

UBC REPORTS

Volume 41, Number 2

January 26, 1995



Going, Going . . .



Gavin Wilson photos

Gone

Bystanders laugh as a student takes a tumble after trying to ride the bucking barrel, one of many events held recently during Aggie Week, sponsored by the Agricultural Sciences Undergraduate Society.

Zoology professor's low-oxygen work earns gold medal

by Gavin Wilson

Staff writer

Peter Hochachka has travelled from the ice floes of Antarctica to the world's highest mountains to discover how people and other mammals adapt to low-oxygen environments.

His research has made the UBC Zoology professor an international leader in comparative physiology and biochemistry, and now it has earned him the 1995 Canada Gold Medal for Science and Engineering.

The award is the highest honour given by the Natural Sciences and Engineering Research Council (NSERC), Canada's largest university research granting agency.

"The Gold Medal award recognizes Dr. Hochachka's extraordinary contributions to Canadian research," said NSERC President Peter Morand, who will present the medal in Ottawa in June.

"He has been described as the world's foremost researcher in adaptational physiology and the dominant creative influence in his field."

Hochachka's groundbreaking studies of the different ways in which animals convert food and oxygen into energy have changed the course of biological research and our understanding of how animals, including humans, adapt to their environment, Morand said.

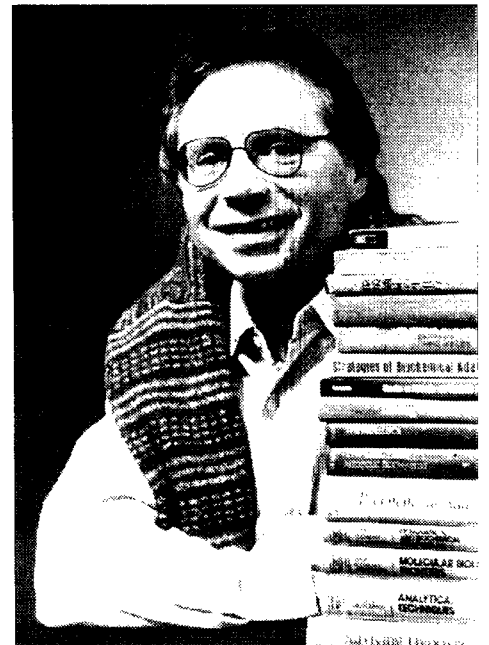
"Thanks to his efforts, UBC has a top research team in a new and exciting field, and an area of growing medical attention," he added.

Hochachka's research focuses on how humans and other mammals adapt to low-oxygen environments, both underwater and at high altitudes.

For example, the Antarctic Weddell seal can hold its breath for well over an hour, diving to depths of 600 metres or more. Himalayan Sherpas can work, without extra oxygen, for prolonged periods at altitudes that would be deadly to most people.

Hochachka looks to uncover the profound physiologic and biochemical adaptations that are key to this ability to function with little or no oxygen.

His insights have come from research on adaptations to oxygen deprivation in many different species — molluscs, fishes, seals, beavers and humans, to name only a few.



Martin Dee photo

Peter Hochachka

"I'm a zoologist. An interest in animals has always driven my research," Hochachka said. "Early in my career, it occurred to me that although evolution and adaptation are themes that go through the life sciences, at the biochemical level there was a dearth of knowledge. I thought this must be a field ripe for exploration."

Hochachka's initial work in the 1970s served as an intellectual "jump start" for the field of comparative physiology and biochemistry, acting as a catalyst for an explosion of research around the world.

Since then, his pioneering studies have advanced the understanding of the metabolic mechanisms underlying environmental adaptations, demonstrated weaknesses in existing theories of metabolic control, and proposed new models to explain how the supply of energy to muscles is regulated.

In recent years, he and his students have been focusing on uncovering the exact molecular and metabolic defense mechanisms against oxygen deprivation. This work has captured the interest of the medical community because of the implications for diseases caused by or complicated by lack of oxygen. Hochachka is one of the few zoology professors to ever lecture at Harvard Medical School.

