working with" or are at least supervised by their professor researchers. Occasionally grant-holding professors are able to employ undergraduate students as research assistants or as assistants for conference organizing, as is the case with the large "Children and War" conference of April 2004.

Several years ago POL SCI 357 (The South in Global Politics) generated the CKUA 13 part program, "Who's on Third?" in collaboration with CCKUA and the Parkland Institute. This particular program has subsequently been used in some 60 distance-education programs across North America and beyond. Students designed each of the segments, did the background research, and carried out the long-distance phone interviews with a variety of international and national experts and practitioners across many "development" issues. In addition, web-based learning technologies are utilized by several researchers in their teaching in Political Science in order to bring students into direct contact with searches, data bases, and website relating to subjects of their research papers.

*Psychology:* The Department of Psychology promotes cumulative research skill development and exposure to research throughout the curriculum. In first year courses, students read secondary sources, learning about research and research perspectives, ethics, and methods. In the research participation component of the introductory courses, students may choose the option of volunteering as participants in several research studies and then learning about the research focus, design, and analysis of each particular study. In second year courses, students learn more about research methods as they complete survey courses that emphasize different research areas in the field. In third year courses, students begin reading primary research literature and may enroll in several courses that provide guided experience in conducting empirical research. For example, in PSYCO 323, Cognitive and Perceptual Development, with an annual enrollment of 75, students may opt to design and conduct a research study with children and in PSYCO 325, Applied Research in Developmental Psychology, with an enrollment of 25, students volunteer with a community organization and develop research projects to address questions of interest to their volunteer placement. In fourth year courses, students read mostly the primary research literature in a specialty area – often the research specialty of the instructor—and integrate the research in some way, such as through an integrative review paper, presentation, or research proposal. We also offer PSYCO 496 and 498, independent studies and research options, with an average annual enrollment of approximately 100, in which students may participate in research laboratories and conduct empirical research under supervision of a professor. Thus, the curriculum is designed to help

students progress from reading secondary sources to reading primary sources to contributing to the research literature.

The Honors program in Psychology, with an annual enrollment of approximately 20 students in each year of the two-year program, is designed to train students in research as preparation for graduate school or a career in psychological or related research. In the first year of the Honors program—which comprises students' third year of university—students work as a research apprentice in a research lab. In collaboration with the professor who has agreed to supervise, the student works on one or more projects, learning the methods of research in that area. Over the course of the year the students acquire the expertise to plan, organize, and conduct a research project. In the second year—the students' fourth year of university—the students conduct semi-independent empirical research with their research supervisor.

The Work Experience program in Psychology, with an annual enrollment of approximately 40 students, allows majors who have completed the third year of study an opportunity for extended, paid work experience in an applied research setting. The program lasts 12 or 16 months and students complete a research project while on work experience and report on the project in a capstone course when they return to complete their fourth year.

*Sociology:* As the Population Research Laboratory (PRL) has further expanded its research activities into computer-assisted telephone interviewing (CATI), students introduced to survey research techniques in their undergraduate courses have begun to ask for employment in the PRL. Each year half a dozen or more undergraduate students have been hired as interviewers for a wide range of social science and health surveys.

*Women's Studies:* All majors and Honours students are required to take WST 302 (Feminist Research and Methodologies) in which they gain a limited amount of hands-on research experience. In Women's Studies, research comes into the classroom because each staff member is teaching a course that actually grows out of her research. For example, "Feminism and Sexual Assault," "Women, Globalization, and Economic Restructuring," and "Immigration and Settlement Issues" are three courses taught by three researchers who are working on these areas at the same time they are teaching the courses in question.

Eight of the eleven students from this year's W ST 498 class (Feminisms: Anti and Third Wave) will be presenting a paper (along with the instructor) at the Canadian Women's Studies Association meeting in Winnipeg at the Congress. All courses in W ST involve the writing of major papers (hence, hands on humanities or social science research) and often require oral presentations, even in first year.

### ***C. Public Forums/Showcase Days/Research Days Involving Arts Undergraduates***

#### ***Fine Arts***

*Art & Design:* Each year in April/May the department presents BFA and BDes group exhibitions featuring the work of 4<sup>th</sup> year students in the Fine Arts Building Gallery (FAB).

*Drama:* Each April the Design Portfolio Show allows design students to showcase their artistic work (renderings, models, studies, etc) for the department (faculty, staff, and students (and Alberta Artistic Directors and Designers, who are invited to attend and to meet the designers). Studio Theatre regularly showcases undergraduate (and graduate) students to the local theater and wider community, especially artistic directors and freelance directors who are invited to attend, as is the university and wider community. Each year the Collective Creation in the Community project involves senior undergraduates in the researching of a community group and in creating a show that reflects that group's stories and issues. They perform the show for that community and in that community. The annual (March) DR 457 production showcases senior BA, BEd, and BA Hons student research, interpretation, and production work in a performance.

*Music:* As part of their musical studies, some 400 students (at various levels) participate in large ensembles, presenting about 25 concerts every year on campus and 35 concerts a year off campus (including national and international concert tours). The department sponsors about 35 public student recitals each year in which performance students (at various levels) appear as soloists on the stage of Convocation Hall or in Studio 27 (FAB). An off-campus performance program for soloists and chamber groups organized by Prof Tanya Prochazka (mUse of A) allows student the opportunity to perform in senior citizens' homes, hospitals, schools, churches and other public places. About twenty times each year music student groups are asked to play ceremonial or reception music. Approximately 20 students are members of the Edmonton Musicians' Association and as such work professionally within the community. Every summer about a half dozen U of A Music students are employed as members of the Ceremonial Guard Band in Ottawa. A similar number of undergraduate students are members of the Edmonton Military Reserve Band.

### ***Social Sciences***

*History & Classics:* The department has recently held an undergraduate student research conference, which attracted participants from all across Canada.

*Psychology:* The annual Brian Harder Research Conference is a venue for third year Honors students to present their thesis proposals orally and fourth year Honors students to showcase their research results in interactive posters.

The annual Joseph Royce Research Conference allows faculty members, graduate students, and undergraduates to present both oral papers and posters. Approximately 10 students present at the conference and another 20 – 30 attend the conference.

As part of a course requirement in several 300- and 400-level courses, students prepare poster presentations on literature reviews, research proposals, class projects, and observational research. These presentations are advertised within the Department and many faculty, graduate students, and undergraduate students attend these course-based poster presentations.

*Sociology*: The annual David Pierce Research Day features research presentations from faculty members and graduate students. Each year at least several undergraduate students have participated as well.

*Women's Studies*: At the end of the term, Honours students are required to make a 20-minute presentation on their Honours project to a group consisting of the faculty members in Women's Studies along with the students' parents/family.

#### ***D. Undergraduate Teaching***

As mentioned in earlier versions of this report, the Faculty of Arts to date has few endowed Chairs. However, it is significant to note that the holders of our endowed chairs are all actively engaged in the undergraduate teaching program of the Faculty and are constantly linking their research with their teaching. These professors include Sean Caulfield (Junior Canada Research Chair in Printmaking, Art & Design), Gary Kelly (Senior Canada Researcher Chair in English), Andrij Nahachewsky (Huculak Chair in Ukrainian Culture and Ethnography, Modern Languages & Cultural Studies), Derek Sayer (Senior Canada Research Chair, Sociology), Anna Yeatman (Senior Canada Research Chair, Political Science), and Adam Morton (Senior Canada Research Chair, Philosophy). For example, Caulfield's work involves hands-on studio courses where students learn the art of printmaking and drawing alongside their instructor; Kelly's students work with him to access library, website, microfilm, and other archived resources on campus as they research popular culture. Nahachewsky hires a number of undergraduate students each year to work on his ethnographic and folklore projects. Some work as historical interpreters at the Ukrainian Village in the summertime and are trained in advance in Ukrainian history and culture in a special course.

Directly and indirectly because of the research money coming into the Faculty of Arts in the form of grants to faculty members, there are a number of opportunities available for undergraduate students to gain research experience. These include extensive microfiche collections through History and Classics, the CRC Humanities Computing Lab and other equipment related to the TAPoR project in English

The Department of Drama has several examples of this, which typifies the activities of many of the other departments in the Faculty:

- Through the winter, David Barnett funds at least one undergrad student as a research assistant through funds raised for his community theatre project, The GeriActors. This summer, two undergrad students will be funded on this project.
- Researchers are able to get major collaborative proposals out the door with funding assistance for research assistants, travel, communication, etc. (e.g. CURA LOI funds)
- Computers are funded this way sometimes; with no greening method we rely on research grants and other sources for computers for faculty members; e.g. a specialized computer and program for vocal mapping (Ley) as well as the standards required for work with SSHRC and U of A systems.

- Theatrical equipment has been bought, for specialized creative activity and more generally for theatrical performance, through Arts Council and Research institute funds (CANARIE, Alberta Foundation, Alberta Lotteries)
- GRAs and sometimes undergrads are funded this way
- SAS and HSSFAR fund short term projects and projects not eligible for major SSHRC or Arts Council funding; also travel to key conferences for dissemination and cross fertilization of research/researchers
- SAS provides very important small (partial) course buy outs which enable faculty artists to take up creative activity opportunities in the professional season, which normally works at exactly the same time as the academic year. Typically, they need a 3-5 week buy out.
- Creative projects and creative/research projects are funded this way. E.G.: the CANARIE research grant which our adjunct professor Will Bauer is PI, funds research into performer controlled light/sound/video in performance as well as high speed internet linking of performance spaces in two sites, as well as web-based performance research. These funded and assisted: special high end staff training/upgrading; student participation (undergrad performers and technical students) in innovative performance technologies; grad and undergrad creation and research with web-based real time performance.

### *E. The Role of the Faculty of Arts in Providing Service Courses for Other Faculties*

The Faculty of Arts plays a major service-teaching role for undergraduate students in other Faculties. In particular, many Business or Education students complete their first year in the Faculty of Arts. As well, many of our graduates go on to take Law or other professional programs. In this service role the Faculty of Arts strives to introduce these students to research in the Arts, stressing the development of writing and communication skills as well as the ability to think critically and creatively about problems.

In the Department of Drama there is a significant role in training students in other Faculties. These courses provide an opportunity to develop enhanced communication skills in an interdisciplinary nature, which benefits their studies in their home faculty.

- Our service courses introduce people from many disciplines to the art form of theatre
- Perhaps most interesting are our service courses with practical elements: where students from many disciplines and many faculties develop theatre from scratch, which reflects in a new communication style, their interests, concerns, stories and perspectives. An interdisciplinary group of diverse students come together and work cooperatively to express their perspectives, concerns and views, through performance. Original theatrical pieces (as opposed to essays or speeches) communicate their interests to others from across campus. These are taught by specialists, faculty and guest artists, in performer created work, improvisation and collective creation.
- Theatre has an interdisciplinary focus: theatre and performance theory is used to examine social conditions which are of concern to many other disciplines; thus theatre

theory and some theatre methods are of use to students from other disciplines, in their primary work.

- Theatre is interdisciplinary in focus #2: theatre provides an alternative communication tool for people from other disciplines.
- Undergrad item: theatre's understanding of communication leads to courses with impact re speech, voice, presentations, oral communication, for use in many other fields. Our courses in these topics draw education, business, law, engineering etc etc students.

### ***F. The Role of Graduate Students as Mentors***

Throughout the Faculty of Arts graduate students play a significant role in mentoring and teaching our undergraduate students. In all of our departments graduate students serve as teaching assistants, principle instructors, or sessionals. Six departments in the Faculty of Arts also participate in the University Teaching Program through the Faculty of Graduate Studies and Research (Anthropology, Comparative Literature, English and Film Studies, History and Classics, Modern Languages and Cultural Studies, and Psychology).

In the Department of **Drama**, for example, each grad student has a mentor if they teach a course independently; we have course coordinators for every course with more than one section and their job includes grad orientation and support throughout the course; the chair and program coordinator attends classes taught by graduate students and meets with the teacher following the course; several students work with a faculty Primary Instructor on a course, which follow a system of collaborative marking so grading approaches are compared (e.g. DR 101 team); discussion and workshop leadership is prepared as a group through faculty and grad student teams (e.g. DR 247 model). As well, all graduate students are encouraged to participate in UTS sessions.

Another example is in the Department of **Philosophy** where almost all of the TAs in the department first serve in the PHIL 101 supersection where prize-winning instructors like Welchman, Kahane, Heyes, and Houle provide great mentoring for them as future profs.

In the Department of **Psychology** undergraduate and graduate students interact in research labs, seminars, and conferences. The graduate students provide role models and mentors for undergraduate students who are interested in research. Graduate students also teach summer courses and laboratories as part of the University Teaching Services University Teaching Program.

### ***G. Other Innovations Enhancing Undergraduate Experiential Learning and Research Experience in the Faculty of Arts***

For the past several years, the Faculty of Arts has provided several dozen undergraduates each year with the opportunity to spend a semester studying in Cortona, Italy. Courses are taught by Faculty professors and focus on topics relevant to the travel/historical experience (for

example, European culture, military history, art history, travel writing, architecture). Courses are taught in a four-day week in order to allow students long weekends for travel in Italy and surrounding countries. The Cortona learning experience is extremely rewarding for both students and professors.

### ***Fine Arts***

*Art and Design:* In the Industrial Design division), Prof Rob Lederer collaborates with COMPRU research projects ranging from the design of surgical implant moulds to the development of control interfaces and apparatus redesign in Speech Pathology and Anaplastology. Undergraduate students and graduate students are research assistants in these projects.

*Drama:* The New Play Festival, inaugurated in 2001, sees students' plays selected by a peer jury for staged readings and workshop productions (directed and performed by students). Most plays emerge from the undergraduate playwriting course (DR 407).

### ***Humanities***

*English:* Students in undergraduate courses taught by Prof Considine (including Engineering students) are invited to bring new English language constructions to the classroom to help update dictionaries. Students in undergraduate courses taught by Prof Bishop and Prof O'Driscoll are regularly taken to the Bruce Peel Special Collection in the library and invited to research this rich literary source. Students in courses taught by Prof Miall are recruited to be paid participants in SSHRC-funded research on reader response.

*Philosophy:* The prize-winning PHIL 101 "supersection" is taught by senior faculty members and uses a team of graduate teaching assistants. This re-structuring of introductory sections ensures that undergraduate Philosophy students are exposed to senior researchers in their first Philosophy class.

### ***Social Sciences***

*Anthropology:* The department has initiated a formal volunteer program whereby undergraduates can assist professor and graduate students with their research. Normally, this is lab-based research or the computer analysis of research data in archaeology or physical anthropology. In addition, undergraduates volunteer to assist with comparative research and teaching collections in archaeology and physical anthropology (for example, fossil casts, human skeletal remains, animal bones, stone tools). About 10 to 15 students volunteer in this research program every year.

*Psychology:* Instruction in the Honors seminars has moved from a traditional content-oriented format to a problem-based format whereby students acquire the skills required to conduct and interpret research. Technologically enhanced sections are available in our introductory psychology courses. These involve considerable student-to-student and student-instructor Web-based interaction on research-related topics.

As a part of the first year experience initiative, introductory psychology students now complete information literacy tutorials designed to help them learn to search the Web and

published research literature databases and to critically appraise psychology-related information and research.

The Undergraduate Psychology Association hosts a number of research and volunteer forums to help connect students with research opportunities. Undergraduate students are invited to a number of regularly organized research seminars, including Cognitive Seminar and Life Span Developmental Lunch.

Undergraduate students are encouraged to become involved in research as paid and volunteer summer research assistants and as NSERC and AHFMR summer research assistantships (approximately 15 are available each summer), and as Arts Undergraduate Student Researchers.

In the Faculty of Arts another factor influencing the expansion of possibilities for undergraduate students to participate in the research experience has been the opportunity afforded many of them to learn first-hand about the ethics of research with human participants. The Tri-Council Policy Statement and the work of the Arts Science Law Research Ethics Board has necessitated the preparation of ethics clearances both for in-class research conducted by professors as well as education and preparation of ethics applications by undergraduate students themselves who are seeking ethics approval for undertaking research (leading to an Honors thesis or a major term paper, for example involving research with humans. In the 2003-04 academic year to date, more than 20 applications have come to the ASL REB for approval from undergraduate students in the Faculty of Arts.

As well, the Faculty of Arts Community-Service Learning pilot project, launched in Autumn 2003, involved three sociology courses, eight community organizations and 35 students. CSL was an option in each course; students were not required to undertake community service in order to earn course credit.

In **Soc 260: Sociology of Inequality and Stratification** (taught by Dr. Satoshi Ikeda), about 25 students had a choice of three different organizations to work with (ECCCC's ArtStart program, Catholic Social Services' after-school ESL program, and Greater Edmonton Foundation Housing for Seniors). Dr. Ikeda was looking for sites where students would not only encounter structural inequalities, but would be challenged to reflect on their own social location of power/privilege. Students incorporated their CSL experiences (20 hours over the term) into the course through written critical reflection papers at mid-term and end-of-term.

In **Soc 365: Media and Cultural Globalization** (taught Dr. Serra Tinic), four students worked with the Global Visions Film Festival, helping organize the festival events—with special involvement in the activities for youth—keeping records of meetings, and meeting with filmmakers. They then wrote papers integrating this practical experience with the media theories from the course.

Finally, in **Soc 345: Cultural Studies** (taught by Dr. Sourayan Mookerjea) seven students chose one of four different local organizations (the HOME Project, APIRG, CJSR, and FAVA) in which they could engage with issues of cooperative practice, collective identity, and cultural commons. The course required them to then segue this experience into some kind of cultural product (e.g., one student did a video, another did a radio program, another created a slide show).

The Faculty of Arts also did a study looking at the feasibility of the project being expanded and released the report "**Pilot Project Outcomes: A Survey-Based Report**", which is available on the Faculty of Arts website. In that report the Student Responses demonstrated a very positive experience that encouraged critical thinking skills, and an increased ability to place classroom concepts into a broader context of the community. The community organizations expressed several advantages in this type of program, including working with capable, motivated, flexible, "high functioning" volunteers; simultaneously meeting organization and student needs; expanding organization's profile in the community and at the U of A; working with people at the U of A who shared common goals and values. Finally the faculty responses said the CSL experiences were important because they helped challenge students with the complexity of naming and responding to collective needs/issues/identities; relate theory and practice; develop students' social citizenship and critical thinking; and enhancing goals of the course. In the 2004-05 academic year the project is being expanded to include Political Science, Linguistics, Women Studies, Drama, and Psychology.

But by far the most exciting new addition to the Faculty of Arts panorama of undergraduate student research opportunities has been the now two-year old Faculty of Arts Undergraduate Student Researcher program. Begun in 2003, this program provides summer employment for undergraduate students in Arts to work alongside an Arts researcher in order to gain both training in research methods but to have true hands-on experience in one of the varieties of research and creative activity within the Faculty. In the first year of the program ten students worked with ten different Faculty researchers on the following projects:

- “Functional Imaging of Children’s Spelling” (Psychology)
- “The Edmonton Popular Literature Project” (English)
- “Music and Religion in the Indian Diaspora: the Role of Devotional Song in the Lives of Indo-Canadian Women” (Music)
- “Children and Armed Conflict: the Plight of ‘Bush Wives’” (Political Science)
- “Installation of a Public Art Commission” (Art & Design)
- “Power Structures and Sectarian Abuse” (Sociology)
- “An Annotated Bibliography of 20<sup>th</sup> Century North American Arctic Travel Literature” (History & Classics)
- “Imagining Taiwan: Tungfang Po’s Soul Searching in ‘Soul Palaquin’ and Other Stories” (East Asian Studies)
- “Dialectical Variations in the Spanish of the Sierra Madre Oriental Region of Mexico” (Modern Languages & Cultural Studies)
- “Kinji Imanishi Digital Archive Project” (Anthropology).

The success of this program in its first year led to its renewal and expansion so that for the summer of 2004 fifteen undergraduate student researchers will be at work in the Faculty of Arts on the following projects:

- “Self-Employment, Domestic Work, and Caregiving in Canada” (Women’s Studies)
- “Iconographic Dramaturgy” (Drama)
- “Marginal Wage Labour in England, 1250-1300” (History & Classics)
- “Archeological Survey at Kastro Kallithea, Greece” (History & Classics)
- “19<sup>th</sup> Century African American Feminist Journalism” (English)

“Everyday Zocalo: The Architecture of Meaning in Mexico” (Modern Languages & Cultural Studies)

“Transnational Kinship: Adoption, Reproduction & Identity” (Sociology)

“Understanding Language Learning Motivation: East Asian ESL Students’ Perceptions” (Psychology)

“Study, Performance and recording of 20<sup>th</sup> Century Duo Music for Violin & Cello” (Music)

“Difficult Histories: Contested Memories (Sociology)

“Stoney Language Project “ (Linguistics)

“Experiential Closeness to Impactful Dreams” (Psychology)

“Gendered Writing Styles” (English/Humanities Computing)

“Studying the Design of Effective Health Messages for Children” (Art & Design).

After the 2003 Undergraduate Student Researcher program, one “alum” decided to continue her work and will enter graduate school next year. Several others have co-authored conference papers. One translation and one bibliography may see publication as well. The most recent competition attracted 80-some proposals, and feedback from researchers and supervisors has been very positive.

## Appendix E - School of Business

### Undergraduate Research Experience in the School of Business (May 28, 2004)

#### Introduction

The School of Business offers a wide variety of courses that incorporate the research expertise of faculty members and provide our students with research experience. The Faculty has not, to date, established an explicit mandate to incorporate teaching and research, but connecting research in undergraduate courses has developed as part of the culture of teaching within the Faculty. It is the goal of the School of Business to provide our students with an enriched learning environment that combines practical business skills, with research opportunities and exposure to members of the business community.

#### Courses

The School of Business has many courses that provide our students with substantial research experience. All undergraduate programs in the School of Business are three-year programs and rely on the Faculty of Arts and Science for their first year experience and coursework. From an undergraduate research experience perspective, the Business courses in Years 2 through 4 can be divided into three groups: 1) introductory courses, 2) electives, 3) specialized or custom-designed courses. As a general rule, as the level increases, the number of students in the class decreases and research exposure intensifies.

- 1) The introductory courses are either taught in single large sections of 250-400 students or in multiple sections of 60-80 students. Despite their introductory nature, some of these courses have research components. For example, in BUS 201 (a second-year course with an enrolment of 400+), students are asked to prepare a business plan in groups. This assignment requires deciding on an idea to base a business, conducting research on the selected industry and competitors, writing up the business plan (including a marketing plan, an operations plan, and a financial plan), publishing the plan on the web, and presenting it to an audience. Students are coached by the course team, business professionals, and library staff, but this assignment can be characterized as an independent and open-ended project. For most students this is an introduction to conducting independent research and utilizing the library resources (particularly the databases we subscribe to). ACCTG 311, which has nearly 500 students in the fall term and 100+ in the other two terms, also has a research requirement. Students do financial analyses of listed companies and write papers on controversial issues such as business ethics. In ORGA 201 (Introduction to Management) students learn how to manage a company. They create a company and make sure that it grows. They can take it international; hire workers; decide on innovative HRM practices; deal with unions, etc. To enhance their marks, students are encouraged to draw upon outside reference materials, citing them in their written report. They use both published, academic articles, as well as web-based articles. In MARK 301 (the introductory marketing course) a marketing plan with a research component often serves as the major course project.