See **MEDAL** Page 2

1995 Honorary Degrees

Pilot, actor among 13 degree recipients

by Connie Filletti

Staff writer

University of British Columbia graduates **Wendy Clay**, surgeon general of the Canadian Forces, and actor **Joy Coghill**, are among 13 distinguished individuals to be awarded honorary degrees by UBC this year.

Clay, a 26-year veteran of the Canadian Forces, began her military career while studying medicine at UBC in the 1960s. A pilot and flight surgeon, she is currently the only female general in the Canadian military.

In addition to an award-winning career as an actor, Coghill enjoys continuing success as a director, theatre producer, artistic director and teacher. Her influence on all aspects of theatre in Canada was recognized with

the Order of Canada, presented to her in 1991.

Other eminent UBC graduates receiving honorary degrees are: **William Esson**, chief justice of the Supreme Court of British Columbia; **Thomas Franck**, director of New York University's Centre for International Studies; **Jack Hodgins**, one of Canada's finest fiction writers; and **Gloria Webster**, a leader in First Nation's cultural affairs.

Honorary degrees will also be conferred on: **Wan Kyoo Cho**, president of the Bioindustry Association of Korea; **Hong Tao Chow**, national policy advisor to the president of the Republic of China and a leader in establishing the annual Canada-Taiwan Higher Education Conference; **Lealie Dan**, founder and president of

See **DEGREE** Page 2



Joy Coghill

Inside

Common Thread

3

Offbeat: A recent Asia Pacific meeting looks like a UBC alumni reunion

Baby Talk

4

A child's difficulty with language and speech may indicate other problems

Smoke Screen

5

Forum: Behind the images, the tobacco industry is simply pushing drugs

Forest Futures

12

Profile: Prof. Gene Namkoong's work on genetic diversity gains recognition

News Digest

Traffic changes spell relief

Editor:

Re: Letter "Catering to cars a mistake," *UBC Reports*, Nov. 17, 1994. The Main Campus Plan was approved in 1992. The Strategy for Roads took into account the existing chaotic road system and the need to manage increasing demands for better access to new buildings.

Until last summer, Health Sciences, East, Main, West and Lower malls all had varying and sometimes confusing traffic regulations. The regulations were challenged and exploited daily by couriers, office suppliers, taxis, fast food vendors, staff, faculty and students. Additionally, some visitors to the campus were confused and frustrated by the complex system of one-way and dead end service roads.

Medal

Continued from Page 1

Of special interest to physicians is his work on adaptations to chronic high altitude oxygen deprivation in native people.

Hochachka's research team was the first to study Quechuas from the Andes and Sherpas from the Himalayas in modern university and hospital laboratories.

The team has identified certain heart, brain and muscle adaptations that allow Quechuas and Sherpas to function normally, even thrive, at very high altitudes. This work continues as part of a major research effort supported by a Collaborative Project Grant from NSERC.

While Hochachka encourages and enjoys the dialogue that has grown up between his discipline and clinical medicine, he emphasizes that the true essence of his work is its fundamental nature.

"What I'm doing is fundamental science — studying and understanding adaptations," he said. "There's still an enormous step to be taken by science before we can really talk about applications in medicine."

Degree

Continued from Page 1

Novopharm Ltd. and founder of the Canadian Medicine Aid Program which provides medical assistance to emerging nations; **Garth Drabinsky**, who has helped put Canada centre stage, alongside London and Broadway, in live theatre with his productions of *Kiss of the Spider Woman* and *Showboat*; **Ivar Ekeland**, former president of the University of Paris-Dauphine, who was instrumental in facilitating the opening of Palestinian universities in the West Bank and Gaza; and **Vincent Stogan**, cultural and spiritual leader of the Musqueam/Sto:Lo Nation and one of the principal resident elders at UBC's First Nations Longhouse.