- 2) The electives are taught in sections of 30-60 students and they allow students to specialize in their selected majors such as accounting, finance, operations, marketing, management information systems, and human resources management. Most electives contain project segments. For example, MGTSC 422 (a course on simulation modeling) requires the students to select a decision problem, model it using the software covered in the course, simulate it, and make recommendations based on the results of the simulation. Some students select problems from the textbooks while others select a real-world problem they are familiar with (such as modeling the customer flow in the university bookstore or at the Edmonton airport). In ORGA 432 (a quality management course) student choose for their term project an existing local organization involved in a quality improvement plan. Students are instructed to explain their research question/argument or the problem they deal with; describe the research setting and the quality improvement initiative; and analyze the situation. They are expected to develop appropriate questions; sign the interviewees on an ethics form; and collect any written material that can enhance their project. In MARK 412 (marketing research) students examine sample size determination, sampling methods, exploratory research methods (e.g., focus groups and depth interviews), survey methods (both internet and pen and paper), tabulation, basic analysis (i.e., descriptive statistics), advanced analysis (e.g., factor analysis, cluster analysis, conjoint analysis) and methods of reporting and presenting the results. Emphasis in this course is also placed on using SPSS, the industry standard statistical program. In addition to student projects, many electives cover advanced material from journal articles where students are asked to read and compare papers. Fourth year electives also allow the instructors to discuss their research in the classroom. However, the research component of electives is highly variable and depends on the major as well as the instructor.
- 3) This group contains the honors courses (typically a graduate course with very small enrolment where a small number of undergraduates is allowed to register), or custom-designed reading courses (the Individual Research 495/496/497 series). Many of these courses are research-focused. They involve reading the literature and producing a paper with the intent of presenting it at a conference or publishing in a journal. These courses are meant for overachievers who have graduate school intentions. The total number of students in such courses in any given year is rather small (25 during the last academic year), but the impact on these students is significant. One example is MARK 420, offered to allow students the ability to explore their aptitude and interest in pursuing academic research for a career. This course places intensive focus on understanding different types of academic research (e.g., historical, qualitative, behavioural, modeling, etc.), factors contributing to theory development, experimental design, operationalizing independent and dependent variables, and advanced multivariate statistical techniques. All students are required to submit a research proposal for a topic of their choice that provides a literature review, theory development, complete research method, analysis plan and areas for future research.

Of interest are two particular course sequences that fall between Groups 2 and 3 above: BUS 490/491 and MGTSC 467/468. BUS 490 and 491 (1.5 credits each) are designed to improve the problem solving, group work, communication, and presentation skills of our undergraduate students through the treatment of Business cases. BUS 490 incorporates the

application of research skills and knowledge developed throughout the program, and prepares students to case competitions. Students receive academic credit for participating in local, national, and international business case competitions. For example, in last competition, our debate team won first place and finance team won second place among over 20 faculties in the prestigious Intercollegiate Business Case Competition. The total registration in BUS 490/491 was 41 last year.

MGTSC 467 and 468 are designed to simulate the operations of a management consulting firm. In MGTSC 467, (about 30-40) students increase their research, team work, problem solving, and presentation skills by exposure to about a dozen quantitative cases. The course includes sector-specific information about preparing proposals, conducting research, and communicating with clients, as well as more traditional academic content on quantitative problem solving tools and techniques. In MGTSC 468 (about 20-30) students form consulting companies, compete for contracts by preparing proposals, sign contracts with milestones, deliverables, and budgets (real dollars), and tackle problems, proposing paths of action to local organizations. The course consists of a single project—there are no lectures. Professors do not act as project managers; their role is more of a resource person. Projects resulting from this course are usually presented at a conference, some win student paper prizes, and some end up being published in academic journals. For example, 5 projects from this course have just been presented at a major international conference (CORS/INFORMS International, May 16-19, Banff).

### **Honors and Co-op Programs**

In addition to these courses the Faculty has implemented new Honours programs in Accounting, Finance, and Management Science, which provide more research opportunities for undergraduate students and feed directly into graduate work in Business. (Appendix A is the announcement of the Accounting Honours Program). While these programs have significant research components, currently the enrolment in them is rather modest since they are very recent.

The Co-op program, organized through the Business Office of Placement Services, provides students with an applied job experience in the field of business. The students have opportunities to apply the skills and theories learned in class - to do 'business'. Typically, 160-190 of 500 students (or 35-40%) eligible participate in the co-op program. All Co-op placements provide students with an exposure to the real-world, and some contain significant research components. All Co-op students are required to write a report on their experiences, describing how they saw theory in action.

In addition to the honors and co-op programs, the Faculty has a unique program that combines the features of both: PRIME (Program for Research and Investment Management Excellence). About a dozen Finance students manage a portfolio of over \$0.5M. This program combines traditional academic objectives with the practical demands of hands-on investment analysis and portfolio management. Participating students learn by using the actual tools of the trade, including quarterly and annual reports, real-time computerized sources of information and access to practicing analysts and managers in the Edmonton business community who serve as mentors.

### **Public Forums and Events**

Students are encouraged to participate in public forums and events. For example, students in operations management present their course projects at the Annual Student Conference on Operations (SCOPE). This is a conference that was established by our faculty seven years ago. It attracts around 15-25 teams from 4-6 business faculties. Usually our students have formed the largest contingent at this conference. Some of the papers presented at this conference are published in academic journals. For example, two papers from the 2002 conference were published in the August 2003 issue of *Information Systems and Operational Research*. (Please see the full description of the event in Appendix B).

### **Centres**

There are a dozen centres at the faculty with various missions—some are primarily research centres, some target outreach, and others deal with continuing education. Those that engage in research involve undergraduate students. For example, the *Centre for Excellence in Operations* employs four undergraduates this summer on various applied research projects, such as increasing the effectiveness and efficiency of the emergency response system in Calgary. Such applied projects invariably spin-off research papers that generalize the findings. In some cases undergraduate students are co-authors of such papers. Similarly, the faculty's current Initiative for a New Economy grant, coordinated by the *Canadian Institute of Retailing and Services* is employing 45 undergraduate students in the writing of 12 cases, and four students as research assistants.

### **Infrastructure**

#### *Winspear Business Reference Library*

The Winspear Reference Room has three group study/meeting rooms and study space for 101 including twenty carrels, with connections to the campus network. Seventeen stations access Library's databases and web resources. The Room is open 80 hours a week. Students are able to access the information they need to do research for assignments and courses in the Winspear Library. Electronic access to business-related, industrial, and commercial databases is available to students. The school invests significant sums to maintain, update and support its corporate and financial databases. A short list of information resources students have access to includes: Dow Jones Interactive, ABI Inform, Datastream, CANSIM, Canada NewsWire, EDGAR, Nexis, Strategis, StatsCan, SEDAR, and the Wall Street Journal. The number of databases available totals more than fifty, a greater number than typically found at other Canadian and US business schools.

#### *Technology in Business*

The School of Business has established a leading centre for the use of technology in education. The Business Centre has 16 smart classrooms, 2 videoconference facilities, 2 smart boards in committee rooms, a complete Wireless Network throughout the building (extending into the Tory/Business Atrium and the Hub Mall), and 120 undergraduate computing stations.

### **Undergraduate Teaching**

The standard teaching load for faculty members is 4 courses per year. However, the individuals loads exhibit significant variance, ranging from one to six courses, based on each faculty member's career stage and aspirations, as well as other obligations. There are a number of sessional instructors used in the School of Business. Some sessionals are on longer term contracts and offer as many as eight courses a year whereas others come to the faculty to teach only one course in their area of expertise. In addition, our doctoral students are involved in teaching and mentoring our undergraduate students. Every doctoral student must teach two courses as part of their program.

#### *Endowed Chairs*

Endowed Professors are very active at the undergraduate level, including the large introductory courses, thus exposing students to the ideas of some of our senior researchers. The undergraduate teaching load mentioned for each chair is a representative load, sampled from 2002-03, 2003-04 and 2004-05.

#### Accounting and MIS-

- Michael Gibbins, Department Chair and Winspear Foundation Distinguished Chair in Professional Accounting (Large section ACCTG 301 - Introduction to Accounting)
- David Cooper, Certified General Accountants Professor of Accounting and Director of the Business PhD program (teaches or supervises the management accounting undergraduate capstone course ACCTG 426).
- Ray Patterson, Canada Research Chair in Management Information Systems, (management information systems introductory course MIS 311 and mainline course MIS 413).
- Karim Jamal, Alexander Hamilton Professor of Business (ACCTG 456, the mainline auditing course that features analysis and research of real companies)

#### Finance and Management Science -

- Mark Huson, Pocklington Professor of Free Enterprise (Large section FIN 301, the introductory finance course)
- Vikas Mehrotra, A. F. Collins Professor of Finance (Large section FIN 301, the introductory finance course)
- Erhan Erkut, Vargo Teaching Chair and Winspear Senior Fellow (Large section BUS 201, Introduction to Business, large section MGTSC 352 – Introduction to Operations Management)
- Randall Morck, Stephen A. Jarislowsky Distinguished Chair in Finance

#### Marketing, Business Economics, and Law -

- Joseph Doucet, H. and R. Drilling Professor of Regulatory Economics (BUEC 463)
- Terry Elrod, Francis Winspear Professor of Business (MARK 472)
- Adam Finn, Banister Chair in Marketing (MARK 412)
- Gerald Haubl, Canada Research Chair in Behavioural Science and R. K. Banister Professor of Electronic Commerce

Strategic Management and Organization -

- Yonatan Reshef, Winspear Senior Fellow (ORGA 417, ORGA 432)
- Royston Greenwood, Telus Professor of Strategic Management (ORGA 434)
- Michael Percy, Stanley A. Milner Professor and Dean
- Lloyd Steier, Chair of Entrepreneurship & Family Enterprise

## Appendix I

### *ANNOUNCING THE ACCOUNTING HONORS PROGRAM*

The Department of Accounting and Management Information Systems is pleased to announce that a new program, the Accounting Honors Program, is in the final stages of approval for implementation this year, in Fall 2004. It will provide an academically enriched program for highly motivated students who may be interested in pursuing a PhD degree or otherwise would like to know more about the research side of accounting. High grades are needed for admission (normally a GPA of 3.7), and the program includes an honors essay research project, a research methods course and a PhD seminar. It will be an exciting program for students who are thinking about becoming a professor, or who are interested in research or would like to know more about how to do it. The program is structured so that the professional associations' requirements can be met while taking the honors components, but this is easier to manage the earlier a student chooses the honors program. For maximum flexibility, application to the program should normally be made after completing Year 2 of the BCom program, but qualified students in any year may apply. Admission will depend on whether the student has room in his/her program to complete the honors components. For further information, please see the detailed program proposal on the AMIS Department web site (<http://www.bus.ualberta.ca/Accounting-MIS/>), contact the Accounting Honors Program director, Dr. Jennifer Kao ([jennifer.kao@ualberta.ca](mailto:jennifer.kao@ualberta.ca), 492-7972), or contact the AMIS office (Business 3-20L, 492-3053).

## Appendix II

### *SCOPE 2004: Student Conference on Operations*

**2004-04-05** — The 7<sup>th</sup> Annual Student Conference on Operations was held at the University of Alberta on April 2 and 3, 2004. This is a conference where students present their operations management projects to an audience consisting of students, faculty members, and industry representatives. It is a forum for the next generation of operations researchers and business analysts to demonstrate their skills in a professional environment. Attending students are exposed to an array of applied work, and have the opportunity to network with business leaders, faculty from other universities, and other operations-oriented students. Faculty members make presentations on research and educational opportunities at their respective schools. The industry representatives serve as presentation judges, provide feedback to presenters, and interact with students and faculty. The conference serves as a link between the students and industry, between the universities and industry, and between the various operations management and management science programs (and students) in Canada.

The Operations Management Student Club of the University of Alberta School of Business organized this year's conference. The co-sponsors were BearingPoint, Metal Fab, and Primed. A total of 14 teams from five universities were in attendance: Queen's University, University of Alberta, University of British Columbia, and University of Calgary, and University of Saskatchewan. The faculty members and the judges were very impressed with the quality of the projects and the presentations. This conference offers further proof that operations management is alive and well in Canada and the new generation of operations researchers are already improving operations in Canadian companies while they are at school. There were two awards for graduate students and four awards for undergraduate students at SCOPE 2004. The award winners are:

#### Graduate Awards:

**Best Operations Strategy:** Enterprise Resource Planning at Small and Medium Sized Enterprises, by Brent Snider (U of Calgary)

**Best Operations Analysis:** CT Scanner Waiting Time Reduction Study, by David Puterman and Kevin Chen (UBC)

#### Undergraduate Awards:

**Best Process Analysis:** KWH Piping Inc. Inventory Control Solutions, by Kevin Braid (U of Saskatchewan)

**Best Service Project:** Calgary Laboratory Services: Pre-analytical Process Improvement, by Paola Bacaro, Peter Chen, and Samuel Poon (U of Calgary)

**Best Presentation:** Facility Location Analysis at Purolator, by Rachel Attwood, Kristen Sarasin, Trevor Riehl, and Gabi Szerze (U of Alberta)

**Best Business Application and 2004 Silver Cup recipient:** Improving Customer Arrival Operations at Air Canada, by Shaun Hoffman, Tyler Zutz, Katharina Stenzel, and Ryan McAlpine (U of Alberta)

Past student attendees from this conference went on to present their work at CORS conferences and won CORS student paper prizes. The plans for SCOPE 2005 are already under way. Next year's conference will be hosted again by the University of Alberta School of Business. While this conference has a strong Western Canadian following, the goal of the organizers is to attract more student teams and faculty members from the rest of the country.

## Appendix F - Faculty of Education

### RESEARCH OPPORTUNITIES FOR UNDERGRADUATE STUDENTS IN THE FACULTY OF EDUCATION

Prepared by Dr. Ingrid Johnston, Associate Dean, Research and Graduate Studies

#### **Introduction**

In the Faculty of Education, we see research and practice as mutually supportive. Research informs both our courses and the field experience components of our program. The entire undergraduate program is based on both explicit and implicit understandings of research that enable beginning teachers to achieve their educational goals. Professors teaching undergraduate courses bring their own and their colleagues' research into the classroom, seeing this as a valuable opportunity to encourage students to understand the relevance and importance of research for their future careers. Course instructors regularly use textbooks based on faculty members' research. In many of our courses, through assignments, projects and class discussions, undergraduate students are offered opportunities to develop research projects, consider research findings, analyze data and draw conclusions from research studies for their own practice.

#### **Departmental Courses that Incorporate Research Perspectives**

In our two curriculum departments, Elementary and Secondary Education, most undergraduate courses are underpinned by research specific to subject area specializations.

##### *Department of Elementary Education*

Elementary Education offers two required undergraduate courses: EDEL305: "Language Arts in the Elementary School" and EDEL 316: "Communication through Mathematics Education" in addition to the many other subject specific courses on offer. Professors teaching these courses use textbooks based on faculty members' research, and design student assignments that include analysis of specific research findings and a consideration of their relevance for pedagogy and curriculum. Optional 400 level courses are more specifically research focused. For example, in EDEL 420: "Curriculum and Instruction in Elementary School Physical Education" a course developed by Dr. Graham Fishburne, students are assigned to complete a specific research project with an elementary school aged child to observe and document how the child can overcome difficulties with motor tasks. Dr. Fishburne's textbook for this course is also used in 270 other education Faculties across North America. In another course, EDEL 411: "Literacy Development through Drama and Literature," students sample and question current research writing in the field and bring their own interpretations to the findings. In all the 400 level courses in Elementary Education, students are asked to read and reflect upon research data in their specific subject area and to develop ideas for their own teaching and for school resources.

##### *Department of Secondary Education*

In Secondary Education, all undergraduate courses are subject area specific and provide students with a variety of curricular-based research experiences. During the Introductory Professional Term, prior to their four-week field experience, students take subject area courses

such as EDSE 327: “Curriculum and Teaching for Secondary School English Language Arts Minors,” and EDSE 369: “Curriculum and Teaching for Secondary School ESL Minors.” All these courses use textbooks that are research-based, and students complete projects and develop lesson plans based on specific subject area research. During the Advanced Professional Term, prior to their nine-week field experience, students in the required 400 level courses such as EDSE 437/438, “Curriculum and Teaching in Secondary School Mathematics” or EDSE 456/457, “Curriculum and Teaching in Secondary School General Science,” undertake mini-research projects related to their subject areas, develop unit plans based on research, or conduct mini literature reviews of research articles. Professors regularly introduce students to current educational research studies. These might include, for example, studies of recent curricular changes in mathematics education, research on global warming in science education, current perspectives on the success of French Immersion education, research on multi-media forms of literacy, or research on health issues related to young people’s physical activities. During their field experience, students keep reflective journals to consider how such studies relate to their own teaching experiences. These opportunities make explicit links between research and practice.

#### *Department of Educational Psychology*

In Educational Psychology, all education students take required courses in inclusive education and assessment. In EDPY 301: “Inclusive Education: Adapting Instruction for Students with Special Needs,” students study theory and research relating to student development, individual and group differences in abilities and student motivation. A research textbook on inclusive education, co-authored by faculty member and Canada Research Chair, Dr. Judy Lupart and a colleague, Jac Andrews, is in the process of being authorized as a primary text for this course. In EDPY 303: “Educational Assessment,” students develop competence in constructing instruments and processes to evaluate student learning and performance. The course is underpinned by the work of faculty member, Dr. Todd Rogers, whose research on fair assessment practices is nationally recognized.

Students in particular specializations in Educational Psychology are offered courses related to their chosen fields of study. These include counselling, child development, deafness studies and English as a Second Language. All these courses require students to read, analyze and reflect on research studies as part of their course requirements. For example, during their Advanced Professional term, students with a specialization in Special Education complete a research case study related to the learning challenges of a special needs child and the resources available to assist the child.

#### *Educational Policy Studies*

Educational Policy Studies offers a required course, EDPS 310: “Managing the Learning Environment,” for education students in their Introductory Professional Term. This course provides opportunities for students to explore social and organizational contexts of schooling through a variety of research based readings and activities. Professors and Field Experience Associates (seconded teachers from local school with an advanced degree) who teach this course bring in action research on various aspects of schooling (classroom management, lesson planning, reflective practice) to enable students to analyze what it means to be a teacher. Optional 400 level courses offer specific courses on various aspects of global and

cross-cultural education, educational philosophy, historical concepts of childhood, and issues in the education of Native peoples. All these courses are informed by research and the work of faculty members such as Dr. Ali Abdi (comparative and international education), Dr. José da Costa (school based mentorship), Dr. Margaret Haughey (distance education), Dr. Cora Weber-Pillwax (Indigenous Peoples education). In one course, ED PS 410: “Ethics and Law in Teaching,” students analyze and critique case studies of educational practices related to teachers’ ethical and legal responsibilities. These studies provide students with opportunities to analyze and critique the research and to learn more about research methodologies.

The School of Library and Information Studies offers a variety of optional undergraduate courses that are heavily informed by research. These include several courses on literature and multi-media materials for young adults, and one course, LIS 210: “Critical Strategies for the Information Universe” that deals specifically with research pertaining to the internet, databases, and other electronic sources.

#### *Courses in the Preprofessional Year*

Education students in their preprofessional year take a required course EDU 250: “The Profession of Teaching,” which offers an introduction to teaching that specifically links research and practice. The text for this course *Teaching from the Inside Out*, co-authored by Dr Larry Beauchamp and Dr. Jim Parsons from the Faculty of Education, draws on practitioner research and is used in education courses across Canada.

#### *Technology Integration in Undergraduate Programs that Support Research*

Undergraduate students are offered a variety of courses in Instructional Technology that provide a range of educational experiences in technology tools for teaching and data communication (e.g. EDIT 202, 434). These are underpinned by the latest technology research and the significantly advanced infrastructure in the Faculty. Many other courses, such as EDIT 486 and EDIT 488, are specifically research based, focusing on principles of interactive multimedia design and current research on communication.

Technology, and research aspects of interactive media are integrated into many of the undergraduate courses across the Faculty. These perspectives are facilitated by instructors’ use of WebCT, and the availability of three mobile computer labs for classroom use.

#### *Aboriginal Teacher Education Program*

This teacher education program, which is supported by ACCESS funding, is aimed at attracting Aboriginal students to the profession of teaching, and offering pre-service education that prepares teachers for culturally diverse classrooms. Courses focus on traditional Aboriginal values and associated traditions. Instructors in the program draw on their own research perspectives and on the research of Aboriginal elders to highlight indigenous ways of knowing.

#### **Endowed Research Chairs**

There are currently two Canada Research Chairs in the Faculty of Education: Dr. Judy Lupart, in Educational Psychology and Dr. Brent Davis, in Secondary Education. Both bring a special

research focus to our teacher education program and both participate actively in undergraduate programs. Dr. Lupart is currently developing a Campus Alberta Inclusive Special Education initiative designed to offer undergraduate and graduate students research workshops and courses in inclusive and special education leading to a professional development diploma. The program will be submitted for funding under the ACCESS program. Dr. Davis currently serves as the Secondary Education coordinator for Minors Courses in the Introductory Professional Term, hosting seminars and meetings for course instructors on opportunities to bring current research perspectives into the courses they teach. Dr. Debra Russell, as the endowed Peikoff Chair of the Western Canadian Centre of Studies in Deafness in the department of Educational Psychology, helps to facilitate undergraduate programs in the area of deafness studies.

### **Public Forums and Research Events**

#### *Education week*

Each year, during Education week, professors are invited to present their research. These projects may include involvement by undergraduate as well as graduate students. Panel discussions with faculty, professionals and educational stakeholders offer undergraduate students research-informed discussions on pedagogical and curricular topics relevant to their future careers in the classroom.

#### *WestCAST Conference*

The Western Canadian Association for Student Teaching Conference, hosted in February of this year by the University of Alberta, brought 425 delegates and more than 100 speakers to the U of A campus. Entitled *Re-Framing Teacher Education: The Changing Landscape*, this four-day event drew student teachers, practising teachers, and scholars from universities in Canada's four western provinces. Presenters included undergraduates from the Education Students' Association and undergraduate students involved in research projects with faculty members. A number of our undergraduate students attended the conference to hear about the latest research on teaching and learning in an Alberta context. Undergraduate students are also invited to attend the conference when it is hosted by a university in another Western Canadian city.

#### *Faculty Webpage*

A newly designed Faculty of Education website showcases faculty members' research that is of interest and relevance to undergraduate students.

#### *Summer Research Step Program*

The Faculty of Education participates in the Summer Temporary Employment Program (STEP) that offers summer work experience for students. Faculty members "top up" the payment for students from their research grants, inviting undergraduate students to work with them on specific aspects of a research project.

#### *Future Initiatives*

The Faculty of Education is exploring the development of a Student Researcher Award intended to cultivate and support research partnerships between undergraduate students and faculty members.

## Appendix G - Faculty of Engineering

### Undergraduate Research Experience in the Faculty of Engineering

April 2004

There has always been a strong emphasis in the Faculty of Engineering on exposing the undergraduate student to the research activities in the Faculty and developing “hands-on” experience. Examples of this are outlined below.

- 1) **Undergraduate Courses:** credit is granted to students undertaking a range of activities such as individual research project courses under a faculty member’s supervision, colloquium courses where students review and present recent research and development results, and mandatory design courses where small teams of students are required to design and construct various discipline-specific projects, frequently with a strong research focus and certainly with the degree of intensity and organization typical of a graduate project. It is worth noting that every single students in Engineering Physics (~25 students/year) take the EE 494/495 project sequence. Numbers in the brackets refer to registrations in a particular year.

#### **Research Courses:**

CH E 594 Advanced Topics in Chemical Engineering (16)  
CIV E 499 Special Topics in Civil Engineering (1)  
CMPE 498 Special Topics in Computer Engineering (new)  
CMPE 499 Special Topics in Computer Engineering II (new)  
EE 494 Research Project Seminar (25)  
EE 495 Research Project (25)  
EE 498 Special Topics in Electrical Engineering (13)  
EE 499 Special Topics in Electrical Engineering II (12)  
MAT E 441 Materials Research Project I (0)  
MAT E 442 Materials Research Project II (0)  
MAT E 454 Special Topics in Materials Engineering (1)  
MIN E 555 Special Topics in Mining Engineering (0)  
MEC E 469 Experimental Design Project II (0)

#### **Colloquia:**

CH E 481 Colloquium I (89)  
CH E 483 Colloquium II (98)  
ENV E 400 Special Topics in Environmental Engineering (26)  
MP E 499 Undergraduate Seminar (8)

#### **Design Courses:**

EE 401 Engineering Design Project (105)  
EE/CMPE 582 Design of Microprocessor Based Systems (70)  
CH E 365/464 Chemical Engineering Design I (64)

CH E 465 Chemical Engineering Design II (81)  
 CIV E 374 Structural Design I (44)  
 CIV E 429/521 Environmental Engineering Design (20)  
 CIV E 474 Structural Design II (58)  
 CIV E 479/574 Structural Design III (50)  
 MATE 443 Materials Design Project (15)  
 MATE 465 Engineering Design II (8)  
 MEC E 465 Design Project (123)  
 MIN E 402 Mine Design Project I (19)  
 MIN E 403 Mine Design Project II (18)  
 PET E 496 Petroleum Engineering Design Project (26)

2) **Public Showcases:** Coincident with Alumni Weekend, the Faculty of Engineering holds an annual Open House. This allows the community to tour selected research labs, view student projects, and learn more about the Engineering programs. The primary audience is Grade 11 students, first year Engineering students and a few alumni. Approximately 300-400 people attend this event which has at least 20 displays and lab tours showcasing research activities in the faculty. Approximately 25 faculty and 40 graduate students would typically participated.

3) **Undergraduate Teaching by Research Chairs:** Generally, research chairs within the faculty are required to teach, although the sponsor often stipulates a reduced teaching load. Of note is the fact that two of our research chairs (Brett, Masliyah) are also Rutherford Teaching Award recipients.

- AbouRizk (NSERC IRC, Steacie) – grad courses only
- Beaulieu (CRC, Steacie, iCORE) – grad courses only
- Bhattacharjee (CRC) – two undergraduate courses (64 and 60 students)
- Burrell (CRC) – two undergraduate courses (88 and 30 students)
- Brett (NSERC IRC, iCORE, CRC) – teaches EE 494, 495 each year (~25 students each)
- Deutsch (CRC) – teaches 3 undergraduate courses
- Elliott (CRC) – one undergraduate course (133 students)
- Elezzabi (CRC) – two undergraduate courses (75 and 54 students)
- Fedosejevs (NSERC IRC) – teaches EE 240 (~ 80 students)
- Gray (NSERC IRC) – two courses / year
- Grover (Steacie) – one undergrad course (154 students)
- Kwok (CRC) – one undergrad course (106 students), one grad course (8)
- Masliyah (NSERC IRC, CRC) – 1 undergrad course (54 students)
- Pedrycz (CRC) – Departmental Chair (no teaching)
- Schlegel (CRC, iCORE) – 1 undergrad course (69 students)
- Shah (NSERC IRC) – two courses / year
- Shaw (NSERC IRC) - two courses / year
- Xu (NSERC IRC) – one undergrad course (30 students)

4) **Innovations within the Faculty:** The following are initiatives undertaken to enhance experiential learning within Engineering.

**Dean's Research Awards:** This is a program to directly involve undergraduate students in faculty members' research programs. Open to students in Years 2 through 4 with a GPA of 7.0 and higher, this program provides a \$250 stipend to students who undertake a research project under a faculty member's supervision. The time commitment is one-half day per week for one term, and the students usually work closely with graduate students and faculty within the research labs. The students present their work in a forum at the end of the term, and the best project is also given the K. Sobol Memorial Prize (\$500). This program has been running for approximately 20 years and generally has ~50 participants each year.

**Coop Program:** The Coop program is a flagship initiative for Engineering. We have the second largest Engineering coop program in Canada with approximately 1200 students from virtually all of our programs (3100 total). This program greatly enriches the educational experience of our students, and while most of the placements are within industry, many are nonetheless within the research labs of our faculty members.

**Student Design Projects:** Designing and building a major project is an essential element of the Engineering educational experience, and each of our programs has a required capstone project. However, some of our students wish to go beyond that and embrace one of our student competition projects. These are international or national student competitions to build the best prototype in any of a number of focused areas, depending on the sponsor. These are highly interdisciplinary activities and are entirely student managed. This is taken very seriously by the students which have traditionally done extremely well at these competitions. The Faculty supports this effort by providing lab space, machine shop time, computers and offices, faculty advisors and funding. Over \$90,000 was spent last year on projects, excluding the very significant donations by the sponsor and other organizations. As well, the Stollery Executive in Residence and other programs bring outside engineers to spend time on campus working closely with the students on the student projects and design courses, and also providing a more intimate perspective on life in the Engineering profession. Over 30 practitioners have participated in this program during the past five years.

The current student projects are

- SAE Aero Design Project: This project is to design and construct an advanced radio controlled cargo plane within certain prescribed constraints. This year, the UofA entry placed third overall (out of 19 international teams) and second in the aircraft design category.
- Autonomous Robotic Vehicle Project: The goal of this project is to design a robotic vehicle which has guide itself through an obstacle course without human assistance. This team has placed second in the Design category in 1999 and 2000 and has won the Tug-of-War each year since 1998. Up to 23 international teams compete.
- Formula SAE Project: This team is to build a working scale Formula 1 race car. Challenges include methanol fuel conversion, suspension design, electromechanical control, ergonomics, etc.

- Great Northern Concrete Toboggan Race: This team of 20-30 students constructs and races a 300 lb. Toboggan with the contact surfaces made of concrete. Issues include braking, speed, and safety.
- Solar Vehicle Project: This is a very multidisciplinary team with over 100 engineering students and 90 students from other faculties. The goal is to build and race a car which is powered by the sun. This will culminate in a race across the U.S. next summer against the other student teams.
- Clean Snowmobile Challenge: This competition is to redesign an existing snowmobile to improve emissions and noise without sacrificing performance. Approximately 20 students are working on this project.
- CASI Glider Project: This is a new project to design and build a stable free-flight (unmanned and uncontrolled) glider.
- Future Truck: This is another new project which involves improvements to a Ford truck. Specific issues include development of a hybrid diesel-electric motor, improved emission control, instrumentation, control, etc.

**Discover E Science Camps:** This is an Engineering student-run initiative to encourage science and technology awareness in elementary and high schools. Summer camps are held (primarily) on campus to engage students in science concepts and expose them to activities, including research, at the University of Alberta. Since its inception almost ten years ago, the Discover E camps have grown at a tremendous rate and had over 1150 participants and 23 staff in 2001. Activities have grown beyond the UofA campus to locations in Grande Prairie, Red Deer, Fort McMurray and Yellowknife

## Engineering Appendix - Research Day for the Dean's Research Award Holders

### Dean's Research Award Presentations

E6-060 ETLC

Thursday, April 08, 2004

#### Mechanical Engineering - Dr LW Kostiuk (*not attending*)

Time	Supervisor	Student	Presentation Title
9:00	Dr D Checkel	Kevin Frank	Evaluate Leak Detection Methods
9:10	Dr B Jar	Tik Man Dick	Transparent Mold for Manufacturing Fiber Composites
9:20	Dr A Amirfazli	Eldon Pierce	Intra-operative Shoulder Stiffness Measurement
			Tool
9:30	Dr A Amirfazli	Perry Johnson	Testing of a Novel Anterior Cruciate Ligament
			Fixation Device
9:40	Dr CR Koch	Mohamed Chebaro	Design of a Micro-Power Demonstration System
9:50	Dr G Faulkner	Rachel Maser	Evaluation of Signals from Impact Analysis

of

10:00	Dr CF Lange	Candice Heron	Bone-Anchored Simulating Fog Formation on Mars
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**Chemical & Materials Engineering - Dr JF Forbes** (*not attending*)

<b>Time</b>	<b>Supervisor</b>	<b>Student</b>	<b>Presentation Title</b>
10:20	Dr ES Meadows	Haohang Zhang	Dynamics and Control of Fluid System
10:30	Dr ES Meadows	Yinan Zhang	Dynamic and a Lowtech Tank System
10:40	Dr UT Sundararaj/ Nanocomposites	Matthew Krantz	Production of Polymer/Metal
	Dr J Haber (Chemistry)		
10:50	Dr T Etsell	Garth Stotts	Zinc Residue Characterization

**Civil & Environmental Engineering - Dr J-JR Cheng**

<b>Time</b>	<b>Supervisor</b>	<b>Student</b>	<b>Presentation Title</b>
11:10	Dr F Hicks	Carin Meliefste	River Ice Modelling, Mackenzie River
11:20	Dr F Hicks	Andrew Burrows	Modelling Ice Effects on Great Slave Lake Outlet Hydraulics

**Electrical & Computer Engineering - Dr W Pedrycz** (*Dr I Fair will attend*)

<b>Time</b>	<b>Supervisor</b>	<b>Student</b>	<b>Presentation Title</b>
1:30	Dr J Sit	Tze Luck Chia	Circular Polarization Effects in Silicon GLAD Films
1:40	Dr Z Koles	Todd Carson	Seizure Onset Detection in Epilepsy
1:50	Dr M Brett	Matthew Hawkeye	Optical Filter Modelling
2:00	Dr M Brett/ Dr R Wolkow (Physics)	Tony Tadic	Development of New Translation Devices for Scanned Probe
2:10	Dr M Reformat	Cuong Ly	Approximate Reasoning on Semantic Web Services
2:20	Dr C Backhouse	Bernice Lau	Application of Fluorescent Anistropy to High Throughput Analysis
2:30	Dr Q Zhao	Hieu Tran	Data Acquisition for a Computer Controlled Process Test
2:40	Dr Q Zhao	Ke Chen	Designing and Testing Controller for a Tank System
3:00	Dr N Durdle	Dean Jeffery	Program to Computer Cosmetic Score
3:10	Dr N Durdle/	William Cheung	Heel Raise Counter

	E Lou		
3:20	Dr N Durdle	Amar Elsafadi	Edge Detection Techniques for Spine Surgery
3:30	Dr N Durdle	Yun-Xuan Chang	X-Ray Digitization
3:40	Dr N Durdle	Patrick Mercier	Digital Camera Calibration
3:50	Dr N Durdle	Hussam Nosair	Back 3D Surface Modelling
4:00	Dr N Durdle	James Park	Vertebral Edge Detection

## Appendix H - Faculty of Extension

### Undergraduate Research Experience in the Faculty of Extension (May 11<sup>th</sup>, 2004)

#### Introduction

While the University's initiative, "Research makes sense For Students" focuses upon the integration of research and undergraduate teaching, Extension's long-standing practice has been to integrate research with practice, meaning that Extension is well positioned to assist with this task.

In our experience, integration of research with instruction or teaching is facilitated by pursuing four basic design principles in the development of education programs: programs, courses, and learning resources that are *learner-centred, practice-focused, research-based, and technology-enabled*. In recent years, these principles increasingly are being operationalised in terms of situated and authentic learning approaches such as internships, practicums, action research and learning, problem-based and workplace learning. These principles and approaches contribute not only to the integration of research and teaching, but also to more meaningful learning experiences.

#### *Undergraduate Courses*

The Faculty of Extension offers two undergraduate courses in English for Academic Purposes (EAP), which are designed to introduce and begin to integrate International students who speak a language other than English into the academic community of the university. At any one time, around 100 International students, who are taking other undergraduate courses on campus are enrolled in these credit courses. An additional 100 or more students are enrolled in these courses in preparation for undergraduate admission.

Following Extension's tradition of applying research to course development, teaching methodology and daily teaching practices, Extension faculty and staff have carried out a large number of studies on the efficacy of such practices as online teaching, the use of video in the classroom, and the overall effectiveness of EAP in preparing students for the language demands inherent within undergraduate education. By way of illustration, Extension faculty, in cooperation with faculty at two other Canadian universities, is currently undertaking a three-year SSHRC-funded study (*Costs and Benefits: English for Academic Purposes Instruction in Canadian Universities*), to clarify the costs and benefits of EAP in students' academic performance in Canadian university studies; to identify other factors that contribute to (or impede) performance; and to describe the stages of the academic acculturation process of second-language students as they adjust to the demands of university.

To begin to integrate EAP undergraduate students into the research community of the university, all students are introduced to resources in the library, and are taught research skills, academic referencing, peer editing and critiquing. In each course, students make an oral

presentation to report on a research project, they write at least one essay per week, and cap this course with a research paper, often of an interdisciplinary nature.

### **Other Undergraduate Research Experiences**

Academic Technologies for Learning welcomes opportunities to involve students in real-life research projects. Undergraduate interns are continually hired, and many of these have been included in research presentations and manuscripts. The trend may well be increased to provide undergraduate students with more opportunities to work on projects, especially when this experience can relate to undergraduate courses that they are taking.

An example of a current project in which our undergraduate intern, Megan Myers, is involved is entitled, “Evaluating the Effects of Media Format in Case- Based Learning”. The objective of this research was to compare three media formats (text, video with text, and technology-enhanced video) used in Occupational Therapy in terms of student performance and student attitudes. The relationship between students’ performance and opinions was also explored. Students were randomly assigned to one of three media groups. A written task was used to measure performance (understanding of case-study patient’s treatment needs) and a survey was delivered to assess the students’ opinions towards the case-study format.

This project is only one example of many undertaken by students at ATL, Yet it demonstrates the type of work in which we involve students in every stage of the research process, enabling them to gain a rich experience of the research role within the University.

#### *Other Research Opportunities*

The Faculty of Extension offers such a wide array of courses and learning opportunities that it is impossible to describe them in a paragraph or two. What remains a constant in all of our curricula is that research underlies everything we do. For example, our Legal Studies Program currently is involved in a SSHRC CURA project investigating the state of communication between the civil courts and the public. This project engages undergraduates from the Faculty of Law as research assistants. These students are directly involved in research meetings, interviewing subjects, making field notes, coding data, and facilitating national partnership consultations. They have formed part of the research team that has travelled to six jurisdictions across Canada, giving them direct experience with the context of the study. They also have participated in conferences at which preliminary research findings have been presented, and have contributed to the drafting of papers and presentations.

### **Summer Research/Recent Initiatives**

The Faculty has been seeking out new ways to engage undergraduates in our research programs. One new initiative has been to hire an undergraduate student to work in the faculty during our MACT Summer Institute. This work experience allows an undergraduate student to be part of this research-intensive course time, as well as participate in the Research Symposium at which both graduate students and professors present their research to the broader academic community.

## **Conclusion**

The Faculty of Extension has been a strong advocate of the work of the Kellogg Commission, which undertook a major analysis of the future of State and Land-Grant universities in the United States. In *Returning to our roots: The student experience*, the Kellogg Commission recommended in 1997 “strengthening the link between discovery and learning by providing more opportunities for hands-on learning, including undergraduate research” (p. ix). One way of doing this, as the Commission suggested in *Returning to our roots: The engaged institution* (1999) is for a university engaged with its larger community to “enrich students’ experiences by bringing research and engagement into the curriculum and offering practical opportunities for students to prepare for the world they will enter” (p. 10). This approach aligns well with the Faculty’s own mission and that of the University.

## **Appendix I - Faculty of Graduate Studies and Research**

### **Faculty of Graduate Studies and Research**

#### **Submission to the Working Group on Teaching and Research**

At a research intensive university graduate student and postdoctoral fellow involvement in both teaching and research is essential to the undergraduate learning environment. Graduate students influence undergraduate students in a number of ways, such as:

- a) teaching the undergraduate curriculum
- b) supervising undergraduate research contributions
- c) mentoring undergraduate student research
- d) interacting with undergraduate students during the course of the research enterprise
- e) working on collaborative research with undergraduate students
- f) learning about research from and with graduate students and postdoctoral fellows

Learning is multidimensional. Those involved in research, undergraduate students through faculty, learn from each other and through that interaction enable new discoveries in research.

Graduate students play an essential role in this multifaceted process: learning by teaching, learning to teach, learning by research activity learning from their mentors and supervisors, and learning research skills.

The Boyer Commission from 1998 identifies several critical areas of that must be addressed at the graduate studies level to improve the connection between the teaching and research for undergraduate students. It states:

#### **VIII. Educate Graduate Students as Apprentice Teachers**

1. All graduate students should have time to adapt to graduate school before entering classrooms as teachers.
2. Graduate apprentice teachers should be assisted by one or more of the following means: seminars in teaching, thoughtful supervision from the professor assigned to the course, mentoring by experienced teachers, and regular discussions of classroom problems with other new teachers.
3. Graduate students should be made aware of their classroom roles in promoting learning by inquiry. They should not be limited to knowing the old modes of transmission of knowledge without understanding the role of student and faculty as joint investigators.
4. Graduate courses need particular emphasis on writing and speaking to aid teaching assistants in their preparation for teaching as well as research functions.
5. Graduate students should be encouraged to use technology in creative ways, as they will need to do in their own careers.
6. Compensation for all teaching assistants should reflect more adequately the time and effort expected.

7. Graduate students should be encouraged through special rewards for outstanding teaching. Financial awards should be established for outstanding teaching assistants. The permanent faculty should make it clear through these awards and through all they do that good teaching is a primary goal of graduate education<sup>5</sup>

The Faculty of Graduate Studies and Research at the University of Alberta encourages and facilitates the undergraduate connection to teaching through the University Teaching Program, where graduate students are mentored by a senior faculty member from their home department to become effective instructors at the University level. The University Teaching Program encompasses several of the areas that are mentioned in the Boyer Commission, including training on effective communication skills, as well as the use of new technologies in the classroom.

The U of A, through the University Teaching Services, recognizes the best graduate student teachers at the Graduate Students' Association Awards Night as nominated by the various undergraduate faculties, though there is not a financial component to that award.

The compensation for teaching assistantships at the U of A, as negotiated by the Office of the Provost and FGSR, is one of the highest earned incomes for graduate student teaching assistants across Canada. TAs also receive numerous other benefits, including paid parental leave.

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<sup>5</sup> Boyer Commission (1998)

## Appendix J - Faculty of Law

### Faculty of Law Undergraduate Research Experience

May 2004

#### Introduction

The Faculty of Law offers a wide variety of courses that incorporate the research expertise of Faculty members and provide our students with research experience. Although the Faculty does not have a specific framework for linking research and teaching, all Faculty members teach at least one course in their areas of research expertise. In many of our courses, the published texts and case books used by the students are authored by the Faculty member teaching the course. In others, the instructors are the authors of the recommended texts or have included some of their writings in materials compiled and reproduced internally for the course.

The Faculty of Law has 512 undergraduate students, 25 graduate students, and 33 faculty members.

#### Courses and Research

The Faculty of Law has many courses that provide our students with substantial research experience. All first year law students are required to complete a course in legal research and writing. This course, taught by instructors hired specifically for this purpose, covers a wide range of topics integral to developing effective legal research skills including: reading, briefing and critical analysis of legal cases; formulating and implementing research strategies; communicating legal research through standard legal formats (such as legal memoranda, factums and legal research papers); developing persuasive arguments; identifying, locating and effectively using legislation, case law, and secondary sources through law library and electronic search engines (such as Quick Law and E-Carswell); and proper legal citation. In addition, all students are required to complete a research paper course in their second or third years of study. The paper must constitute not less than 60% of the final grade and must warrant a minimum grade of C.

Our Faculty offers many other courses and other opportunities providing students with academic and applied legal research experiences. For example:

(1) The Alberta Law Review attracts about 15 students annually and provides students with direct, hands-on experience in the start to finish production of a scholarly journal, the Alberta Law Review, one of Canada's oldest and most widely circulated legal journals.

(2) The National Competitive Moots, with an annual enrolment of approximately 25, provide second and third year students with the opportunity to research, prepare legal papers

and factums, argue moot appellate cases before national and international panels of judges, and to compete against students from other Canadian and American law schools.

(3) Independent Research Paper Courses attract over 30 students annually and pair students with members of Faculty in guided detailed research endeavours, which may result in student publications.

(4) National and provincial essay and publication contests are associated with some of our courses (e.g. Oil and Gas, Environmental Law, Aboriginal law, Dispute Resolution). Competitive students are encouraged to submit and publish papers and have been successful on both fronts on numerous occasions.

(5) We have many seminars in which a major research paper is worth more than 70% of the final grade. Most of our students take at least one of these courses. Many of these courses require students to present and defend their research to their peers. Among these is Aboriginal Peoples and the Law in which students are offered the opportunity to do applied legal research for government, law firms or First Nation organizations.

(6) Students are required to take Legal History or Jurisprudence, and Professional Responsibility. The former courses engage students in research concerning normative and historical foundations of legal theory, institutions and practice. Students have a writing requirement in Professional Responsibility.