The honorary degrees will be awarded during UBC's two graduation ceremonies: Spring Congregation, May 30 to June 2 and Fall Congregation, Nov. 23.

Determined drivers were often observed cruising down Main Mall or quickly traversing University Boulevard from the Bookstore to West Mall. The road system was further compromised by the need to allow service vehicles to access buildings fronting Main Mall. Parking and Security personnel were constantly required to make judgements on the validity of drivers' rights to be on service roads. Staff and students with disabilities were also required to utilize this same confusing system. It was not surprising that some (drivers) chose to ignore regulations for convenient pick-up of passengers in inclement weather. Also, it was common to witness drivers speeding down West Mall or taxis dropping off passengers outside the Henry Angus Building. Finally, the increasing building density strained the existing road circulation to the point of being unmanageable. It was clear a new road system was urgently required.

The road strategies in the Main Campus Plan required accessibility to only those destinations that absolutely needed access by vehicles and

also required acknowledgement that the inner campus is a special (sacrosanct) place for pedestrians. The yellow post barriers with no entry signage virtually eliminated campus core traffic while the ring road system — West Mall, Agronomy, East Mall and Crescent Road — was clearly a logical choice requiring only the removal of the largely redundant no entry signs in a few sections. However to ensure the automobile did not automatically become "king" again, new road speed signs and speed buttons were installed. (Traffic was audited before and after the recent changes and average speed reductions of 30 per cent have been recorded.)

In summary, the logic of the decision was based on the need to adapt an unmanageable road system to meet the new conditions of an increasingly densely built campus while enhancing the pedestrian campus core.

David Grigg
Manager, Engineering Services
UBC Campus Planning and Development



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UBC Reports is published twice monthly (monthly in December, June, July and August) for the entire university community by the UBC Community Relations Office, 207-6328 Memorial Rd., Vancouver B.C., V6T 1Z2.

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Students protest Axworthy proposal

by Gavin Wilson

Staff writer

Tens of thousands of Canadian students were expected to join a nationwide protest Jan. 25 of federal government proposals that would cause tuition fees to soar three times their current level.

The Canadian Federation of Students called on its members to boycott classes for the day, but UBC's Alma Mater Society decided against endorsing a strike in favour of organizing a campus rally.

The AMS anticipated that more than 2,500 students would take part in the rally at the Student Union Building plaza, called to condemn the proposals outlined in Human Resources Minister Lloyd Axworthy's green paper on social security.

UBC students were also expected to take part in a citywide rally in downtown Vancouver later in the day.

Students launched the protest in response to the Axworthy green paper, which proposed dropping federal funding for post-secondary education in favour of a massive cash infusion for an income-contingent loan repayment plan.

University administrators, faculty and students have warned that this would drastically increase tuition fees and harm the infrastructure needed for research and teaching.

Meanwhile, in an earlier meeting in

Ottawa, Axworthy told a group of graduate student leaders, including UBC's Graduate Student Society President Vighen Pacradouni, that he may consider offering cash grants to students as part of an expanded loan system.

Pacradouni said it was the first time that the minister had publicly hinted at offering grants to offset the increased student loans the new system would bring.

The student leaders told Axworthy that graduate students spend more time in school and would face even higher debt loads on graduating than undergraduates.

The result could be a brain drain as Canadian graduate students leave for the United States where endowments cover the cost of tuition fees for many students, they warned.

The students told Axworthy they are not opposed to financial aid reform if its aim is to root out inefficiencies or abuses by borrowers and lending institutions.

But it is a mistake to link financial aid reform to funding cuts, they said.

"If Axworthy is looking at making universities more efficient, his proposals don't necessarily get at that," Pacradouni said.

Axworthy told the graduate students that if he thought the green paper proposals would result in a significant decrease in accessibility to post-secondary education, he would not have proposed them.