(7) Outside of for-credit courses, the case-work divisions of Student Legal Services (SLS) provide law students with the opportunity to do applied legal research in relation to specific legal files under the supervision of practicing lawyers (e.g. respecting criminal matters). The Legal Research and Reform division of SLS also engages students in large research projects of contemporary social and legal importance. The *Pro Bono* Students Canada Project has a Chapter affiliated with SLS and our Faculty; this Project provides opportunities for students to do applied legal research, under the guidance of legal practitioners, on issues of concern to non-profit organizations.

## **Curriculum and Research**

We do not have a dedicated "capstone" project for our undergraduates. Research papers done for particular classes focus on research conducted for those classes. Because of the nature of law and legal education, upper year papers will build on both the first year educational experience and on experience in other law courses. The papers, however, are not intended to summarize course work or reflect on course work as a whole.

This being said, our upper year mooting programs could be understood to provide a form of "capstone" experience. Competitive mooting presupposes that students have a solid grounding in the underlying law. The nature of moot problems (legal issues with no obvious solution) demand that students engage in deep and integrated reflection on the applicable areas of law.

Canada does not have an "accreditation" program similar to the American Bar Association program in the United States. Generally, a requirement for enrollment as a student-at-law in a common law province in Canada (i.e., as an articling student; "articles" must be successfully completed before an individual is permitted to practice in a Province) is an LL.B. degree from a Canadian (common law) law school. This requirement is set in statute or in Law Society rules made under statutory authority.

Law Schools in Canada are not required to teach a particular curriculum. In fact, however, there are substantial similarities in the curricula of Law Schools across common law Canada. Our Faculty has more compulsory courses than some other law schools. Our view is that this gives our graduates a competitive advantage in the workplace. Our students know the law. We have a very high placement rate for our graduates in professional articling positions.

We do not have an "Honours" program or an "Honours" stream. Neither do we have a stream or program for students who may be interested in doing graduate work. These ideas were discussed during our last decanal appointment process, but so far they are not the subject of a Faculty initiative.

### **Contract Research Opportunities for Undergraduates**

Our Faculty members' research sometimes involves travel; it seldom requires the purchase of much equipment; it often requires student research assistance. Our Faculty members, Centres and Institutes (Centre For Constitutional Studies, Health Law Institute, Canadian Forum on Civil Justice, and Alberta Law Reform Institute), and the Indigenous Law Program hire undergraduate students throughout the year to work part-time as research assistants. The research is funded by both external (e.g. SSHRC) and internal (e.g. Small Faculties) grants. For example, Prof. Cathy Bell has hired student researchers under her SSHRC grant concerning the Protection and Repatriation of Aboriginal Cultural Heritage; the Health Law Institute retains 5 or 6 student researchers per year. In addition, the Faculty of Law allocates funds every year (\$30,000 in the last two budget years) to Faculty members to hire summer research assistants. Two students entering second year will be the recipients of our new Borden Ladner Gervais Fellowships, which provide \$10,000 each for research under the supervision of Faculty members (the supervisors are selected through an internal competitive process).

Through these opportunities students may receive training in interdisciplinary, empirical and qualitative research.

### **Research Support and Technology**

Supporting our research is an excellent library with one of the largest collections in the country and a wide array of electronic legal information sources. Free sessions are offered regularly by the Weir Law Library for Faculty members and students to learn to use the electronic resources.

Legal research is now done primarily electronically. Our Faculty has arrangements with several commercial legal data-base providers, giving our staff and students free access to the data-bases and search tools. Moreover, our Library is increasingly developing strong electronic collections. We have multiple modes of electronic access to a wealth of national and international legal materials. Of course, our students have access to the tremendous quantity of legal materials available through the Internet.

Our students receive training in computer-based legal research. The instruction is provided through our compulsory first year Legal Research and Writing course (see above). A computer lab is found on the first floor of our Library. We have a "wired" reading room on our second floor. We have two "smart classrooms" that permit computer use. Students often use their personal computers in other classrooms. In paper courses, students are encouraged to use net-acquired materials, in accordance with good scholarly and analytical practice. In research and paper classes, students frequently use Power Point in their presentations.

We support information-technology teaching innovations: Prof. Rod Wood has developed web-based instruction in the secured transactions area; Prof. Bruce Ziff employs multi-media materials in his first year Property course. Instructors who use our two "smart classrooms" typically use the available technology at least to display textual materials. While not all legal subjects are equally amenable to instructional enhancement through technology, with our increased numbers of younger, technologically-adept Faculty members, we can expect a natural increase in the use of technology in teaching. We do not, at present, have a Faculty plan to increase the use of technology in teaching. Many of our instructors have made materials (e.g. notes, practice examinations, other course-relevant records) available through our Faculty website. E-mail is frequently used to enhance communications between students and instructors. Our students come to us computer-literate, through their previous education. While we do have to train our students in the particular and peculiar legal species of computer-based research, in many other ways they come already trained, and certainly willing to use their e-capacities

### **Student Research Collaboration Opportunities**

Students are encouraged to collaborate in their projects in research and paper courses. While students may informally collaborate in examination courses, these courses may be successfully completed without collaboration. Mooting is inherently collaborative. It is a team exercise. Students collaborate in the delivery of legal services through their work with organizations such as Student Legal Services and *Pro Bono* Students Canada. As well, students who do research for our Centres and Institutes (our Health Law Institute is a good example) work in collaborative environments. They work with other students, with Institute staff, and with supervisory faculty or directors.

### **Teaching and Research**

Faculty members carry a normal teaching load of 12 credits per year (4 \*3 credit courses). We do not have faculty members designated as 'research' scholars, who carry a lower teaching load in compensation for a higher research obligation. Many senior faculty members teach

first-year compulsory courses, including our Dean, who teaches a first-year compulsory course in Contracts. Good teaching is strongly emphasized in our Faculty. We instituted our Faculty teaching award, the Tevie H. Miller Teaching Award, in 1997.

We have one CRC who teaches undergraduate courses, Tim Caulfield. His area of expertise is Health Law and Policy. He offers courses in Health Law, Policy and Ethics as well as Law and Medicine. In addition, we have the Belzberg endowment, which has been used to support the Belzberg Lecturers who deliver our compulsory first-year Legal Research and Writing Program. In April 2004, CN donated \$1 million to the School of Business and our Faculty. Our fifty-percent share of the donation shall be used to establish the Faculty of Law CN Professorship in International Trade. While the position is not yet filled, it is assumed that the appointment will require undergraduate teaching.

The Faculty does not have a specified policy on teaching release. However, because of our high student faculty ratio such relief is rarely given unless a Faculty member receives an award for providing for release (*e.g.* a McCalla, or teaching relief purchased through an external research grant).

Our Faculty standards do not have an express criterion respecting the correlation between good undergraduate teaching and good research. Good teaching, of course, depends on good research; we expect our faculty members to bring their research into the classroom, as is appropriate.

### **Teaching and Graduate Students**

The Faculty of Law does not have a tradition of using graduate student Teaching Assistants for undergraduate courses, particularly as the Faculty lacks dedicated resources for this purpose. All teaching and marking are done by faculty members or sessionals brought in for individual courses.

Many of our graduate students are international students. Despite their credentials, they have received training and education in other legal systems. Legal regimes vary from Canadian province to province; the Canadian legal system often differs substantially from legal systems in other countries. Hence, many of our graduate students have not been in a position to take on much instructional work.

We are making efforts, however, to enhance the teaching experience of our graduate students. As a first step, we intend to use our compulsory graduate seminar to provide (at least) simulated teaching experiences for our graduate students. We do make our graduate students aware of the programs available through UTS. No current graduate students, however, are involved in these programs.

### **Interdisciplinarity**

Under Law Faculty Council Policy, our undergraduates are entitled to take one out-of-faculty course for credit toward the LL.B. Few students avail themselves of this opportunity. Nearly

all of our students are interested in obtaining as much legal education as they can, in preparation for their professional lives. To this limited extent, then, the study of law is not "interdisciplinary."

In other senses, however, the study of law is highly interdisciplinary. Most Law undergraduates have at least a Bachelor's degree. Many have advanced degrees. The students bring their backgrounds (whether in Sociology, Engineering, or Biochemistry) with them to the classrooms, and to classroom discussions.

The study of Law is inherently interdisciplinary. Some of our staff are engaged in empirical, field-work or survey/interview-based research. Others are engaged in theoretical analyses. Our scholars' theoretical interests range from "traditional" Anglo-American/analytical approaches, through critical theory, to Continental post-modernism, to Law and Economics. Other staff are engaged in "doctrinal" research (determining what the Law is, or, given identified legal principles or other fixed points, what the Law should be). Many staff are engaged in legal policy analysis (respecting what the Law should be, from a larger political/administrative perspective). Still others do work respecting the organizational analysis of legal and political institutions (such as the judiciary).

Furthermore, the very course of legal studies leading to an LL.B. is interdisciplinary. In their first year, students are taught Criminal Law, Torts, Constitutional Law, Contracts, and Property Law. Upper year compulsory courses include Administrative Law, Corporations Law, Evidence, and Civil Procedure. While there are commonalities in each of these areas (they are all areas of legal study), the subjects and concerns of these areas differ. Each of these areas could be the terrain of a separate department in a larger Faculty. In research and paper-based classes, the approach to legal materials is often highly interdisciplinary, depending on the resources of the instructor and the students.

### **Public Forums and Events**

Undergraduate students working with our Institutes, such as the Health Law Institute, have participated in workshops, conferences and poster presentations. Our students have many opportunities to attend public forums in areas of their research interest including panel discussions and special seminars organized by Research Institutes within our Faculty. The Faculty also hosts several annual lectureships and has a visiting speaker program that brings eminent national and international scholars to our Faculty. Undergraduate students are invited to all of these events.

Student organizations also host speakers and invite students to engage in discussion including the International Environmental Law Students Association, the Women's Law Forum, and the Aboriginal Law Students Association (which organizes an annual week of lectures on Aboriginal legal issues).

## **Collegiality**

First year students in the Faculty of Law have a common, compulsory program. They enter and work through their legal education as a cohort. Our students are strongly identified by their "year." Each year is understood to have its particular challenges and features. Students participate in social events by year. For example, at the annual "Carbolic Smoke Ball" dinner, each year presents a video. The Faculty hosts events for in-coming first years, and holds an annual third-year lunch. The "sense of year" is confirmed and reinforced through alumni events. We have an Alumni and Friends organization. Alumni events are hosted throughout Canada, throughout the year. We hold an annual "Reunion Weekend" at the Law School.

We list 20 student associations on our website. Student groups have space allocations in the Faculty, and students have a large lounge on the first floor of the Law School. Our students publish a newspaper, the *Canons of Construction*, which deals with issues of concern to Law students. One of the key cultural events for students is the annual Law Show, which involves many students as actors, dancers, musicians, writers, and support personnel.

## **Recent Initiatives**

We improved and restructured our legal research and writing program and have hired instructors with expertise specifically for this purpose. We have raised the minimum grade for the research paper requirement from a C- to a C. We have encouraged and substantially increased the number of external grants in the Faculty over the last five years.

We do not now have a Faculty research award, though we are currently preparing draft terms of reference for such an award.

## Appendix K - Faculty of Medicine and Dentistry

### Undergraduate Research Experience Faculty of Medicine & Dentistry

#### Summer Student Program

The Faculty of Medicine & Dentistry has one of the largest summer student programs in Canada. In 2003 our Faculty hosted over 130 undergraduate summer students. The AHFMR supported 93 students (35 medical students and 58 undergraduate science students) while others were supported by a combination of endowment funds and trust funds provided by supervisors. Project duration is from two to four months from May - August. Project descriptions are submitted to the Office of Research by potential supervisors and are posted on a dedicated summer student website (<http://www.med.ualberta.ca/research/summerstudent.cfm>). Students are invited to visit the site and contact faculty members directly.

To complement the summer student program a Seminar Series is offered and all summer students are expected to attend on a regular basis. This series is held twice weekly during the noon hour. We consider this a valuable learning experience. Presentations from faculty members are scheduled in June leaving July and August open for the students to present their research projects.

The Faculty also sponsors the Annual Summer Student Research Day. The 2003 event was held on Saturday, October 25 in the Lister Conference Centre. Of the 137 abstracts submitted 125 posters were presented. A number of faculty and family members drop in to view the posters and discuss the research with the students. A panel of judges selected ten recipients as having presented the best posters, each received a \$300 cash award (four awards were provided by the Alumni Association) and a certificate. Out of the ten awardees, two medical students were awarded travel grants to represent the University at the National Students Research Forum Poster Competition in Galveston, Texas, in April '04.

#### MD with Special Training in Research

In 2003, 34 students completed the program requirements and will convocate with the designation "*MD with Special Training in Research*". The objective of the program is to encourage awareness of the importance of basic and clinical biomedical research to the practice of medicine. A minimum of 24 weeks research in a laboratory or other appropriate setting, engaged in a basic science or clinical research project, under appropriate faculty supervision. Normally, this research experience will be gained while registered as a medical student. Program requirements include a written submission and an oral presentation to the MD Research committee.

#### Honours in Research for Medical Laboratory Science Students (1-2 students each year)

Normally 1-2 students are registered in this program per year, however in 2003 there were no students registered.

The program has been designed particularly for students who are looking for more exposure to research than is possible within the Medical Laboratory Science (MLS) Program. Normally, students begin this program the summer following completion of their clinical year, Phase 2 or the 3rd year of the MLS Program. At this point, students are eligible to write the certification exams for the externally administered General Certificate of the Canadian Society for Medical Laboratory Science. The projects are completed during the next academic session (fall and winter terms of Phase 3 or the 4th year of the Program) through the (6-credit) research course (INT D 491) offered by the Division of Medical Laboratory Science.

\*The following are responses from the Faculty of Medicine and Dentistry  
Departments/Divisions:

### **COURSES:**

*A number of our departments offer undergraduate Specialization or Honors programs.  
Specialization Programs – Departments of Biochemistry, Cell Biology & Pharmacology  
Honors Programs – Departments of Biochemistry, Cell Biology, Neurosciences,  
Pharmacology and Physiology.*

**Division of Anatomy:** Will be introducing the following undergraduate course in the Fall of 2004.

#### **ANAT 497 Research Project**

\*4(*fi* 8)(either term, 0-0-6). Directed research carried out in the laboratory of an assigned member of the division. Credit for this course may be obtained more than once. Successful completion requires a written report and oral presentation on the research project. Registration is contingent upon a student having made prior arrangements with a Faculty member in the Division. Prerequisite: consent of Division.

#### **Biochemistry:**

There are three courses offered by the Department that incorporate research experiences in the curriculum: BIOCH 401, 498 and 499. BIOCH 401 is a senior biochemistry laboratory course required in both our BSc Specialization and Honors programs. Students are taught research techniques and methods covering a wide spectrum of topics in biochemistry. Part of the students' evaluation consists of two practical examinations where they conduct experiments they think will answer specific questions. BIOCH 498 and 499 are directed research courses. BIOCH 498 is a \*3 credit course offered in either term designed as an option for Specialization students. BIOCH 499 is a two term course required in the Honors program. In both courses, students carry out an approved research project under the direction and supervision of a faculty member. There are approximately 20 students in both the B.Sc Specialization and Honors programs - all completing BIOCH 401 and approximately 10 engaged in some research project. Prerequisites for BIOCH 499 is the student will normally be in the graduating year of the honours biochemistry program.

#### **BIOCH 401 Biochemistry Laboratory**

\*6 (*fi* 12) (two term, 0-0-8)

Laboratory course in modern biochemical techniques. Designed for Biochemistry Honors and Specialization students in their third or fourth year. Other interested students may enroll subject to space limitations. Prerequisites: BIOCH 203 and 205, and consent of Department.

**BIOCH 498 Advanced Laboratory**

\*3 (fi 6) (either term, 0-0-4)

An advanced laboratory course for undergraduate students enrolled in Honors or Specialization Biochemistry who wish to engage in individual research. Enrolment is limited to students whose performance is exceptional (e.g., GPA of 3.3 or greater). Can be taken as a science elective but not as a substitute for required courses in Biochemistry. Prerequisites: BIOCH 401 and consent of Course Coordinator. Not to be taken by students with credit in former BIOCH 501.

**BIOCH 499 Honors Research Project**

\*6 (fi 12) (two term, 0-0-8)

Supervised research within a laboratory in the Department of Biochemistry, to be carried out over both terms of Fall/Winter. The results of the research project will be presented in a final written report and an oral presentation. Prerequisite: Students enrolled in this course will normally be in their graduating year in the Honors program in Biochemistry.

**Centre for Neuroscience Honors Program:**

**Lab Course (NEURO 451, NEURO 452) – prereqs: PMCOL 371, PHYSL 372.**

Courses reviewing Contemporary Research Literature (NEURO 450 prerequisite PMCOL 371, PHYSL 372, NEURO 472 prerequisite PHYSL 210 or 211 or ZOOL 241 or equivalent and PMCOL 371 or 342 and/or consent of the course coordinator, NEURO 443 Prerequisite PHYSL 210 or equivalent or PHYSL 371 or consent of instructor).

**Cell Biology:**

**CELL 498 Research Project**

\*3(fi 6)(first term, 0-0-6). Directed research carried out in the laboratory of an assigned member of a department participating in the Cell Biology Program. Credit may be obtained for this course more than once. Successful completion requires a written report.

Prerequisites: A 300-level CELL, Biological Sciences, or Biochemistry course, and the consent of the Cell Biology Undergraduate Advisor.

**CELL 499 Research Project**

\*6(fi 12)(two term, 0-0-6). Directed research carried out in the laboratory of an assigned member of a department participating in the Cell Biology Program. The project normally continues through Fall and Winter Terms. Successful completion requires a written report and an oral presentation on the research project.

Prerequisites: A 300-level CELL, Biological Sciences, or Biochemistry course, and the consent of the Cell Biology Undergraduate Advisor.

**Dentistry:**

**DDS 549 – Oral Biology III**

A seminar course designed to give the student an appreciation and understanding of current areas of research in dentistry and the experimental approaches used. Students will be required to design and carry out an independent research project under the guidance of a faculty member.

**D HYG 317 Ethics, Practice & Leadership**

A course designed to provide students with strategies for decision-making in various contexts including ethical dilemmas. Students also critique scientific literature and discuss topics related to dental hygiene practice. Students are required to design and conduct a leadership project in conjunction with a faculty advisor and community agency. The students present their project in a poster presentation format following protocol for a scientific conference.

**D HYG 422 Health Information & Policy**

A course designed to provide students the opportunity to work with multiple sources of evidence to propose policy for a local application. Students analyze epidemiological data from authentic communities to develop their program proposals.

**Laboratory Medicine and Pathology:**

Medical Laboratory Science students in the Department of Lab Med and Pathology have a required course in the final year of the program. The students take INT D 409 and INT D 491.

**INT D 409**

\*3 (fi 6) (second term, 0-0-6). Directed research in medical laboratory science. Supervisor and research project to be chosen by student. Requires writing a project proposal, keeping an accurate laboratory notebook, conducting adequate experimental research, writing a research paper and presenting a short seminar based on the research. Restricted to fourth-year Medical Laboratory Science students. (Offered jointly by the Department of Medical Microbiology and Immunology, and the Division of Medical Laboratory Science.)

**INT D 491**

\*6 (fi 12) (full session, 0-0-6). Directed research in medical laboratory science. Supervisor and research project to be chosen by student. Requires writing a project proposal, keeping an accurate laboratory notebook, conducting adequate experimental research, writing a research paper, and presenting a short seminar based on the research. Restricted to fourth-year Medical Laboratory Science students. (Offered jointly by the Department of Medical Microbiology and Immunology, and the Division of Medical Laboratory Science.)

**Medical Microbiology and Immunology:****MMI 498 Research Project in Infection and Immunity**

\*3 (fi 6) either term, 0-0-6). Directed research on a specific topic in medical microbiology or immunology in the laboratory of a faculty member in the department. Can be taken for credit more than once. An oral presentation on the research project is required for completion of the course. Pre- or co-requisites: INTD 370 or 371 or INTD 452 or MMI 351 and/or consent of the Department.

**MMI 499 Independent Research in Infection and Immunity**

\*6 (fi 12) (two-term, 0-0-6). Directed research project in the laboratory of an academic staff member of the Department of Medical Microbiology and Immunology. An oral presentation and a written report on the research project are required for the completion of the course. Pre- or co-requisites: INTD 370 or 371 or INTD 452 or MMI 351 and/or consent of Department.

(NB: MMI 499 is an approved research project course (honors thesis) for students in the Honors in Immunology and Infection undergraduate program in the Faculty of Science.)

**Oncology:**

Research projects may be undertaken in the Department of Oncology, CCI for Phys 499, EE 499, NU FS 400 and NU FS 401 courses.

**PHYS 499 Special Projects**

\*3 (fi 6) (either term, 0-0-6)

Experimental or reading project under the direction of a staff member. This course is intended for both Honors Physics students and Honors Mathematical Physics students. Prerequisites: A 300-level Physics course and consent of Department.

**EE 499 Special Topics in Electrical Engineering**

\*3 (fi 6) (second term, 3-0-0)

Intended to enable individuals or a small group of students to study topics in their particular field of interest under the supervision of a member of the Department of Electrical and Computer Engineering or other appropriate departments.

**NU FS 400 Undergraduate Reading Project**

\*3 (fi 6) (either term, 3-0-0)

Individual study. Critical reviews of selected literature under the direction of a staff member. Note: For third- and fourth-year students only. Students must obtain approval from Department before registration. May be taken more than once provided topic is different.

**NU FS 401 Undergraduate Research Project**

\*3 (fi 6) (either term, 0-0-6)

Directed laboratory study under supervision of a staff member. Note: For third- and fourth-year students only. Students must obtain approval from Department before registration. May be taken more than once provided that topic is different.

Students do research in the CCI Dept of Medical Physics and receive credit for the course.

**Pharmacology:**

**PMCOL 498**, which is a compulsory 6 credit course, reserved for Honors Pharmacology Students. It involves research that is performed in a Faculty members laboratory. Students are assessed based on oral presentations, a written report in the form of a manuscript and their laboratory notebook.

Prerequisite: consent of Department. Normally available to fourth year honors students only.

**PMCOL 337** is a compulsory course in our BSc program that involves practical work in a teaching laboratory. Prerequisite or corequisite: Normally restricted to Pharmacology Specialization or Honors programs. PMCOL 342.

**Physiology:****Physiology 465 Undergraduate Research Project**

Students spend one term in the laboratory of a faculty member and are involved in a research project, which is the focus of the faculty members research program. Evaluation is based on laboratory performance an oral presentation to a committee and a formal paper at the end. In many cases students are included as authors in published manuscripts.

**Physiology 466 Undergraduate Tutorial**

This usually precedes Physiology 465 and involves a literature review in a specific research area, which allows the student to gain an insight into a scientific area. Evaluation is based on performance an oral presentation to a committee and a term paper.