D. Thomson photo

Much Mochi

Sushi, sashimi, soba and mochi (sticky rice) cakes were some of the delicacies served at the Asian Centre's Oshogatsu event earlier this month. Organizers estimate that 1,000 visitors attended the Japanese New Year's celebration.

Offbeat

by staff writers

The Dept. of Foreign Affairs and International Trade held its Asia Pacific "Heads of Mission" meeting on campus earlier this month. The gathering could have easily been billed the "UBC Alumni Heads of Mission." Graduates in attendance included: **John Bell**, High Commissioner, Malaysia (BCom '62); International Trade Minister **Roy MacLaren** (BA '55); **Maurice Hladik**, Charge d'affaires, Korea (MSc '69); **John Paynter**, Ambassador, China (BA '62); **Raymond Chan**, Secretary of State, Asia Pacific (BSc '77); **John Curtis**, Senior Policy Advisor, Trade and Economic Policy Branch (BA '63); **Hugh Stephens**, Resource Planning and Management Secretariat (BA '67); **Raphael Girard**, Asst. Deputy Minister, International Service (BA '63); Rear Admiral **Bruce Johnston**, Commander, Maritime Forces Pacific (BA '64); and **John MacDonald**, President, MacDonald Dettwiler and Associates, Ltd. (BSc '59).

....

The front-page picture of the Jan. 12 issue of *UBC Reports* showed graduate student Noel Genoway preparing the Asian Centre bell for a ceremonial New Year's ringing. The bell is traditionally rung 108 times on New Year's eve in a symbolic dispelling of the 108 earthly desires which, according to Buddhist teachings, plague human beings. In explaining the 108 "Bonno," as they are called in Japanese, Keith Snyder of Tozenji Buddhist Temple in Coquitlam points out that a more accurate translation would be "negative mental states" or "hindrances to enlightenment." The top 20 hindrances are:

1. greed
2. anger
3. ignorance
4. pride
5. doubt
6. belief in an eternal self
7. belief that there either is or is not an afterlife
8. denying the principle of cause and effect
9. upholding the previous three as the truth
10. undertaking difficult practices in vain for the sake of what is not the way to liberation
11. lack of repentance
12. lack of shame
13. envy
14. covetousness
15. regret for having done something good in the past, or for not having done something bad
16. cloudiness of thought
17. being rash
18. melancholy
19. petty anger
20. concealing one's past

Snyder adds that the first three hindrances are the so-called "three poisons" from which all other negative mental states spring. Perhaps that is why the bell ringer at the Asian Centre event limited his efforts to a few tolls rather than the traditional 108.

Parents, coaches asked to help with sports ethics

by Abe Hefter

Staff writer

Three UBC researchers are taking a grassroots approach toward helping establish a more complete set of ethical guidelines for Canadian amateur sport.

Counselling Psychology professors Colleen Haney and Bonnie Long and research assistant Gayle Howell Jones plan to survey approximately 500 coaches, athletes and parents of athletes to get their views on such issues as cheating, fair play and eligibility.

"This is our way of enhancing the ethical guidelines already established by the various sports governing bodies across Canada, like Sport Canada and the Canadian Coaching Association," said Howell Jones.

To initially explore the perception of ethical issues in sport, Haney and Howell Jones interviewed coaches, athletes and parents of athletes in a series of focus group studies across the Lower Mainland. Each of the 12 focus groups looked at a particular sport.

"We covered a whole range of competi-

tive sports, both team and individual, from martial arts to basketball," said Howell Jones. "Each focus group consisted of three to six people and included athletes from all levels of competition, their parents, and coaches from all levels of certification.

"Once we have established the prevailing themes or issues that emerged from these focus group studies, we will formulate a questionnaire that will be distributed throughout B.C. and eastern Canada."

Haney and Howell Jones have been involved with focus group studies since the fall. With the questionnaire expected to be completed within the next two months, they are now looking for approximately 500 athletes, their parents, and coaches to take part in the study.