### **Physiology 501 Topics in Cardiovascular Physiology**

This course is offered to honors physiology students and graduate students. It involves the critical evaluation of current literature in the cardiovascular field. Prerequisites: PHYSL 210 or 211, PHYSL 404 and consent of instructor.

The topics are usually controversial. The course evaluation is based on two presentations to two faculty members and the class. Class discussions are encouraged and required. A term paper and a final examination is also part of the evaluation. The final exam requires the student to referee a current manuscript, which has been refereed by one of the faculty, and recommend its acceptance or rejection.

### **PHYSL 502 Problems in Current Research**

\*3 (fi 6) (either term, 0-0-6) (Physiology honors students and graduate students)

Individual study. Credit for this course may be obtained more than once.

### **PHYSL 506 Tutorial and Seminar Course**

\*3 (fi 6) (either term, 3-0-0) (Physiology honors students and graduate students)

Guided reading course. Credit for this course may be obtained more than once.

### **PUBLIC FORUMS/EVENTS:**

#### **Biochemistry:**

Undergraduate students are provided opportunities to "discuss" their research in a public setting under three circumstances: In addition to the work completed in the laboratory, students in BIOCH 498 and 499 are evaluated on a written report and an oral presentation of their work at the end of the Winter term. Some research successes by undergraduates are included in oral and poster presentations at Departmental retreats.

#### **Centre for Neuroscience Honors Program:**

Our undergraduates attend annual events at which ongoing research (done by graduate and undergraduate students and faculty) is presented in a poster session that is open to the Centre and to the Faculties participating in the Centre. Our students also attend a full-day lecture session (Career Orientation) held every two years, during which professors speak candidly about their career tracks and research goals. This event received strongly positive feedback from students, who generally found the talks inspiring and very useful for planning their own future careers in research. Our undergraduates also attend weekly University-wide Neuroscience Seminars that feature invited speakers from Canada and from other countries.

#### **Dentistry:**

Department of Dentistry Research Day

Brown Bag Lunch Hour Seminars

Dental Hygiene student posters are also displayed at the Alberta Dental Hygienists Association Annual Professional Conference

**Division of Urology, Department of Surgery:** Undergraduate students have an opportunity to present their work at a number of forums: Faculty's Annual Summer Student Research Day; Prairie Urologic Association Meeting (Regional Urology Meeting); Tom William's Research Day (Dept. of Surgery); Canadian Urological Association if abstract is accepted.

**Emergency Medicine:**

Contribute to the Medical Students Seminar at the Canadian Association of Emergency Physicians (CAEP) Annual Meeting involving Research in Emergency Medicine. Annually, Emergency Medicine participates in the Undergraduate Summer Studentship Program through the Faculty of Medicine and Dentistry.

**Family Medicine:**

Summer research students can present their research findings at the "Family Medicine Research Forum," a monthly research seminar series within the Department.

**Medical Genetics:**

Have undergraduate students for 4<sup>th</sup> year research projects in collaboration with other departments, particularly BioSci. These students present their results at weekly department research meetings.

**Medical Microbiology and Immunology:**

The Department hosts an annual afternoon session where summer research students make oral presentations on the results of their research project to the Department. A panel, composed of graduate students and postdoctoral fellows, judge the presentations.

**OBGYN:**

The Annual Western Perinatal Research Meeting in Banff is an excellent forum for undergraduate research presentation. The Department Research Day and the Annual Student Research Day sponsored by the Faculty of Medicine and Dentistry also are excellent student forums. Recently, the APOG and SOGC annual meetings provide a forum for undergraduate student research.

**Pharmacology:**

Hosts regular open seminars, student presentations, student traveling to meetings and department retreats.

**Physiology:**

Undergraduate students participate in presentations to a number of research group seminars.

**Surgery:**

Monthly student presentation day.

**UNDERGRADUATE TEACHING:****Medicine:**

*Dr. Stephen Archer* – Heart & Stroke Foundation Chair in Cardiovascular Research  
DMED 514 - Cardiovascular Pulmonary/Renal small group sessions – 18 hours, 11 students  
Physiology 501 – 24 hours, 12 students

*Dr. Dean Befus* – Astra Zeneca Chair in Asthma Research

Undergraduate Lecture – Biological Sciences 452 – Experimental Parasitology – 2.4 hours, 5 students

Undergraduate Seminar – DMED 512 - Allergy and Asthma – 1 hour, 169 students  
3 Undergraduate Summer Students – 24 hours

**Dr. Wayne Martin** – Toupin Chair in Neurological Sciences

Undergraduate Clinical – MED 546 – 2 hours, 3 students

Undergraduate Clinical – DMED 524 (Phase II Neuroscience Block) – 6 hours, 6 students

Undergraduate Lecture – Phys 372 – 1.5 hours, 100 students

Undergraduate Lecture – Pharm 380 – 1.5 hours, 75 students

Undergraduate Lecture – DMED 524 (Phase II Neuroscience Block) – 2 hours, 150 students

Undergraduate Problem based learning tutorial – DMED 524 (Phase II Neuroscience Block) – 1 hour, 12 students

**Dr. Phil Halloran** – Muttart Chair in Clinical Immunology

64 hours clinical skills teaching to undergraduates

**Dr. Edward Tredget** – Firefighters Chair in Burn Research

Undergraduate Lecture – Nutrition & Metabolism in Injury: Medicine 513 – 1 hour, 60 students

Undergraduate Lecture – Musculoskeletal Block DMED 523 – 3 hours, 136 students

Teaching (non-classroom setting)

Undergraduate Medical Student – Farrah Yau – 80 hours per year

**Dr. Ross Tsuyuki** – Chair in Patient Health Management (Merck/Aventis Pharma)

Undergraduate Lecture – DMED 514 “Congestive Heart Failure” – 1 hour, 120 students

Undergraduate Lecture – DMED 514 “Pharmacotherapy of Ischemic Heart Disease” – 1 hour, 120 students

Undergraduate Lecture – Pharmacy 457 – Contemporary Issues in Pharmacy – 1 hour, 110 students

**MMI:**

**Dr. D. Lorne Tyrrell** – Glaxo Wellcome Canada Inc. Chair in Viral Pathogenesis

DMED 512 (Infection, Inflammation, and Immunity) – 7 hours, 165 students

MED 650 – CIP Course on Technology Transfer – 1 hour, 10 students

**Oncology:**

**Dr. Vickie Baracos** – ACF Endowed Chair in Palliative Medicine

DMED 513, 2 hours per year 150 students

BIOCH 410, 7 hours per year – 120 students (even numbered years only)

NUFS 478, 3 hours per year – 120 students

**Surgery:**

**Dr. Stewart Hamilton** – Walter Stirling Anderson Chair in Surgery

Undergraduate Lecture – Bedside Teaching – 1 hour, 16 students

Undergraduate Seminar – Resuscitation of the surgical patient – 1 hour, 16 students

Undergraduate Seminar – Bowel Obstruction – 1 hour – 16 students

## Appendix L - Faculty of Nursing

### Faculty of Nursing Undergraduate Research Experience

The University of Alberta, Faculty of Nursing is a diverse faculty with a rich history. The Faculty ranks in the top three nursing schools in Canada and is one of only six to offer a full range of undergraduate and graduate degree programs. It is one of the largest of the “small” faculties at U of A, with 1376 undergraduate students and 250 graduate students (181 MN and 69 PhD).

#### **Undergraduate Program.**

The Faculty began as a School of Nursing in 1923 with two programs, a three-year diploma program and a five-year Bachelor of Science in Nursing program. The four year integrated Baccalaureate in Nursing Program was implemented in 1966 when the School of Nursing became an autonomous academic unit. The School received faculty status in 1976.

Since this time there have been many changes in the undergraduate program. In 1991, as a step toward meeting its goal of providing increased access to baccalaureate nursing education in Alberta, the Faculty collaborated with hospital and college diploma programs in the Edmonton area. Each of these institutions taught the first two years of a collaboratively developed basic baccalaureate program that was transferable to the University of Alberta at third year. An additional change was the merger of the University of Alberta Hospitals School of Nursing as a joint department of the Faculty of Nursing and the University of Alberta Hospitals. With this merger, there was one program jointly sponsored by the two institutions, with all students enrolled in the university. Beginning in September 1995, students enrolling in the Collaborative BScN Degree Program attend the University of Alberta, Faculty of Nursing for the entire four years.

In 1990 a five-year pilot began for an off campus BScN program that was developed in collaboration with Red Deer College. In 1995, Keyano College, Fort McMurray, Grande Prairie Regional College, Grande Prairie and Grant MacEwan Community College, Edmonton became collaborative partners with the University of Alberta. In this collaboration, the curriculum is jointly developed and oversight is provided by an administrative council composed of representatives from the collaborative sites. Discussions are beginning as to the status of the collaboration, with the passage of Bill 43.

The undergraduate program currently consists of several different routes to completion of a BScN:

- basic four year program
- post RN program, for those who hold a diploma in nursing (implemented in
- Post RPN (registered psychiatric nurse) to BScN Program (implemented 1993)
- after degree program for those with a degree from a variety of disciplines (implemented in 2002).

There are a number of new initiatives underway. The LPN to BScN program was sent to the Nursing Education Program Approval Board (NEPAB) in April 2004 and is due to begin in Fall 2004. The BScN – Bilingual program (a joint program with Faculte St. Jean), received approval from the University, NEPAB, and Alberta Learning and the first students will be admitted in Fall 2004. An Honors Program has been supported by the Academic Standing Committee and is going through the approval process within the University.

In the mid nineties, the Faculty undertook a major review of its undergraduate program and, as a result, introduced a new curriculum in 1997. Underpinning this curriculum are several beliefs about learning which include:

- Learning is an active, individual, lifelong process of creating meaning from information and experience.
- Learning is a process of acquiring and integrating values, knowledge, attitudes and skills that influence the way one thinks, feels, and acts.
- Learning occurs incidentally or purposefully in the context of prior experiences which in turn provides the context for subsequent learning. The process of learning is as vital as the content to be learned.

Based on these beliefs, it is necessary to ensure content is presented within the context of real-life nursing situations or, in other words, learning is context-based. Context-based Learning (CBL) is learner-centered and uses nursing situations that serve to refine critical thinking. Through critical thinking and problem solving practice, student practitioners learn content and develop skills and confidence in their ability to think through issues and propose solutions. Well-chosen situations in classroom and clinical settings help refine and reinforce patterns of thinking that nurses use in practice. Small group interactions and teacher/learner relationships promote the qualities required for professional nursing practice. All teaching –learning occurs in small groups, with a tutor to guide the inquiry process.

Within CBL the role of the Faculty member is to guide students through active learning process by asking questions rather than giving instructions thereby stimulating students to: discover what it is they do not know or understand, determine what they need to learn, determine how they will go about meeting their learning needs, seek credible resources that adequately address their learning needs, and synthesize information in relation to the demands of the context-based situation.

Students share equally in group roles and responsibilities that facilitate their learning through group process work. They follow through with the analysis and decision-making process associated with CBL situations. As well, they learn, within a safe environment, to reflect on their own performance as learner and leader of the group and to provide feedback about individual and collective group member performance to group as a whole.

Primary Health Care, as adopted by the World Health Organization in the Declaration of Alma Ata (1978) is the model used for the overall curriculum design. The underlying philosophy for the model rests upon the premise that health is a resource and health care must be available to all. The complex societal and personal interrelationships identified in this model provide the rationale for integrating courses from other disciplines. The elaboration of Health Promotion

as a primary focus of the model (Ottawa Charter for Health Promotion 1986) supports the content selection related to the health disciplines in general and nursing in particular.

Canada does have a voluntary accreditation program for undergraduate nursing programs offered by the Canadian Association of Schools of Nursing (CASN). Plans are underway for this accreditation to be done in the Faculty in 2006.

### **Undergraduate Teaching.**

Faculty members are expected to teach across the undergraduate and graduate programs. A normal teaching load consists of four courses.

The Faculty does have 8 faculty members who are supported as “research scholars” by AHFMR, CIHR, or CHSRF. These faculty members all carry at least a 25% teaching commitment, some of which is in the undergraduate program. As well, most of these Faculty have undergraduate students as summer research assistants.

The Faculty of Nursing expects its Faculty to be excellent teachers. This is evidenced by the number of Rutherford Award Winners (4) and 3M scholars (3). The Nursing Undergraduate Association and the Nursing Graduate Student Association, as well as the Faculty have several awards for teaching. Although we do not ask Faculty to specifically assess, in their teaching evaluations, the student’s perception of integration research and teaching, there is an expectation faculty members bring in their research as well as that of others into the classroom and clinical areas.

A significant number of the Faculty serve as peer consultants with UTS; there is a strong commitment to the FGSR/UTS teaching program for graduate students; and Faculty are expected to have up to date teaching dossiers. These dossiers are part of the FEC review process at times of tenure and promotion.

### **Undergraduate Research Courses**

The use and assessment of research findings is an integral part of every nursing course. Nursing interventions must be based on the best available evidence. Thus students are required to seek out appropriate information/research to substantiate the interventions they are using in clinical practice or are suggesting be used when in the classroom setting.

Students are required to take research and statistics courses. Three courses are available for students:

*NURS 301 Nursing Research* ★3 (fi 6) (either term, 3-0-0 or 6-0-0 in 7 weeks). Introduction to the process of research through a comparative analysis of selected studies exemplifying different theoretical, methodological, and analytical approaches. Emphases is on the communicability of research, the needs of the research consumer, and the development of skills of critical appraisal. Pre- or corequisite: Statistics elective. Note: (NURS 301 and STAT (★3}) and (NURS 397 and 497) may not both be taken for credit.

*NURS 397 Nursing Research and Statistics* ★2 (fi 4) (first term, 2-1.5s-0.5 in 7 weeks). Introduction to the process of research through critical appraisals of selected quantitative and qualitative studies. Emphasis is on understanding the research process and knowing how to critically read, analyze, and begin to apply the knowledge gained from research in practice. Focus is on the planning phase of the research process and descriptive statistics. Corequisite for Collaborative and Post-RPN students: NURS 390; Corequisites for Post-RN Program-1 students: NURS 393, 396; Corequisite for Post-RN Program-2 students: NURSE 394. Note: NURS 397 and 497, and NURS 301 and STAT [★3] may not both be taken for credit.

*NURS 497 Nursing Research and Statistics II* ★4 (fi 8) (either term, 2-5s-1 in 7 weeks). Students continue to develop their skills to critically read, analyze, and begin to use knowledge gained from research in their practice. Building on the knowledge from NURS 397, this course focuses on understanding the implementation phase of research and inferential statistics. Students also examine trends and issues in developing evidence-based practice for the profession of nursing. Prerequisite: NURS 397. Corequisite: NURS 490. Note: NURS 397 and 497, and NURS 301 and STAT [★3] may not be taken for credit.

### **Graduate Education.**

The Faculty of Nursing established the first graduate program in nursing in Alberta in 1975. The Master of Nursing (MN) Program aims to prepare nurses to function as advanced level practitioners in hospital, community, educational settings or to progress to PhD. Many opportunities exist within the program structure, for example, students may focus on advanced practice in a variety of specialty clinical areas, nursing education, nursing leadership, or nursing research.

The first Canadian PhD in Nursing Program was instituted at the University of Alberta, with funding from advanced education and health, in January 1991. The PhD program prepares nurses for leadership roles in practice, education, and research, as well as to advance nursing knowledge through identification of nursing phenomena and the development and testing of nursing theory.

### **Flexible Delivery.**

Following the initiation of the PhD program it was recognized that the traditional methods of an on campus delivery model limited access to doctoral education for well-qualified students from both within and outside Canada. Following extensive review, a flexible PhD program was initiated. Courses were offered using varying technologies such as WebCT, and videoconferencing. This initiative was extended into the Masters program and currently all core courses are offered through distance technology. As well, alternatives to Fall/Winter course offerings were assessed and currently 15 courses are offered during spring and summer sessions. During the normal academic year courses are also offered via week-end courses. Flexible Delivery initiatives have now been integrated into several undergraduate courses.

The table below outlines the flexible delivery initiatives within the Faculty for Winter 2004.

**Courses with full or partial flexible delivery components:**

<b>Term</b>	<b>Course</b>	<b>Delivery Mode</b>
Winter 2004	NURS 113 Physiology	Classroom with WebCT component
	NURS 151 Pathophysiology	Classroom with WebCT component
	NURS 301 Nursing Research (2 sections)	WebCT with teleconferencing and classroom components
	NURS 301 Nursing Research	WebCT with teleconferencing and classroom components
	NURS 306 Health Assessment	WebCT with lab and classroom components
	N502 Nature and Development of Nursing Knowledge	Classroom with WebCT component
	N502 (Internet Section) Nature and Development of Nursing Knowledge	WebCT with teleconferencing
	NURS 503 Design and Conduct of Nursing Research	WebCT with teleconferencing
	NURS 545 Pharmacotherapeutics in Advanced Nursing Practice.	WebCT with Videoconferencing
	NURS 560: Teaching in Nursing Practice	Classroom with WebCT and teleconferencing components
	NURS 684 History and Politics of Nursing	WebCT with teleconferencing
	INT D 570: Health Care Ethics	WebCT with teleconferencing
	INT D 690: Topics in Knowledge Utilization	Teleconferencing with WebCT and videoconferencing

**Educational objects and events produced from 1 October 2003 to 26 April 2004**

<b>Course</b>	<b>Streaming videos</b>	<b>Streaming audio movies</b>	<b>VHS Videos</b>	<b>CD-ROM</b>
NURS 397			1	
NURS 498	11			
NURS 503	3			5
NURS 510		6		
NURS 545	17			
NURS 560	1			
INT D 690		18		
<b>Events</b>				
Visitor Lectures	1			
NGSA – Grants	1			
Student teaching			2	
<b>Learning Objects</b>				

Library searching	1			
Creating posters	2			
Bates Health Assessment movies	Reformat (194 movies)			
<b>Total:</b>	<b>37</b>	<b>24</b>	<b>3</b>	<b>5</b>

### **Institutes and Centers.**

Several Centers or Institutes are situated within the Faculty of Nursing. As well, the Faculty has an active role in several interdisciplinary Centers.

*Institute of Philosophical Nursing Research.* The Institute of Philosophical Nursing Research is devoted to investigating philosophy of nursing issues and answering questions as fundamental to nursing as "What is Nursing?"

*WHO Collaborating Center.* In July 2002, the Faculty of Nursing was designated as a PAHO/WHO Collaborating Centre for Nursing and Mental Health. Ours is the second nursing Faculty in Canada to achieve this designation.

*International Nursing Centre.* The International Nursing Centre (INC) was established in 1998 to create an environment for international nursing initiatives through a network of linkages. As part of the University's strategic goal of internationalization, a major objective of the INC is to become a center for knowledge development and mutual capacity building in international/intercultural health and nursing. The Faculty of Nursing has formed partnerships and been involved in a number of mental health education and research initiatives with schools of nursing in the Americas, the Caribbean, Ghana, Hong Kong and Thailand. Establishing these partnerships provides our faculty and students with invaluable opportunities for growth; students at both the undergraduate and graduate levels may participate in international student exchanges as well as international and cross cultural clinical placements.

*The International Institute for Qualitative Methodology.* This institute, established in 1997, brings leading scientists from many disciplines together and helps develop and refine a variety of qualitative methods. The institute is unique internationally, placing the U of A in a leadership position and on the cutting edge of qualitative research in health care.

*Knowledge Utilization Studies in Practice.* The purpose of the KUSP research program is to develop knowledge and research utilization theory that can be used to increase the use of research by nurses and other allied health professionals to improve patient and client health outcomes.

*Centre for Knowledge Transfer.* The Centre for Knowledge Transfer is a national training centre in the area of knowledge utilization and policy implementation. The Centre is comprised of a consortium of universities, research institutes and health authorities. The partnership universities are Laval, Manitoba, Saskatchewan and Alberta, which houses the administrative functions of the Centre.

*CIHR Gender & Health Institute.* Supports research to address how sex and gender interact with other factors that influence health to create conditions and problems that are unique, more prevalent, more serious or different with respect to risk factors or effective interventions for women and for men.

*Centre for Health Promotion Studies.* The Centre was created by the University of Alberta in 1996 in response to a growing demand for new knowledge and skills in health promotion and population health in a rapidly changing health system.

*The John Dossetor Health Ethics Centre.* The John Dossetor Health Ethics Centre is an interdisciplinary centre committed to work in the area of health ethics. Through partnership and dialogue, we promote professional and public reflection, debate and research on matters of ethical and moral concern in our healthcare facilities and in our community.

*Perinatal Research Centre.* The mission of the Perinatal Research Centre is to "...discover the causes and cures of perinatal illness, to train scientists and practitioners in perinatal science, [and] to encourage research which promotes the health of women and their infants.

### **Interdisciplinary Education**

Health Sciences Council, made up of Deans of Medicine and Oral Health Sciences, Nursing, Pharmacy and Pharmaceutical Sciences, Physical Education and Recreation, and Rehabilitation Medicine, provides a medium for interdisciplinary activity within the health disciplines. The goals of the council include interdisciplinary education for health professionals; generating world-class research and sharing findings with health stakeholders; and being a resource to Alberta Health, Regional Health Authorities, care providers, and other stakeholders. Students for all health science faculties are required to take Inter D 410- Interdisciplinary health team development. A certificate in Interprofessional Health Team Development is also being instituted.

### **Public Forums and Events.**

An annual research day, held for the past 17 years, provides opportunities for graduate and undergraduate students to present papers and posters on research topics. It is an expectation that undergraduate students attend this conference. An increasing number of undergraduate students are participating as presenters at this annual event. Many of those who do present have held summer research studentships.

A number of "brown bag" sessions occur during the academic year and undergraduate students are welcome to attend these. These are offered by the Faculty, Institutes (e.g. IIQM, John Dossetor Bioethics), or research units (e.g. Knowledge Utilization Studies Program). This past year we had a research fair where Faculty held "open houses" in their research labs and/or made varying public presentations about their research. This fair targeted undergraduate students.

In May a new initiative, "Research Speedbumps" was initiated. These sessions provide a forum for Faculty and students to discuss issues and concerns about research. Several students working as research assistants attend these.

**Summer Research and Other Research**

Our Faculty do use their research funds to hire students as researcher assistants. As well, students are encouraged to apply for summer research studentships. Students who apply for AHFMR summer studentships are assisted with their applications by the Research and Graduate Studies Office. As well, Dr. Janice Lander, CHSRF chair, offers 5 summer research assistantships and the FON offers up to 3. All these are held by undergraduate students. This summer 10 undergraduate summer studentships are in place.

## Appendix M - Faculty of Pharmacy and Pharmaceutical Sciences

### *Undergraduate Research in the Faculty of Pharmacy and Pharmaceutical Sciences*

#### **Introduction:**

Our Faculty does not have a clear approach toward the incorporating teaching and research at the undergraduate level. The curriculum in the faculty is structured around problem-based learning throughout the four years of the program, and stresses the development of critical thinking and analysis skills in all of our courses. Pharmacy is also an accredited program, which impacts the flexibility allowed in the curriculum within the Faculty.

The Faculty of Pharmacy and Pharmaceutical Sciences is a quota faculty, restricted to 130 incoming students each year. Between 40-50% of the students entering Pharmacy already have a degree, and all students entering Pharmacy have at least a single year in another program (usually in Science).

#### **Courses:**

The curriculum in the undergraduate Pharmacy program has just undergone an extensive review and changes include the implementation of courses tackling issues such as analysis of data, the validity of research results, and a critical literature survey. Inquiry or problem-based learning is the norm in all of our classes. Faculty members are specifically asked to bring their research into the courses they are teaching. The Faculty is also looking into the possibility of bringing our pharmaceutical sciences researchers into courses throughout the program to talk about new developments in the discipline.

There is a 'direct study' course (PHARM 498) that is research-based. Students find a preceptor who will supervise a small research project. Between 1-6 students register in the course each year.

Pharmacy is interdisciplinary by nature, drawing people from a number of different faculties into our program and drawing from a number of different disciplines to form the pedagogical basis of the curriculum.

There is a requirement of 500 hours as an intern to qualify as a pharmacist. Recently we convinced the Alberta College of Pharmacist to grant partial recognition to research as internship hours (including summer research placements). We have an average of 10 students per year taking up this opportunity.

The curriculum is focused on ensuring that our graduates are successful in their professional practice, but are also capable of continuing to learn throughout their career. In a discipline that is continually changing, inquiry skills are critical to a successful professional practice. As well, the curriculum does focus on ensuring success on the Pharmacy Examination Board of Canada examinations required of all our graduates entering professional practice. Our success on these exams has been recognized in numerous venues on campus, and across the country, with our graduating class finishing first in the country 13 of the past 15 years. As well, during that time we have had the top individual ten times. Because of that success we are attracting the top students from across Canada into our program.

**Public Forums/Events:**

Our annual Pharmacy Research Day was initially geared toward attracting undergraduate student to research. Our over ten years of experience has indicated that the Research Day was not effective. During our Research Day undergraduates are provided with opportunities to present their research as podium and poster presentation. We rate the presentations and provide awards.

**Undergraduate Teaching:**

The Faculty is divided into two divisions, Pharmaceutical Sciences (PS) and Professional Practice (PP). All of the PS and some of PP members are very active in research. All our researchers regardless of the nature of their appointment teach undergraduate courses. There are approximately 30 faculty members in Pharmacy, with 12 being researchers in the pharmaceutical sciences division. The teaching load for our faculty ranges from 30 and 100 hours per year. Many of our students do receive one-on-one professional practice training during the program.

The Faculty does provide every new faculty member a year release from teaching to get their research program established. As well, the Faculty does allow teaching release for faculty members with research grants that demand extra time.

The Faculty is in the process of recruiting a Canada Research Chair. We also have a Biomira Chair and a Health Management Chair, but these are predominantly for research with minimal commitment to teaching and community service.

This is balanced by the fact that the majority of the equipment used in our teaching labs for both undergraduate and graduate students comes from our research grants, including an NMR spectrometer, and other fundamental pieces of equipment necessary for our students.

Our Canadian graduate students do a substantial amount of teaching and mentoring, but our foreign graduate students tend to not be involved with our undergraduate students, at least until their senior years. This is largely because of their lack of understanding about the Canadian and North American professional context.

**Summer Research:**

Every year we announce the opportunities for summer studentships. Academic staff members interested in supervising summer students provide a list of projects. The list is examined by interested students who then approach the academic member individually. An application is prepared and submitted to a committee. The committee rates students and sends applications to outside agencies. Some scholarships are decided internally as well. The annual average number of summer studentship ranges from 8 to 12. There are usually sufficient spots for those who apply. Generally our students prefer to spend their summer working in pharmacy settings since 1) they earn more money, and 2) their time is fully counted as internship hours.

Though the Faculty sees summer research as a potential recruitment tool into graduate programs, there is a difficulty recruiting graduate students into Pharmacy because of the high remuneration and shortage of pharmacists across Alberta.

**Recent Initiatives:**

In addition to the curriculum review mentioned above, the latest initiative is a Merck Summer Studentship Award provided by Merck USA. It contains one studentship/pharmacy

school. In addition to \$4000 salary, \$1500 is provided as travel expenses to the annual meeting of the Canadian Society for Pharmaceutical Sciences. Students present their research in the meeting.

Another recent initiative is the opening of the SUB Pharmacy as a teaching/professional practice venue. It allows students to experience pharmacy from a practical level, while also allowing the collection of data in a professional practice setting. Some private pharmacies in Edmonton also have partnerships with the U of A in a similar capacity.

**Comments:**

Involvement of undergraduate students in research has two opposite results depending on the experience gained. A productive and hospitable laboratory environment encourages students to consider research as a career alternative. On the other hand, time spent in laboratories that do not provide a nourishing environment results in the rejection of the notion of research as a career. Hence, selection of a host laboratory must be based on certain criteria.

## **Appendix N - Faculty of Physical Education and Recreation**

### **Undergraduate Research Experience Faculty of Physical Education and Recreation University of Alberta**

#### **INTRODUCTION**

The Faculty of Physical Education and Recreation at the University of Alberta ranks as one of the premiere faculties for research among its peers in Canada. A wide variety of courses are offered incorporating the research expertise of Faculty members providing students with research experience. Students have the opportunity to complete their Professional Practicums with researchers at the University of Alberta, as well as conducting research in the community and at other universities.

#### **COURSES**

The Faculty of Physical Education and Recreation offers courses that not only provide an introduction to the research process but also the opportunity to complete a practicum within their chosen area. Students are introduced to research in the areas of physical education, Kinesiology, recreation and leisure studies, behavioural medicine and dietary testing, sports psychology, motor behaviour, biomechanics, and occupational testing.

#### **PEDS 409 – Introduction to Research (Prerequisite PEDS 309)**

In this course, Dr. Doug Weber introduces students to research with a particular focus on the areas of physical education and Kinesiology. Included is an overview of research with an emphasis on the application of different types of research as well as research ethics, designs, methods, measurement concepts and writing. A major objective of course work is to give the student a “hands on” research experience. This course is intended for students who possess a basic knowledge of statistics. Working within a team, students are required to develop a proposal to do a small research study. While the proposal itself is a team effort, each student is required to do an independent review of the literature. As part of the evaluation, each research team is required to present the proposal during class. Students will then work as a team to complete a research study using other members of the class as participants. Upon completion of the study, each team will do a final presentation of their research and each student will independently prepare and submit a paper.

#### **HEED 311 Measurement of Fitness and Health**

In this course, Dr. Gordon Bell’s students complete an assignment that is a conference-style poster presentation that requires some aspects of research and presentation of their work to their peers and the faculty at a “poster day”.

#### **RESEARCH PRACTICUMS**

#### **RLS 449 – Professional Practicum Full-Time**

The Professional Practicum RLS 449 is a requirement for students in the Bachelor of Arts (Recreation and Leisure Studies) Degree Program and the Bachelor of Science (Kinesiology) Degree Program.

### **PEDS 490 – Professional Practicum Half-Time**

### **PEDS 491 – Professional Practicum Full-Time**

The Professional Practicum is an option in the Bachelor of Physical Education Degree Program. Researchers offer students the opportunity to be involved in a research project, either a new one, or an ongoing project. In some cases, the student is included in the planning of the project, ethical procedures, physiological testing, monitoring and data handling. Students can complete a full time practicum or a half time practicum. Practicums require the student to dedicate 20 hours a week towards the research experience and on occasion, the student may assist with the production of conference presentations based on a research project if it is completed within their practicum.

Over the past few years BPE and KIN students, through research-oriented practicums, have assisted in:

Completion of literature searches specific to exercise and cancer research, supervision of clinical population trials in clinical exercise physiology laboratory, data collection and entry, and performance of exercise tests on breast and lung cancer patients in testing laboratory at Cross Cancer Institute.

Scheduling tests, performing testing and data collection and entry, dietary analysis, collection and review of selected obesity/weight control literature, and supervision of exercise sessions.

Data collection and entry, and supervised exercise sessions with rowing study.

Data collection, entry and preliminary analysis of research related to the area of sport psychology.

Completion of fitness testing in the exercise physiology lab; organization, coordination of equipment, set-up, and the development of teaching materials during Kinesiology lab courses.

Testing and data collection of research related to firefighter applicant fitness testing.

Collection, digitization and data entry, set-up of equipment for high speed filming and placement of sensors on subjects, and completion of preliminary analysis of research related to biomechanic studies.

Technical skills acquired in the laboratory will also enhance opportunities to work in fields such as Human Factors and Ergonomics research. Personnel emerging from the Perceptual Motor Behaviour Laboratory will have the skills to compete in the research arena for both basic and applied endeavours.

#### *Research Practicums In Other Faculties at the University Of Alberta*

BPE and KIN students have also been involved with academic staff across campus assisting in their research projects:

Faculty of Rehabilitation Medicine

Department of Physiology

#### **Research Practicums In Community-Based Agencies**

BPE, KIN, and REC students are placed in community agencies and have been involved in research with staff in the following agencies:

Syncrude Centre for Motion and Analysis  
Glenrose Rehabilitation Hospital, Edmonton  
Elk Island National Park – Parks Canada

#### *Research Practicums In Other Universities*

Currently, a student from the Faculty of Physical Education and Recreation is involved in research at the School of Physical Education at the University of Victoria in British Columbia. This student is involved in data collection, data analysis, and field-testing to develop occupational testing skills in the Canadian Forces Military Divers Project, as it relates to occupational testing research.

#### **PEDS 499 Directed Studies**

In this course, Dr. Gordon Bell offers research opportunities similar to those in PEDS 490 or 491; however, the time commitment is less.

#### **PUBLIC FORUM AND EVENTS**

Undergraduate students have participated in workshops, conferences and poster presentations. There are many opportunities for students to attend public forums in areas of their research interest including panel discussions and special seminars organized by Research Institutes within our Faculty.

#### **KINESIOLOGY UNDERGRADUATE RESEARCH TEAMS**

Dr. Brian Maraj initiated a program to create teams of undergraduate students whereby they work together for a term and complete a project which is then presented at a conference or symposium.

#### **SUMMER RESEARCH AND OTHER RESEARCH**

NSERC summer studentships have been offered by our researchers for the past 3 years. These will continue again this year with 2 more students.

#### **RECENT INITIATIVES**

Graduate student mentorship – we have undertaken to have undergraduate students paired with graduate students. They work together on different research project and is intended to create an understanding of the research process for the undergraduate student.

## **Appendix O - Faculty of Rehabilitation Medicine**

### **Faculty of Rehabilitation Medicine Submission Working Group on Teaching and Research**

#### **Courses**

Currently, only one department in the Faculty offers an undergraduate program -- the Department of Occupational Therapy. All of the OT students' clinical courses require critical thinking and use of the research literature to support evidence-based practice. In terms of actual course work that has a research component, there are two courses for students in occupational therapy: (a) OCCTH 362 - Introduction to Research and Clinical Reasoning and (b) Rehab 468 - Research in Rehabilitation. Both are required.

#### **Undergraduate Teaching**

At the present time, there are no endowed research chairs in charge of courses in the OT undergraduate program, however the Faculty policy is that all academic staff must do some teaching. We have four AHFMR Scholars, an AHFMR Population Health Investigator, and two Canada Research Chairs in our faculty, but none of these researchers are in the Department of Occupational Therapy and any instructional time they have with OT students is in the form of guest lectures in courses taught or coordinated by members of the academic staff in the Department of Occupational Therapy.

#### **Recent Initiatives**

All 3 departments in the Faculty have revised their programs to have greater research focus. Physical Therapy and Speech Pathology and Audiology have moved to entry level masters programs having a larger research component including critical thinking and evidence-based practice. Similarly, Occupational Therapy has revised its undergraduate program to focus more on research in critical thinking and evidence-based practice.

## Appendix P - Faculté St. Jean

### Faculté St. Jean Working Group Submission

The story of undergraduate involvement in research at Faculté Saint-Jean is currently being written. Our approach is twofold:

- Firstly, we strive to ensure that our students acquire higher-order thinking and learning skills and develop the knowledge and abilities required for the inquiry process (approaches to theory, inquiry, analysis and synthesis). To this end, we are currently discussing what our key learning objects should be and how best to achieve them. This discussion of research skills acquisition is occurring throughout our sectors.
- Secondly, we want to involve undergraduate students in actual research. This is occurring to some extent in hiring of research assistants due to limited numbers of graduate students available, and in having senior undergraduate students leading many of our science laboratories.

In our *Centre de communication orale et écrite*, students are working with other students under the supervision of a professor in supporting their development of French language skills and in diagnosing individual learning needs, and more generalized development needs.

In our Education sector, students are also involved in classroom observations and structured interactions with teachers and students. However, more needs to be done.

To that end, and with the assistance of Dr. Ed. Aunger, Senior Advisor to the Vice-President (Research), we are currently putting in place a research bureau led by an interdisciplinary team of faculty members and supported by a part-time research facilitator to be hired from our sessional lecturer pool.

The Faculty fully expects that, by next year, we will have enough “stories” to fill a book.

## Appendix Q - Faculty of Science

### Undergraduate Research Experience Faculty of Science University of Alberta

#### I. Introduction

Although we have not received reports from all seven departments in the Faculty, it is safe to assume that the Faculty of Science places high priority on linking research and teaching for undergraduate students. This philosophical framework is based on significant incorporation of undergraduate students in research programs that involve individual faculty members, our course programs, summer and term research programs, and special events and extra-curricular initiatives. Herein a description of the variety of learning experiences available to the undergraduate student is as illustrated in this report.

#### II. Courses:

There are many courses in the Faculty of Science that contain research experience for the undergraduate student. Here a selection from:

**1) Department of Biological Sciences project/honors courses** [those in **bold** are new courses or existing courses redesigned with research components since 2001].

Course	Short Title	Enrolment	Independent Research Project	Data Collection/ Analysis	Oral Presentation Results	Written Research Report
<b>Bioinformatics 401</b>	Bioinformatics II	7	Yes	Yes	No	Yes
<b>Biology 208</b>	Principles of Ecology	729	Yes	Yes	No	Yes
<b>Biology 299</b>	Undergraduate Research Opportunity	New Course	Yes	Yes	No	Short Report
Biology 333	Wetlands Ecology & Management	30	No	Yes	No	Yes
Biology 335	Principles of Systematics	63	Yes	Yes	No	Yes
<b>Biology 391</b>	Techniques in Molecular Biology & Bioinformatics	19	Yes	Yes	No	Yes
<b>Biology 430</b>	Experimental Biology	37	Yes	Yes	No	Yes
<b>Biology 464</b>	Limnology	8	No	Yes	No	Yes
<b>Biology 470</b>	Landscape Management	15	Yes	Yes	Yes	Yes
Biology 498	Research Project	18	Yes	Yes	No	Yes
Biology 499	Honors Research Project	67	Yes	Yes	Yes	Yes
Botany 306	Biology of the Fungi	11	Yes	No	No	Yes

<b>Botany 322</b>	Field Botany	7	Yes	Yes	Yes	Yes
Botany 332	Plant Ecology	58	Yes	Yes	Yes	Yes
<b>Entomology 378</b>	Insect Pathology	56 (optional)	Yes	Yes	No	Yes
<b>Entomology 427</b>	Insect Taxonomy	8	No	Yes	No	Yes
Genetics 420	Research in Molecular Genetics	20	No	Yes	No	Yes
<b>Marine Sciences 403</b>	Directed Studies in Marine Sciences	5	Yes	Yes	Yes	Yes
<b>Microbiology 345</b>	Microbial Laboratory Techniques	24	No	Yes	No	Yes
Microbiology 450	Fermentation Biotechnology	5	Yes	Yes	Yes	Yes
Zoology 344	Laboratory Exercises in Animal Physiology	29	Yes	Yes	Yes	Yes
Zoology 351	Freshwater Invertebrate Diversity	8	Yes	Yes	No	No
Zoology 354	Wildlife Diseases	20	Yes	No	Yes	Yes
<b>Zoology 370</b>	Ethological Mechanisms	40	Yes	Yes	No	Yes
Zoology 371	Behavioural Ecology	78	Yes	Yes	No	Yes
Zoology 434	Field Course in Animal Ecology	9	Yes	Yes	Yes	Yes
Zoology 452	Experimental Parasitology	10	Yes	Yes	No	Yes
Zoology 552	Advanced Parasitology	6	Yes	Yes	Yes	Yes

### Current Topics Discussion Courses

Several Honors and Specialization Programs in the department require students to complete a graded current topics/discussion/seminar course in which the focus is on discussion and critique of current primary research articles, and to develop scientific and research thinking abilities.

### Such courses offered within the past 2 years include

Course	Title	Enrolment
BIOL 364	Freshwater Ecology	38
BIOL 433	Plant-Animal Interactions	11
BIOL 468	Problems in Conservation Biology	22
BOT 384	Global Change and Ecosystems	19
ZOOL 402	Current Topics in Developmental Biology	19
ZOOL 441	Current Topics in Homeostasis	15
ZOOL 442	Current Topics in Intercellular Communication	14

- A new course BIOL 495 (Special Topics in Biology) will be added in 2004/05.

## 2) Department of Chemistry

### ■ CHEM 401 Introduction to Chemical Research

Normal enrolment approximately 7 - 10 students. Currently this is an option course for students in the Honours and Specialization programs, but either this course or CHEM 400 (see below) will be a requirement for the Honours students as of Fall 2005. The course involves research experience with a faculty member and requires approximately 8 hours/week. It is taken in the final year of the program. In addition, this research course involves a written report and a final oral presentation that is given to an audience of undergraduate students, graduate students and academic staff. Instruction is given to the students to help them prepare for the oral presentation.

### ■ CHEM 403 Chemical Research

Normal enrolment is about 2 - 4 students. This is an extension of Chem 401 and involves a second term of research after completion of one term of Chem 401. This course is optional for Chemistry Honours and Specialization students. The time commitment and the requirements for a written and oral report are the same as for Chem 401. As a result of research done during the 401/403 courses, students have co-authored at least 9 publications and given at least 9 presentations at conferences in 2002/2003 and at least 3 publications and 3 presentations in 2003/2004.

### ■ Chem 400 Industrial Internship Practicum

This course involves writing a report and giving an oral presentation of results of research done as part of the student's Industrial Internship in the previous year. The normal enrolment is 7 - 10 students/year. In the past year alone, students have given 2 conference presentations.

### ■ Chem 493 Computational Chemistry

Enrolment approximately 10 - 15 students/year. This is a one-term course in which the first half is devoted to lectures on the state-of-the-art computational techniques needed in Chemistry. In the second half of the course each student submits a research proposal, then after approval and suitable discussion with the instructor, carries out the necessary computational research on their proposal. Students use either their own computers or make use of the computer facilities in W1-50 in the Chemistry Department. A written report and an oral presentation are required.

A number of upper level undergraduate courses involve a component in which reports are written or oral presentations are made based on a review of the chemical literature. This would involve about 5 - 10 students/year.

## 3) Department of Computing Science

- **CMPUT 499.** This is a designated course number at the 400 level for independent studies courses. These are directed readings and research courses undertaken by

joint agreement between a faculty member and some students. These courses often have a project requirement and typically involve reading current research articles from conference proceedings and scholarly journals. The format often includes weekly discussion meetings, in which research issues are dissected and discussed. During the four academic terms from Fall 03 to Winter 04 inclusive, nine such independent studies courses were taught, involving seven different faculty and 16 students.

- The Computing Science curriculum requires that students enroll in a minimum number of ‘project’ courses, in which students form teams and often tackle a significant computing problem.

Examples of these courses are **CMPUT 466 (Machine Learning)** and **CMPUT 412 (Experimental Robotics)**.

It is typical for assignments in advanced courses (third and fourth year) to be connected to current research issues or techniques with which faculty are familiar.

## **II. Courses (cont. - special program – Industrial Internship Program)**

The Industrial Internship Program formally integrates a student's university education with work experience in co-operating employer organizations. It offers undergraduate students, between the third and fourth year of study, paid work experience in a corporate setting. The internship is a continuous single-work period of 8, 12, or 16 months with industry or agency.

In some Faculty of Science departments (*e.g.*, Biological Sciences), this program demands a research component, while others (*e.g.*, Computing Science) provide “hands-on” real world experience in the work force.

During the academic year, the interns are registered as full-time, off campus students and have faculty advisors. On return to the University, each student in all Departments (*e.g.*, see Chem 400 IIP Practicum above) takes a credit course in which they provide written and oral reports on their research/work experiences.

Approximately 100 students from the Faculty are in the program each year and several research publications in refereed scientific journals often result.

### III. Public Forums/Events:

#### Department of Biological Sciences

- Research Days
  - This annual 2-day event is largely for graduate students, but undergraduates are encouraged to participate.
  - Organized by students
  - Internationally renowned scientist is special guest and "keynote speaker" - fully advertised across campus
  - Poster presentations of student research
  - Oral sessions of student research
  
- PUBS (Prairies University Biology Seminars)
  - An annual international scientific meeting for senior undergraduate and graduate students held at universities in the "Prairies" (including Northern Plains in US and Western Canada).
  - U of A hosted the event in 2004 with ~250 participants;
  - To- or three-day event with student presentations and keynote speaker
  - Organized mainly by graduate students, but undergraduate researchers are also involved
  
- Seminar Series
  - Numerous series of research seminars offered, to which many undergraduate students are invited and attend.

#### Department of Chemistry

- The "Western Canada Undergraduate Chemistry Research Conference" was started by the Department of Chemistry at the University of Alberta and involves all Canadian Universities between Thunder Bay, ON and Victoria, BC. The location of this annual conference rotates amongst the participating universities. Students give either oral or poster presentations on original chemistry research carried out while they were undergraduate students, and can involve either academic or industrial research. Typically, the department sends 10 - 20 students to this conference each year. Individual research supervisors and a significant departmental contribution cover costs.
  
- Recently, the "National Undergraduate Chemistry Conference" has been initiated by the University of Ottawa and is held in Ottawa each year. Chemistry sends 0 - 2 students to this conference each year, but the distance and timing (early October) make it difficult to encourage student participation.
  
- The two pre-eminent national chemistry conferences in North America are the American Chemical Society Conferences (held semi-annually) and the Canadian Society for Chemistry Conference and Exhibition (held annually). Depending on the location, the Chemistry department sends 0-5 undergraduate students per year.

- One faculty member in Chemistry, Glen R. Loppnow, is a member of the RISE (Reactive Intermediates Student Exchange) program, in which 1 - 2 students from the University of Alberta perform research at other participating universities in Canada. At the end of the summer, all of the students in Canada gather at one of the Universities for a mini-conference and present the results of their research. In 2003, this mini-conference was a part of the national CSC Conference.