"Those who take the time to answer these questions will be guaranteed anonymity," said Howell Jones. "The results of the questionnaire will be presented at various conferences and coaching clinics."

If you would like to take part in this study, contact the project office at 222-0870.

Two-day health fair examines human sexuality issues

by Connie Filletti

Staff writer

Healthy sexuality is the focus of a two-day fair taking place Jan. 26 and 27 in the concourse of the Student Union Building between 11:30 a.m. and 2:30 p.m.

The Sexual Evolution, a presentation of Health Education Outreach, explores how we can move toward healthy sexuality by involving the whole person in sexual expression.

"Sexuality is more about who we are than what we do," said Pearl Wierenga, UBC's health education co-ordinator.

"It includes everything that makes us

male or female, what we are taught, the roles we play in society, what we think of our bodies, how we feel about ourselves, how we relate to others and so much more."

Campus groups and community resource services will be represented at several information booths. Participating campus units include the Women Students' Office, Student Health Services and Counselling Services. Off-campus groups include AIDS Vancouver, Planned Parenthood and the Eating Disorder Resource Centre of B.C.

For more information about the Sexual Evolution, call 822-4858.

Language acquisition research:

Early speech patterns may indicate hidden problems

by Connie Filletti

Staff writer

Toddlers who experience trouble learning how to talk may have a serious developmental problem such as autism or cerebral palsy, a UBC speech-language pathologist says.

"Speech and language difficulties should be viewed always as a symptom of something else, which is why it is important to pay attention to them early in life," says Judith Johnston, director of UBC's School of Audiology and Speech Sciences.

Johnston, who has been researching language acquisition for 35 years, said that although children typically begin learning about speech from birth, they can vary in age from nine to 18 months before forming their first words.

This point in development is often difficult to determine because parents vary in what they count as first words. This makes it difficult for them to determine if their child has a speech problem, Johnston said.

She explained that one of the major differences in the way parents view first words is that some parents pay attention to how a child uses words and others don't.

"What parents often fail to notice is that their child only uses a word in one particular place with one particular object or situation. Other children will be using their early words in a more general manner."

She stressed that although first words are often not a good indicator of a child's success in language learning, the expectations by age two are much clearer.

Research indicates that a two-year-old child should have a vocabulary of at least 50 words, or be combining words into short phrases of two or three words, Johnston said.

About 84 per cent of children meet that criterion.

"If children have not reached that milestone by 24 months they are at serious risk for language-learning problems, and those problems may indicate other social, physical or cognitive difficulties. It would not be a good idea to assume that everything is fine because a child is still young," she said.

Johnston said the most common problem children have is learning the sound system of the language, that is, figuring out what sounds are important for meaning and how they pattern. They may use an "f" sound instead of an "s" sound, for example, or leave sounds off when ever they occur at the end of a word.

Mild problems of this sort that do not interfere with intelligibility are not a matter of concern until a child is well into primary grades. However, widespread difficulty with speech sounds, especially when this is combined with other sorts of speech or language problems, does warrant attention even in preschoolers.

Other prevalent difficulties

can involve learning grammar and vocabulary or processing language once it is learned. Children with this latter difficulty may forget verb endings when they are expressing complex ideas, for example, or fail to understand speech that refers to something out of context.

Compared to problems with speech sounds, these problems with grammar or processing are more difficult to detect and may have more serious implications, Johnston said.

"I'm not talking about learning to speak correctly, but learning to speak in an organized communicative manner."



Judith Johnston

"Children with difficulty learning to speak are rarely children who have been deprived of language input. These problems are not a result of being neglected or ignored. Of a whole series of possible explanations, this one is at the end of the list."

-Judith Johnston

"Grammar is the heart of language. Without a way to put words together systematically, you can't express ideas. Children who have difficulty learning how language is organized are not learning grammar and, consequently, are fundamentally not learning language."

Johnston said there is no doubt that children who experience language delays usually suffer emotional and social consequences.