#### IV. Undergraduate Teaching

*Policy on teaching release for faculty members:* When proposals are put forward for externally funded chairs, there is typically a concrete specification for a reduced teaching load, but all faculty members teach.

*Undergraduate teaching by holders of endowed research chairs:*

##### Department of Biological Sciences

**Killam Chair:** Dr. David Schindler teaches mainly graduate courses, but is a significant role model for undergraduates.

**Alberta Conservation Association Chair:** Dr. Mark Boyce teaches Population Ecology (BIOL 331; enrolment 54)

**NSERC Industrial Chair:** Dr. Stan Boutin teaches the Field Course in Animal Ecology (ZOOL 434: enrolment 9)

##### Canada Research Chairs:

Dr. Neil Adames (CRC Molecular Genetics) participates in the team teaching of two undergraduate courses, GENET 301 (Organization of simple genomes) and GENET 304 (Gene expression and its regulation) with enrolments of 102 and 98, respectively.

Dr. David Hik (CRC Northern Ecology) is currently on sabbatical but has been assigned to teach part of BIOL 208 (Principles of Ecology) and BIOL 433 (Plant-animal Interactions) in 2004/05.

Dr. Mark Lewis (CRC Mathematical Ecology) teaches the graduate level course BIOL 570 (Models in Ecology) in which a few undergraduates have also enrolled in the past.

Dr. Sally Leys (CRC Evolutionary & Developmental Biology) teaches half of BIOL 361 (Marine Science) and half of ZOOL 303 (Animal Developmental Biology); these have enrolments of 184 and 39, respectively. She will also participate in teaching the new course BIOL 495 in 2004/05.

Dr. Andrew Waskiewicz (CRC Genetics of Vertebrate Development) contributed to the teaching of ZOOL 303 (Animal Developmental Biology) last year. In addition to this, he will contribute to part of ZOOL 402 (Current Topics in Developmental Biology) and develop a new 400 level course in Animal Development Genetics in 2004/05.

**AHFMR Scientists/Scholars:**

Dr. Linda Reha-Krantz teaches GENET 408 (enrolment 43).

Dr. Kathy Magor teaches parts of IMIN 200 (Infection and Immunity), 372 (Research Techniques in Immunology) and 401 (Comparative Immunology) with enrolments of 233, 23 and 17, respectively.

Dr. Tracy Raivio teaches one section of GENET 270 (Foundations of Molecular Genetics; enrolment 153) and parts of GENET 304 (Gene Expression and its Regulation; enrolment 98).

**Alberta Ingenuity Scholar:** Dr. David Coltman (AI Scholar Molecular Ecology) joining the Department in July 2004. He will be involved in teaching BIOL 380 (Genetic Analysis of Populations).

**Department of Chemistry**

The three Chair holders teach one course/year. The courses taught by these individuals will vary from year to year as needed, but the following was their teaching component last year.

**Strathcona County Lemieux Chair in Carbohydrate Chemistry:** Dave Bundle – Organic Chemistry II. Chemistry 263 (enrolment 53)

**Canada Research Chair:** John Vederas – Organic Chemistry I. Chemistry 161 (enrolment 205)

**Canada Research Chair:** Rod Wasylishen – Applications of Nuclear Magnetic Resonance Chemistry 483 (enrolment 9)

**Department of Computing Science**

**Canada Research Chair:** Schuurmans (Tier II/ teaching load = .66 or 2 single semester courses per year): CMPUT 366 (AI), CMPUT 466 (machine learning).

**Canada Research Chair & iCORE Chair:** Schaeffer (Tier I, iCORE/teaching load = .5 or 1-2-1-2-1 across 5 years): CMPUT 201 (programming methodologies), CMPUT 415 (compiler design)

**iCORE:** Sutton (teaching load = .5): none yet

**iCORE:** Zhang (teaching load = .5): CMPUT 412 (experimental mobile robotics), CMPUT 229 (machine architecture)

**V. Summer Research:****Department of Biological Sciences**

Over 50 summer students supported by NSERC Summer Studentships and/or AHFMR Summer Studentships perform field and bench research in over 30 laboratories yearly

Numerous research grant and contract supported summer research opportunities are also available annually

STEP and SCP programs places students in summer research positions

WISEST program places female senior high school students in labs often resulting in students following up on research path upon entering university

### **Department of Chemistry**

Each year has 50 - 60 undergraduate involved in summer research projects, of which approximately 30/year are supported by NSERC, AHFMR, Pfizer, or ACB scholarships. In addition, 1 - 2 students participate in the summer RISE program (see above) and 0 - 3 students participate in summer research at other universities through other programs. Also, 2 - 5 students are involved in research during the academic term in the Department not affiliated with any course.

### **Department of Computing Science**

During summer 2002, 35 undergraduate students were employed as summer research assistants (14 held NSERC undergraduate summer scholarships, the remainder were supported entirely by faculty research grants). During summer 2003, 50 undergraduate students were employed as summer research assistants (12 NSERC, 2 employed as IIP students by the Department, and the remainder funded fully by faculty research grants).

## **VI. Recent Initiatives:**

### **Department of Biological Sciences**

#### **BioDITRL**

A collection of visual aid materials available for use in teaching by other institutions and by the Edmonton Public School

Teaching and research materials and related images and animations

All materials submitted are refereed

Community outreach as well as teaching aid

#### **DITRL**

Facility and personnel to develop digital and electronic teaching and research presentation materials

Also a collection of images and materials for several courses offered by the department (e.g., parasitology course)

Industrial Internships for DITRL/BioDITRL

Placement of undergraduate student as part of the IIP program in Science

At least one student per year placed

Involved in developing on-line teaching materials such as animations

### **Molecular Biology and Microscopy Service Units**

Students working on honors' thesis and summer research projects extensively use these advanced laboratories

#### *Research Posters and Displays*

Our department has numerous examples of research posters and exhibits, which are intentionally placed near undergraduate classrooms so that students will be exposed to the many career options and interest areas in biology.

### *Ongoing Summer Student Research Initiatives*

Over 50 summer students supported by NSERC Summer Studentships and/or AHFMR Summer Studentships perform field and bench research in over 30 laboratories yearly

Numerous research grant and contract supported summer research opportunities are also available annually

STEP and SCP programs places students in summer research positions

WISEST program places female senior high school students in labs often resulting in students following up on research path upon entering university

### **Department of Chemistry**

The entire chemistry program is currently being examined in detail and numerous changes are being made to enhance the undergraduate's experiential learning and scholarly inquiry. Just a few examples are given below.

A. Experiential Components. Most, if not all, research shows that students are engaged more and do better when allowed to do hands-on work, the earlier the better. Chemistry has committed to requiring an experiential component to our Honours program, either Chem400 or Chem401, by Fall, 2005. In addition, we are adding Chem299 a research opportunity for second-year students in Honours and Specialization Chemistry as an option by Fall, 2005.

B. Better hands-on opportunities. Chemistry, more than any other discipline, requires a solid grounding in modern techniques of analysis. Because techniques are only now becoming available to directly observe molecules, most established analytical techniques are indirect and, therefore, expensive. The high cost of lab equipment for chemistry, combined with the almost total lack of funding agencies for teaching offers a significant challenge in providing students the modern, hands-on experience they require as part of their education. Chemistry has had one success in finding a suitable solution for an NMR instrument for our undergraduate labs, arguably one of the most important characterization techniques in chemistry. We hope to have a state-of-the-art 400 MHz instrument in our labs by Fall, 2004, funded by the Faculty of Science, Department of Chemistry, and an anonymous Chemistry donor. Nevertheless, this issue will occupy the Department over the next few years as we strive to improve and modernize the hand-on experience our undergraduates receive in Chemistry courses

### **Department of Computing Science**

Our main efforts are directed in ensuring our undergraduate teaching labs at all levels reflect state-of-the art hardware and software.

New courses and labs are always under development, under the direction of our faculty (current examples: computer vision course to be test-run next year; a new robotics course to be test-run next year). It's fair to say that new course development at this level and of this character is driven by the fact that we are a research-intensive faculty.

Every five years, we undergo an external accreditation process by an independent review board, the Canadian Information Processing Society, which has published standards for university computing science curricula. We also evaluate our curriculum against ACM/IEEE standards, which are revised every five years. These efforts directly impact the continued development of our undergraduate programs.

The bioinformatics degree programs that both Departments of Computing Science and Biological Sciences offer are specialized undergraduate programs of study that very directly reflect the research strengths of our bioinformatics faculty.

## **Department of Computing Science**

### ***Field Schools***

A critical part of several of our programs is the field-based component, as exemplified by the five field schools we run every year. We have integrated modern techniques, such as GPS receivers, data loggers, and computer-based mapping tools, to ensure our students are exposed to current and cutting-edge methods in field studies. For example, we have developed a close working relationship with Campbell Scientific, a leading designer and manufacturer of data loggers and associated instrumentation. They provide both equipment and technical expertise to our Environmental Earth Sciences field school every year.

To provide additional field experience for our students, we have recently added a fourth-year field course, which is run in collaboration with the C.S. Lord Geoscience Centre in Yellowknife, N.W.T. in late August. This course has very limited enrollment, because of the logistics involved in the fly-in camp that it uses as a base in the N.W.T. north of Yellowknife. We handpick the six best field geologists, based on their performance in the required second- and third-year field schools (EAS 234 and 333, respectively), for this opportunity. They spend two weeks in the field with two faculty members from the Department and a number of professional geologists from the C.S. Lord Geoscience Centre. They map in an area previously unmapped, and ultimately produce a geological map for that area. This field school ran for the first time in August 2003 with five students (the sixth had to withdraw at the last minute because of an injury); the students and faculty involved subsequently gave presentations at the Yellowknife Geoscience Forum in November 2003. Three of the students worked on projects derived from this field school for their Undergraduate Theses; another had already formulated her thesis project based on the work she did during that summer for the Alberta Geological Survey. The students gave presentations on their research at the WIUGC in Vancouver in January 2004 (see above).

These field schools are an essential component of our undergraduate students' education, but they are expensive to run. In particular, the N.W.T. field school is very expensive; we have been very fortunate in that the C.S. Lord Geoscience Centre had obtained H.D.R.C. funding for this field school for 2003 and 2004, but

we will need to obtain alternative funding for subsequent years to continue this innovative and unique opportunity for our students. We have worked to find non-University funding to help fund these field schools. For example, working with the Faculty of Science Development Office, our Chair has been successful in obtaining donations from alumni that are directed towards the costs of our first and second-year field schools.

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**Addendum:**

Examples of subsequent success of industrial internships, honors thesis, and summer research students, Department of Biological Sciences

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Research experience contributes to the success of undergraduate students in terms of scholarships competitions and admission into graduate programs.

<b>NSERC PGSB (PGSD) SCHOLARSHIP RECOMMENDATIONS</b>				
<b>(Biological Sciences BSc Graduates)</b>				
	For Academic Year			
	2002-2003	2003-2004	2004-2005 (PGSD or CGSD)	Totals
<b>Number of PGSB (now PGSD) Recommendations</b>	12	12	18	42
<b>Had research experience</b>	12	12	18	42
<b>Completed an honors thesis</b>	9	11	16	36
<b>Had summer research experience</b>	9	11	16	36
<b>Had both honors thesis and summer research experience</b>	7	10	15	32
<b>Received the NSERC PGSB (D) Scholarship</b>	9	11	12(to date)	32

<b>NSERC PGSA (PGSM) SCHOLARSHIP RECOMMENDATIONS</b>				
<b>(Biological Sciences BSc Graduates)</b>				
	For Academic Year			
	2002-2003	2003-2004	2004-2005 (PGSM or CGSM)	Totals
<b>Number of PGSA (now PGSM) Recommendations</b>	18	13	17	48
<b>Had research experience</b>	18	13	17	48
<b>Completed an honors thesis</b>	10	11	11	32
<b>Had summer research experience</b>	7	13	17	37
<b>Had both honors thesis and summer research experience</b>	10	11	11	32
<b>Received the NSERC PGSA (M) Scholarship</b>	16	11	11	38

<b>RESEARCH EXPERIENCE FOR GRADUATE STUDENTS ADMITTED IN PAST 3 YEARS</b>			
	For Academic Year		
	2002-2003	2003-2004	2004-2005 (as of April 27, 2004)
Total Admitted	63	72	24
Had research experience	51	53	20
Completed an honors thesis	32	37	15
Had summer research experience	28	30	16
Had both an honors thesis and summer research experience	20	21	11

**Department of Earth and Atmospheric Sciences**  
**The Undergraduate Research Experience:**  
**Snapshot May 2004**

***Introduction***

The Department of Earth and Atmospheric Sciences has 42 academic staff, of whom 39 are tenure-track teaching faculty, ~120 graduate students, and 250 undergraduate students registered in our degree programs. Of the undergraduate students, twenty-seven are in the B.Sc. Specialization or Honors program in Atmospheric Sciences, twenty-one are in the B.Sc. Specialization or Honors program in Environmental Earth Sciences, ninety-five are in the B.Sc. Specialization or Honors program in Geology, and eighteen are in the B.Sc. Honors program in Paleontology. An additional sixty-seven are B.S. Majors in Earth and Atmospheric Science, and twenty-two are B.A. Majors in Human Geography. In total, we currently have 35 students in Honors programs, 126 in Specialization, and the remainder in a Major program. We do not track students who have declared a minor in either Earth and Atmospheric Sciences (B.Sc.) or Human Geography (B.A.).

The faculty of the Department of Earth and Atmospheric Sciences are researchers of national and international stature, who weave their research experiences and background into their teaching whenever possible. The foundation knowledge necessary for research in the various subdisciplines in EAS is typically sufficiently broad in scope that it is unusual for students to be an active, contributing participant in formulating and conducting research projects until their third or fourth year. This reflects the intrinsically interdisciplinary nature of our sciences. A notable exception is our field courses, in which the students undertake, on a limited scale, the same type of field study that is integral to research at the postgraduate level by both academic and professional practitioners.

In other subdisciplines, once the students have the requisite knowledge base, they are active in research, both in individual classes and for undergraduate theses and directed study projects. Over the past five years, 70% of our B.Sc. Honors and Specialization students have completed Honors Theses or Directed Study projects. Many of these projects are outgrowths of summer research opportunities, either in the Department, in industry, or in Federal, Provincial, or Territorial government agencies.

***Courses***

In all our programs, the majority of our fourth-year undergraduate courses involve research, typically in the form of a project that includes a class presentation and a paper on the results of the research (see Appendix 1). Depending on the subject of the course, the type of research involved ranges from strictly library-based reading of primary literature and synthesizing that information, to projects that involve laboratory-based or field-based measurements that are integrated into the body of information on a given topic.

In addition to the research exposure in these courses, our fourth-year Honors students must enroll in EAS 426 (Honors Thesis 1). Students in Specialization programs may enroll in EAS427/428 (Directed Study). Both of these courses allow them to work closely with a faculty member on a research project that typically spans a full academic year. In most cases,

the end result of an EAS 427/428 is a thesis of comparable quality to those produced from EAS 426. Many of the projects that form the basis of both the 426 and 427/428 courses are outgrowths of research conducted by the student in the summer following their third year in the program. This summer research includes that funded by NSERC USRAs, industry, and Federal and Provincial government agencies. In the latter two situations, the industry or government project is developed and expanded under the guidance and supervision of a faculty member in the Department. Often the agency involved will contribute funds toward analytical or other research costs.

Almost every one of the undergraduate research projects conducted in the Department take advantage of equipment and facilities that are present in the Department only because of the externally-funded research of faculty members; such facilities include the scanning electron microscope, the electron microprobe, the new LA-ICPMS (laserablation inductively coupled plasma mass spectrometer), the thermal ionization and gas source mass spectrometers, the micro-focusing FTIR (fourier transform infrared) spectrometer, the experimental facilities in the C.M. Scarfe Laboratory for Experimental Petrology and the new Laboratory for Comparative Planetology, and the GIS/Remote Sensing computers, image libraries, and reflectance spectrometers of the EOSL (Earth Observation Systems Laboratory).

Both the formal thesis course (EAS 426) and the Directed Study courses (EAS 427 and 428) are popular with our students; over the past five years, we have averaged 12 theses and 23 Directed Studies per year. To place these numbers in context, over the same time period, we averaged 50 graduates per year from our Specialization and Honors programs, so on average 70% of our students take advantage of our research-based 426 and 427/428 courses.

Our Human Geography program successfully incorporates research papers and projects into some of their second- and third-year courses, as well as their fourth-year courses (see Appendix 1). This may result from the relatively small cohort of students in that area, and perhaps as well a difference in philosophy between the Faculty of Arts-based Human Geography program, and our other programs based in the Faculty of Science. Recent additions to our program in Human Geography are the Directed Study courses (EAS 497 and 498), which were introduced in 2000-01. Since that time, ten students have enrolled in these courses. This relatively low number may result from the small number of students majoring in Human Geography (averaging five graduates/year), or may reflect the high proportion of courses in the Human Geography program that have an integrated research component.

### ***Public Forums/Events***

Although the Department currently has no Departmental fora for undergraduate students to discuss their research, we are considering introducing an Undergraduate 1 As of 2004-05, EAS 426 has been renamed 'Undergraduate Thesis' and is available to both Specialization and Honors students. It remains a required course for our Honors programs, but is an option for Specialization students. Research Symposium to be held in the latter part of second term for students to present the results of their Undergraduate Theses and Directed Study projects. Undergraduates in the geology program do participate in the WIUGC (Western Inter University Geological Conference), which is held every January. Both undergraduates and graduate students present research talks and posters at this event. At the 2004 WIUGC in

Vancouver, undergraduate students from our Department won awards for the Best Undergraduate Talk and Best Undergraduate Poster. Other recent venues at which our undergraduate students have presented include the GAC-MAC (Geological Association of Canada – Mineralogical Association of Canada) Annual Meetings in 2003 and 2004, the Yellowknife Geoscience Forum in 2003, the 2004 Spring Meeting of the AGU (American Geophysical Union), the Eighth International Kimberlite Conference in 2003, and the 2004 Annual General Meeting of the Western Division, Canadian Association of Geographers.

Some undergraduate projects result in publication in peer-reviewed journals. For example, Steven Creighton's undergraduate research led to a publication in the Proceedings of the Eighth International Kimberlite Conference, which is to be published in the peer-reviewed journal *Lithos*. Another example is the combined undergraduate research projects of Melissa Bowerman and Amy Bablitz; one paper has been accepted by a peer-reviewed journal (*The Canadian Mineralogist*), and two others are in preparation for submission.

### ***Undergraduate Teaching***

We have a number of endowed Chairs within our Department, including a Vargo Teaching Chair, the C.R. Stelck Chair in Petroleum Geology, a Northern Research Chair, a CIAR Fellow, and three Canada Research Chairs. For the Research Chairs, it has been Departmental policy to release the Chair from one course's teaching duties, so they teach two courses per year rather than the Department norm of three courses. Their current or most recent teaching responsibilities are outlined below.

- Tom Chacko, the Vargo Teaching Chair, is very active in undergraduate teaching; in 2003-04 he taught EAS 332 (Metamorphic Petrology), a required third-year course for our Geology program students, half of the fourth-year EAS 436 (Advanced Igneous and Metamorphic Petrology), as well as half of a graduate seminar. In addition, he co-led our NWT field school (see ***Recent Initiatives*** below).
- Brian Jones, the C.R. Stelck Chair in Petroleum Geology, is Chair of the Department and has no current undergraduate teaching duties. He previously taught a variety of courses at the undergraduate level, including Sedimentology, Sedimentary Petrology, Introductory Earth Sciences, and Field School.
- John England, the Northern Research Chair, was on sabbatical in 2003-04, but cotaught EAS 110 (First Year Field School) and a graduate course in 2002-03, and is scheduled to teach the fourth-year EAS 451 (Arctic Environments) course in 2004-05, in addition to a graduate course.
- Andrew Bush, CIAR Fellow, taught two undergraduate courses in 2003-04, EAS 370 (Applied Atmospheric Physics) and 373 (The Climate System). Both of these courses are core courses in our Atmospheric Sciences program.
- In 2003-04, Senior Canada Research Chair George Pemberton taught EAS 330 (Stratigraphy), which is a required third-year course in our Geology program, in addition to a graduate course.
- Canada Research Chair Kurt Konhauser taught EAS 205 (Environment Earth), a second-year course designed for non-majors, in 2003-04. He also taught a graduate course in Geomicrobiology.

- Canada Research Chair Thomas Stachel has taught EAS 232 (Mineralogy II), a core second-year course in our Geology program, for three years now. He also teaches a graduate course.

### ***Research Opportunities: Summer and Term***

The Department of Earth and Atmospheric Sciences is an active participant in the NSERC USRA program. Over the past five years, twenty-three (out of 42) faculty have participated in this program; some have supervised as many as seven USRA students over that time. Many of these students continue on into graduate school (see table below).

### **NSERC Undergraduate Student Research Awards**

<b><i>Year</i></b>	<b><i>Student</i></b>	<b><i>Supervisor</i></b>
2004	Michelle Blade	Peter Kershaw
	Robyn Ferguson	Brian Chatterton
	Sarah Gammie	Robert Luth
	Shoshana Goldstein	Robert Luth
	Anita Gue	Carl Mendoza
	Cristen Krauss	Thomas Chacko
	Thomas Lakeman	John England
	Wendy Markowski	Peter Kershaw
	Jessica Norris	Christopher Herd
	Edward Pollock	Andrew Bush
	Kathleen Smart	Thomas Chacko
	Matthew Vavrek	Brian Chatterton
	Brett Wheler	Paul Myers
	2003	Steven Creighton*
Erin Doxsey-Whitfield		John Shaw
Shoshana Goldstein		Paul Myers
Natalie Hayes*		Michael Caldwell
Lesley Hill*		Edward Lozowski
Thomas Lakeman**		John England
Jessica Liggett		Carl Mendoza
Ryan McKellar*		Brian Chatterton
Lynn Reich*		George Pemberton
Adrienne Thompson		John England
2002	Marilyn Zorn*	George Pemberton
	Melissa Bowerman*	Robert Luth
	April Fenwick	George Pemberton
	Shoshana Goldstein	Paul Myers
	Natalie Hayes*	Brian Chatterton
	Ryan Ickert*	Octavian Catuneanu
	Patrick Nicoll*	Robert Luth
	Lynn Reich*	Octavian Catuneanu
	Adam Sanderman	George Pemberton
	Michelle Trommelen*	John England
	Matthew Vavrek	Michael Caldwell
	Katie von Gaza	John England
Christopher Wielki	Andrew Bush	

\*Students now in graduate studies.

\*\*Students accepted for graduate studies in Fall 2004.