They often feel confused and frustrated if they can't communicate ideas and feelings easily and successfully to family members, and their ability to develop good social relationships is hampered if they can't understand what people are saying to them.

She added that there are intellectual consequences as well.

"We normally use language to think. It is a wonderful tool for solving complicated problems. Children who are not facile with language are hindered in higher-level cognition," Johnston said.

"Research done by myself and others has shown that children who have intellectual development near normal at age four but who have serious language impairments will, by the time they are 10 or 11, be two to three years behind in concept development."

Johnston feels that although parents should always try to communicate well with even very young children, be attentive and speak in language that is appropriate to their level, they should not feel that they should have spoken more or differently if their child is discovered to have a speech or language problem.

"Children with difficulty learning to speak are rarely children who have been deprived of language input," Johnston said. "These problems are not a result of being neglected or ignored. Of a whole series of possible explanations, this one is at the end of the list."

She does advise parents to seek the help of speech language pathologists who are on staff at most school districts in B.C. and available through local health units.

"Changes in clinical practice during the last decade have led to more normative research on very young children," Johnston said.

"This has enabled speech language pathologists to identify children with delays in language acquisition early, and to make these judgements with a great deal of assurance."

Johnston believes that we need to make speech and language interventions available to more young children and to draw attention to the problem through public education. People need to recognize that human speech is a product of active learning.

"People think of language learning as effortless and automatic, a process that doesn't take any particular skill or ability," she said.

"Language learning actually entails very complicated cognitive mechanisms. It involves more than merely repeating what people say to you. If adults realized this they would understand that difficulty learning to speak is a serious problem."

Johnston also hopes that more family physicians will acknowledge that it is possible to identify children with speech problems early, and that effective treatments are available.

Most of all, she cautioned against inaction.

"We need to dispel the myth that still pervades our society that if you just wait long enough everything will turn out fine. The wait-and-see strategy is not a wise one any longer for children with speech and language delays. The consequences are too pervasive and long-lasting to be treated in that fashion."



PRESIDENT'S SERVICE AWARD FOR EXCELLENCE 1995

Nominations are now being taken for this year's President's Service Award for Excellence.

Up to five awards are presented each year and the winners will each receive an engraved gold medal and \$5,000.

The deadline for nominations is FEBRUARY 28.

Entry forms and brochures have been mailed to all departments - for extra forms or more information, call the Ceremonies Office at 822-2484

The President's Advisory Committee on Lectures

DAVID STRAUSS

Architect, Seattle

Dream and Spectacle in the Project of Fifteenth Century Ferrara and the Piazza Nuova

Monday, January 30 at 12:30 PM
Lecture in Lasserre 104

Urbanism in Fifteenth Century North Italian City States

Monday, January 30 at 4:30 PM
Seminar in Recreation Lounge, Green College

Part of the Course Sponsored by the Department of Hispanic and Italian Studies and the UBC Renaissance Seminar
The Interplay of the Arts in Renaissance Mantua and Ferrara

PROFESSOR CYNTHIA BOUTON

Department of History, Texas A&M University

In Hunger's Terrible Shadow: Changing Gender Roles in French Food Riots and Society, 1690s-1850s

Monday, January 30 - 12:30 PM
Lecture in Buchanan A-204

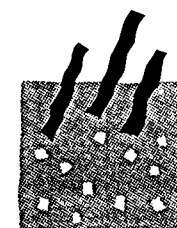
Comparative History: A Vantage Point on Gendered Behaviour in Food Riots

Monday, January 30 - 4:30-6:00 PM
Buchanan Penthouse - Reception follows

Part of Speaker Series, Spring 1995
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The gala Awards Dinner is May 18, 1995 at the Hyatt Regency.