In addition to the students involved in the USRA program, other undergraduate students are involved in research during the summer as research assistants, both in the lab and in the field. From 2002 to 2004, twenty-two faculty in the Department have employed twenty-eight undergraduate students as research or field assistants, exclusive of those in the USRA program. Some of these positions are during the summer, but a number of these Research Assistants are employed during the academic year on a part-time basis as well.

Our faculty conduct field studies in diverse areas; including the high Arctic, the Caribbean, and Central and South America. Most of these field studies require field assistants, and our undergraduate students, because of their background, are the prime candidates for these jobs. In addition to valuable field experience, the undergraduate student usually builds a strong rapport with his or her graduate student or faculty supervisor, which leads to an informal mentoring situation and often to increased interest on the part of the undergraduate student to continue on in research, both at the undergraduate level, enrolling in EAS 426, 427, or 428, and into graduate studies.

Many of our undergraduate students work during the summer in their field of interest. As mentioned above, these students will often return for their fourth year with a proposed project based on their work during the summer, which they use as the basis for a thesis or directed study project during their fourth year. Recent examples of this include students whose summer employment was with the oil and gas industry, the Alberta Geological Survey, DIAND, and mineral exploration firms.

Another route for our students to do research is through the Industrial Internship Program, of which the Department is an active participant. Some employers set up their internships such that an independent research project, mentored and advised by one of their people, is an integral part of the student's IIP placement. Environment Canada, which has employed up to three of our Atmospheric Sciences B.Sc. students every year for the past four, is particularly proactive in this regard. The research project the student works on while at Environment Canada is clearly a high point of their IIP experience, and is typically the centerpiece of the oral presentation that the student gives upon return to the Department.

## **Recent Initiatives to Enhance the Undergraduate Learning Environment**

### ***Field Schools***

A critical part of several of our programs is the field-based component, as exemplified by the five field schools we run every year. We have integrated modern techniques, such as GPS receivers, data loggers, and computer-based mapping tools, to ensure our students are exposed to current and cutting-edge methods in field studies. For example, we have developed a close working relationship with Campbell Scientific, a leading designer and manufacturer of data loggers and associated instrumentation. They provide both equipment and technical expertise to our Environmental Earth Sciences field school every year.

To provide additional field experience for our students, we have recently added a fourth-year field course, which is run in collaboration with the C.S. Lord Geoscience Centre in Yellowknife, N.W.T. in late August. This course has very limited enrollment, because of the

logistics involved in the fly-in camp that it uses as a base in the N.W.T. north of Yellowknife. We handpick the six best field geologists, based on their performance in the required second- and third-year field schools (EAS 234 and 333, respectively), for this opportunity. They spend two weeks in the field with two faculty members from the Department and a number of professional geologists from the C.S. Lord Geoscience Centre. They map in an area previously unmapped, and ultimately produce a geological map for that area. This field school ran for the first time in August 2003 with five students (the sixth had to withdraw at the last minute because of an injury); the students and faculty involved subsequently gave presentations at the Yellowknife Geoscience Forum in November 2003. Three of the students worked on projects derived from this field school for their Undergraduate Theses; another had already formulated her thesis project based on the work she did during that summer for the Alberta Geological Survey. The students gave presentations on their research at the WIUGC in Vancouver in January 2004 (see above).

These field schools are an essential component of our undergraduate students' education, but they are expensive to run. In particular, the N.W.T. field school is very expensive; we have been very fortunate in that the C.S. Lord Geoscience Centre had obtained H.D.R.C. funding for this field school for 2003 and 2004, but we will need to obtain alternative funding for subsequent years to continue this innovative and unique opportunity for our students. We have worked to find non-University funding to help fund these field schools. For example, working with the Faculty of Science Development Office, our Chair has been successful in obtaining donations from alumni that are directed towards the costs of our first and second-year field schools.

### ***Computer Applications in EAS***

Several areas of our varied disciplines use specialized computer software extensively. Examples of these that are relevant to our undergraduate programs are the areas of GIS (Geographical Information Systems/Science), hydrogeology, and structural and petroleum geology. All three of these areas require dedicated computer labs with sufficient computational resources to run industry-standard software (e.g., ARCVIEW, ARCGIS for GIS). We have two dedicated computer labs (ESB 1-39, Tory 2-87) to support these, and other courses that require computer exercises in their labs. Our IT support staff includes a GIS specialist (Valery Companytsev) in addition to workstation and network analysts. Unfortunately, these labs are currently oversubscribed, and we are unable to accommodate requests from instructors in other courses that wish to schedule time in the computer labs. Additional computer lab space will become available in the CCIS when it is completed.

We have successfully involved industry in our efforts to ensure that our students are trained on industry-standard software (e.g., Accumap and IDC, in addition to those mentioned above). This software is used both by academic researchers at our and other universities, and by professionals working in a variety of industries. Many of the companies have donated software or have provided site licenses at significant discounts for our student laboratories.

*Appendix 1.*

**Courses in the Department of Earth and Atmospheric Sciences with a research component:**

**Faculty of Arts (Human Geography):**

- EAS 293 The Urban Environment
- EAS 391 Introduction to Environmental Planning
- EAS 392 Research Methods in Human Geography
- EAS 394 Issues In Human Geography
- EAS 395 Health, Space and Place
- EAS 491 Resource Management and Environmental Policy
- EAS 492 Geographical Information Systems for Social Science
- EAS 493 Human Dimensions of Global Change
- EAS 494 Environment and Health
- EAS 497 Directed Study in Human Geography I
- EAS 498 Directed Study in Human Geography II

**Faculty of Science (Atmospheric Sciences, Environmental Earth Sciences, Geology, and Paleontology programs):**

- EAS 225 Earth Surface Processes and Landforms
- EAS 234 Geology Field School
- EAS 250 Biogeography
- EAS 333 Advanced Geology Field School
- EAS 354 Environmental Earth Sciences Field School
- EAS 420 Geochemistry II
- EAS 421 Advanced Structural Geology
- EAS 422 Basin Analysis
- EAS 424 Subsurface Geological Methods
- EAS 426 Undergraduate Thesis
- EAS 427 Directed Study I
- EAS 428 Directed Study II
- EAS 430 Petroleum Geology
- EAS 432 Precambrian Geology
- EAS 434 Geochemistry of Ore Deposits
- EAS 435 Geotectonics
- EAS 436 Petrogenesis of Igneous and Metamorphic Rocks
- EAS 437 Geology of Canada
- EAS 451 Digital Remote Sensing
- EAS 453 Arctic Environments
- EAS 455 Alpine Environments
- EAS 457 Global Change
- EAS 470 Clouds and Storms
- EAS 471 Atmospheric Modelling
- PALEO 414 Paleontology

## Department of Mathematical and Statistical Sciences

### Undergraduate Research Experience June 2004

#### Introduction

The faculty in the Department of Mathematical and Statistical Sciences are researchers of national and international stature. Each year several faculty members hire some of our strongest undergraduate students as research assistants. The background knowledge required for research in the various branches of mathematics is sufficiently broad that it is unusual for an undergraduate student to produce original results. Traditionally, our undergraduates are prepared for mathematical and statistical research through our honors programs. These programs consist of sequences of specialized courses that are designed to provide a broad understanding of the corresponding discipline, to teach abstract reasoning and the skills required for exposition.

#### Courses

All of our honors students are required to take Math 496 in either their third or fourth year. It is in this course that they are introduced to some of the recent research in mathematics. For the most part, the emphasis of the course is to give each student an opportunity to investigate recent work in an area of his/her choosing. Each student prepares a project on some aspect of a particular area of research. At the end of the term each student gives a presentation to the class on the material he/she has read. This has proven to be an excellent preparation for students who intend to go on to graduate work in mathematics or statistics. Our department chair, Dr. Tony Lau, was telling me recently that 3 of the 7 students in the Math 496 class that he taught a few years ago have gone to complete PhDs in the area in which they did their project. It was also announced this recently that one of these students has been named the winner of the 2004 Canadian Mathematical Society's Doctorial Prize. To give the students the attention they need, our Math 496 classes are usually very small. For example, there were two classes of Math 496 with 7 students each the year referred to above. Usually a large percentage of the students who complete one of our honors degrees go on to do graduate work.

Students who take statistics course can get an introduction to research methods as early as their second year. Dr. Kolacz has setup a web site with several case studies for Stat 252 that focus on the statistical methods used in specific published research papers. These studies are broken into several parts to illustrate the steps involved in a statistical study. This method is carried forward to the laboratory projects in Statistics 252 where students are given data and background information for several statistical studies and are then required to analyze the data and make recommendations based on that analysis. They are also questioned about the appropriateness of the design and statistical methods used in the studies.

In Stat 475 students are asked to complete a project that accounts for 20% of their final grade. For this project, each student has to find an appropriate data set, determine a method for analyzing the data and prepare a report on his/her findings. Each student is required to present his/her project to the class. Examples of the best projects are published on the course web site.

### Research Opportunities: Summer and Term Projects

Every year a number of senior undergraduate students are employed to assist faculty members with research projects. Many of these students are funded through the NSERC USRA program. The table below list the NSERC Undergraduate Student Research Awards held by undergraduates in this department during the summers of 2003 and 2004.

<b>Year</b>	<b>Student</b>	<b>Supervisor</b>
<b>2003</b>	Cheng, Carson KS	George Peschke
	Dagenais, Genevieve E	Michael Li
	Hammerlindl, Andrew S	John Bowman
	Khussheed, Fareeza	Sam Shen
	Kublik, Richard A	Gerda De Vries
	Macdonald, Jeremy	Terry Gannon
	McIntyre, Laura A	Michael Li
	Nault, Joshua T	Bruce Sutherland
	Semenjuk, Steven R	Sam Shen
	Stewart, Liam H	Michael Kouritzin
	Van Weelden, Richard M	Michael Kouritzin
	Wasylishen, Stephen J	Bin Han
	Yewchuk, Kerianne P	Bruce Sutherland
<b>2004</b>	Ashburner, Michelle RM	Maziar Shirvani
	Barrington-Leigh, Robert RM	Gerda de Vries
	Khurshed, Fareeza	Sam Shen
	Macdonald Jeremy	Terry Gannon
	McIntyre, Laura A	Sam Shen
	Nault, Joshua T	Bruce Sutherland
	Neitsch, Andrew D	James Muldowney
	Newton, Fraser E	Michael Kouritzin
	Ondrus, Alexander A	Gerald Cliff
	Van Weelden, Richard M	Michael Kouritzin
	Vogt, Ryan A	Mazizr Shirvani

In addition to the opportunity provided by the NSERC USRA program, many of the above students also worked with the indicated supervisor as research assistants during the fall and winter term and were funded by their supervisors' research grants.

The following students who did not receive NSERC USRA were funded by their supervisors' research grants during the 2003-04 academic year. These students are also assisting the indicated supervisor with research projects during the summer of 2004.

<b>Year</b>	<b>Student</b>	<b>Supervisor</b>
2003-04	Beltaos, Andrew	Gerda De Vries & Mark Lewis
	Blackburn, Patrick	Bruce Sutherland

Cochrane, Andrea	Bruce Sutherland
Griffin, Spencer	Hans Kunzle
Hammerlindl, Andrew	John Bowman
Kyba, Patrick	Bruce Sutherland\
Prince, Thomas	John Bowman
Steinberg, David	James Lewis

Some of the research projects the students are assisting with include the following: the design and development of a high-level mathematically oriented graphing interface to the postscript vector graphics language; creating a dataset for the Alberta drought history based on historical documents and using this dataset to assess climate changes in Alberta; determining a mathematical formulation of the optimal surface temperature from weather station data; modeling the effects of radiotherapy in treating ovarian cancer; the preparation of materials for the department's mathematical biology summer school; generating a model of the flight path of a spinning spherical object in the atmosphere (application: golf, tennis and baseball) and modeling the dispersal of pollutants from flares. Several of the students have given talks at conferences and workshops on their work. At least 6 of the undergraduate students named above are co-authors on papers recently submitted for publication by their supervisors.

### **Enhancing the Undergraduate Learning Environment**

Over the last few years, members of the Department of Mathematical and Statistical Sciences have undertaken a number of initiatives to enhance the learning environment of our undergraduate students. Here are a few examples. The labs in many of our first and second year mathematics and statistics courses have been revised and now make substantially use of the visualization and analysis available in modern computer programs. In addition, many of our statistics labs now use actual experimental data so that laboratory assignments mimic real statistical studies. Many of our faculty members have extensive web sites for their courses. These web sites typically contain lecture notes, assignments, assignment solutions, sample exams with answers and students' grades to date. Also a number of instructors have developed elaborate Powerpoint materials with extensive graphic and animation that they use to enhance their lectures. In 2004-05 the department will be offering an internet course for the first time. The materials for that course was designed and developed by Gr. George Peschke with funding from a several sources. Dr. Henryk Kolacz was recently awarded \$94,000 by the Albert government under its access program to develop a program that will enable students to complete and submit their laboratory assignments from home. We have hired an Industrial Internship student for each of the past 5 years to assist instructors with the development of web materials for their courses and help them maintain a web site for each of their courses.

### **Endowed Research Chairs**

The department has three Canada Research Chairs. It has been department policy to release Research Chairs from one half of the normal teaching duties of a continuing faculty member. As a result, Research Chairs normally teach three courses in two years. In 2003-04, the department's Research Chairs taught 2 introductory undergraduate courses and 3 graduate courses.

## Enhancement of Undergraduate Experience: Physics Department

Department of Physics provides undergraduate students with a flavor of research experience in several ways: (i) encouraging the faculty to use their own research as examples in undergraduate courses; (ii) offering project courses specifically designed to give undergraduates an opportunity to conduct an “independent” research; (iii) involve undergraduate students in research during summers and/or through the academic year; (iv) requesting fourth year students to attend weekly departmental colloquia throughout the year; (v) encouraging senior undergraduate students to attend seminars organized by one of four research focus areas in the Department. Below, more detailed information is given concerning each of the points.

- Although it is rather difficult to incorporate modern research results into junior physics or geophysics courses in any prescribed manner some instructors seem to find a way of exposing students in a classroom to research, either their own or by other members of the Department. The course outlines do not formally require doing this and the situation is different in each course and between different sections of the same course.

The examples below do not pretend to give the complete picture:

An in-home research is introduced in a very general way in Phys 114 – a largely qualitative course aimed at students in Arts in which the overall structure and main concepts of physics are examined. For example, the introduction of time and its units is accompanied by the discussion of the shortest accessible time intervals. The pump-probe experimental set up, used in several labs in our Department, is described and accompanied by demonstrations (e.g. an impressive demo of a fan and a strobe light). Discussion of the shortest distances is accompanied by “photographs” of atoms taken in our labs using modern imaging techniques like Transmission Electron Microscopy (TEM) or Scanning Tunneling Microscopy (STM).

In Phys 126 – the algebra based introductory physics course (attended mainly by life sciences students) one of the instructors discusses examples from her own research on applications of mass spectroscopy to isotopic and trace-element analysis of geologic material and from her involvement in sending a mass spectrometer to do the first in-situ analysis of comet dust particles. Also, current research at the University on the generation of Earth’s magnetic field is described. Reversal of the Earth’s magnetic field never fails to fascinate students in this course. In other section of the course, elements of the instructor’s own research at TRIUMF are incorporated when the appropriate topics come up, real life examples of e.g. velocity selectors (with crossed electric and magnetic fields), magnetic moments, solenoids, etc. are described.

One of the instructors in Phys 130 – the introductory physics course for engineering students – attempts to show the students that the material which they learn is not a “dead old physics” but that there are research developments that are both interesting and practical in the areas of physics taught at a junior level. The examples are taken from sources like:

American Institute of Physics Weekly Bulletin (materials with negative refractive index, slowing down and stopping light); Physical Review Focus (use of photonic crystals, photon splitting); Discover/Scientific American (shock waves in astrophysical objects, polarized light in astronomy); and other miscellaneous sources (seismic waves, adaptive optics, Keck telescope, light guide and Doppler effect applications in medicine). The instructor plans to incorporate these items into the WebCT pages for the course (once the copyright issues are resolved). Teaching physics to engineering students at a junior level is a challenge. Majority of students find such “extras” interesting and valuable but there is always a margin of about 10% students who prefer to be taught a bare minimum without “complicating” the course.

In Astro 120 one of the instructors describes her own research on meteorites, asteroids, and early solar processes.

Discussion on the Standard Model of Elementary Particles in Phys 200 (Relativistic aspects of modern physics – a course for non physics students) and in Phys 351 (Relativity – one of the core physics courses) generates usually a lot of excitement when muon decay experiments confirming relativistic time dilation are described. When relativistic energy relations are discussed the instructor tells the students how Dirac got his famous equation by incorporating these relations into quantum mechanics and then introduces the students to his own research in which the Dirac’s equation is used to study atomic nuclei. The students use examples from his research to find the threshold energies in the photo-production of  $\pi$ -mesons. The search for Higgs bosons – the research direction at the forefront of high energy physics in which our colleagues are involved – and the energies needed in this search are also discussed.

In the introductory computational physics course, Phys 234, the need to solve sets on non linear equations for large systems is illustrated by showing original results from a finite element simulation of the magnetosphere. The instructor distributes 3D stereo glasses to show a 3D mesh used in the simulations.

In the course on electron microscopy, Phys 319, the instructor’s own research data are integrated into the course.

In the environmental physics course, Phys 364, the instructor spends extra time to discuss her own experience with stratospheric aerosols and with collection of interplanetary and terrestrial (of volcanic origin) dust particles in the stratosphere. This allows to illustrate the physical behavior of particulate matter in the atmosphere – one of the important topics in the course.

In the introductory space and atmospheric physics course Phys 429 the students are introduced to the ground-based research, to the rocket and spacecraft instrumentation, and to computational modeling in which Canadian space scientists, including the instructor, are involved. In order to help students to visualize the interaction between the solar wind and the Earth’s magnetosphere the instructor’s own magnetohydrodynamical simulations are presented and discussed.

In the senior condensed matter physics course, Phys 417, the instructor's own experimental research data on superconductivity, done at TRIUMF, are used.

In geophysics Geoph 332, 424, 438 the field data collected for research are used in class or as part of the research projects.

- The Department offers presently three undergraduate courses that give students opportunity to research an independent research guided by one or more faculty members. These are: Phys 491 (Advanced Laboratory), Phys 493 (Instrumentation B), and Phys 499 (Special Projects). In order to consolidate the offering, the Department will no longer offer the first two courses but will offer Phys 499 in each term and allow students to take it more than once provided the student works on different research topic each time (preferably under different supervisor). The projects in Phys 499 can be selected from all areas of physics, astrophysics, geophysics, and medical physics. Each student willing to register in Phys 499 is expected to get familiar with the research directions in the Department, contact a prospective supervisor and have the project defined. The coordinators of the course (usually both associate undergraduate and graduate chairs) solicit projects from the Physics faculty but usually the students do a quite good job finding the project and the supervisor independently. Occasionally, the supervisors are selected from the Departments of Mathematics, or Chemistry. The course formally starts with an organizational meeting in the first week of classes. During the term the students conduct independent experimental or theoretical investigations. There are no formal rules concerning the frequency and the form of the student – supervisor interactions. Around the midterm week the students provide a typed two–page progress report to the coordinators of the course and give a 5-minute presentation to fellow students registered in the course. These presentations are not marked and their only aim is to provide an opportunity for the students to prepare a short talk and to speak “in public” without a pressure of being judged. At the end of the term each student provides the course coordinators and his/her own supervisor with a typed report (about 20 pages) and one day is set aside for oral presentations (20 minutes plus 10 minutes for discussion) attended by all other students in the course, by all supervisors, and other faculty members from the Department. The final grade is a prescribed average of the term and the report mark (provided by the supervisor) and the presentation mark (provided by all faculty members present at the talks). The popularity of the course is increasing and in 2004 the number of students registered was 15 – the limit set by the ability to accommodate all presentations in one day.

- Several faculty members involve undergraduate students in their research. In case of the summer research the students are subsidized by “NSERC Student Research Grants” (13 students were awarded these grants for the Summer 2004). Other sources of support are from Alberta Energy Research Institute (one student in summer 2003), NINT (one student in summer 2004 – the research in this case will be the continuation of the Phys 499 project), ICORE, STEP (ask D. Schmitt for the full name), etc. In almost all cases the students' salaries are augmented from the individual researchers' NSERC grants. Usually, the students involved in the research are in their 3rd or 4th year but in exceptional cases younger students are involved too – in one case the 1st year student involved in the

summer research continued on a part time basis during the full academic year to follow. Sometimes, younger students volunteer to be involved in experimental research on a voluntary basis with no or rather symbolic pay. Some of the faculty members in the Department employ students from the Faculty of Engineering or act as supervisors in a project course offered there. Students in Geophysics are involved in field works (Rocky Mountains Foothills, South West British Columbia, Alaska). More time than was given to prepare this report would be needed to collect specific data from all faculty members in the Department and organize them into a detailed report.

- The Department of Physics offers a Colloquium every Friday during the school year. It is a series of talks by a researchers (usually invited from outside) addressed to all members of the Department and aimed at the level appropriate for senior undergraduate students. Fourth year students are expected to attend (graduate students are requested) and, indeed, they attend quite enthusiastically. The topics range from pure physics, astrophysics, through medical physics, physics education, to philosophy and relation between physics and other areas of human activity (like business, arts, etc.).
- The Department of Physics has four research focus areas: Condensed Matter, Subatomic, Astrophysics, and Geophysics. Medical Physics, although outside the formal structure of the Department is also present. The Department offers undergraduate programs in several flavors matching the above areas. Undergraduate students registered in these programs or intending to register are encouraged to attend the seminars and informal research meetings organized within the areas.

Edmonton, May 10, 2004

## **Appendix R - What is the Research Profile Project?**

'Research Makes Sense For Students' is the theme for the Research Profile Project, a new initiative of the Vice-President (Research) in conjunction with the Dean of the Faculty of Graduate Studies and Research. This project will incorporate a series of initiatives to demonstrate to the U of A and external community the importance of research, how research impacts teaching, and the importance of students being involved in research in our continued development as one of the premier research-intensive universities in Canada.

Under the Research Profile Project, profiles will be written of postdoctoral fellows, graduate students, and undergraduate students involved in research projects or activities. As well, the Research Profile Project will be working with individual faculties and departments to help promote their programs, the research being conducted by their faculty and students, and the research opportunities available in their undergraduate and graduate programs.

The Research Profile Project is also provided administrative support to the Working Group on Teaching and Research, which is assessing the current links between teaching and research on campus for undergraduate students and making recommendations about how to improve the undergraduate research experience at the U of A.

All of these activities will be conducted with the goal of informing students, the rest of the U of A community, and the external community (including government) about the critical role played by a research-intensive university in the post-secondary education system. In particular, it will be conducted to raise the awareness of the role of the University of Alberta in the future development of Edmonton, Alberta, Canada, and the world.