For information, contact the Public Relations Dept. at the **VANCOUVER YWCA, 895-5765.**

Forum

Tricks of the tobacco trade

by Richard Pollay

UBC Prof. Richard Pollay of the Faculty of Commerce and Business Administration teaches advertising and marketing management dealing with corporate decisions on marketing and consumer research, advertising strategy and implementation. He also consults for the U.S. Surgeon General's Office on Smoking and Health. This is an excerpt from an address he gave at the University of Massachusetts. Jan. 16-22 was National Non-Smoking Week in Canada.

Nicotine is truly addictive, a description well established by the U.S. Surgeon General among others. Its use is often fatal when used exactly as intended, in normal use. Smoking is the most preventable cause of death in the U.S. Current estimates indicate that this year 430,000 American smokers will die from their nicotine addiction — more than traffic accidents, suicide, murder, AIDS, fire, crack, cocaine, and heroin all combined!

Cigarettes are deadly, not only because of cancer and emphysema. Even more die from circulatory problems, heart attacks and strokes. There are also many non-lethal effects. Doctor's see the evidence of nicotine addiction every day. More than 20 Surgeon General Reports over more than 25 years have summarized literally tens of thousands of studies. There is no major controversy among health authorities. They have every reason to tell us the truth, and no reason to lie.

The industry, on the other hand, has lots of reason to lie, if only to protect their record profits year after year. The Philip Morris Company, for example, seller of Marlboro and Virginia Slims, will take profit estimated at more than \$5 million per day, and it's estimated that half of the profits come from customers addicted as kids.

The typical starter is 12, 13, or 14 years old and naive. Corporate company documents recognize both the addiction and the naiveté. This is the first and a very basic reason why advertising is important. Many people rationalize that "if it was really dangerous, government wouldn't let it be advertised." But it is dangerous, and government does let it be promoted.

Cigarette promotional spending has more than tripled in recent years, even adjusting for inflation. The top 10 outdoor advertisers are all cigarette brands, and at the last count I heard, 320,000 new billboards had been erected since the Highway Beautification Act. Cigarette companies spend over \$4 billion a year promoting smoking. That's more than \$10 million a day, or almost a half a million dollars every hour. How is this enormous amount justified?

The purpose of cigarette advertis-

ing and promotion is, of course, ultimately to promote sales and profits. This is done by influencing perceptions and attitudes toward cigarettes. Cigarettes are defined by company documents as an ideal drug delivery system - portable, convenient, self-administered. We could add to this definition: "with a fire at one end, and a sucker on the other end." But remember that the sucker deserves our sympathy, because they were likely suckered to start and get addicted while very young, long before the legal age of consenting adulthood.

The industry claims that the only purpose, and the only effect, of all of this advertising is on brand switchers. But very few people actually switch brands. These days only seven to 10 per cent of smokers switch in any year. Most switchers are older, health concerned smokers and cannot justify the enormous amount of money spent. Switchers are too few, too frail and too fickle.

Regulation has either been inept or ineffective, almost totally undermined by lawyers, lobbyists and advertising creativity. The nicotine industry acts with impunity, earning record profits, and has never been forced to pay a single penny to a health victim.

Information and images are presented to shape perceptions, attitudes and to reinforce the psychological denial that surrounds addiction.

Images make smoking seem a sexy and stylish adult custom. Images make brands symbolically male or female. Images make smokers seem healthy.

- Richard Pollay

Cigarette ads and packages both suppress information about ingredients and effects. Heavy ad spending inhibits and distorts the information we might otherwise get from the news. Images make smoking seem a sexy and stylish adult custom. Images make

brands symbolically male or female. Images make smokers seem healthy. Images make smoking seem commonplace and socially approved. Images make cigarettes a symbol of adult independence to attract young starters.

The industry denies all of this. Despite claims to the contrary, some ads target young starters, and others offer false reassurance to the health concerned "pre-quiters." The industry is very poorly regulated, despite its complaints.

There is a lot that could be done to demarket cigarettes. We could quit selling cigarettes cheaply (raise the price). We could quit distributing them widely (prescription only). We could quit fancy packaging (plain packages, big warning). At the least, we should quit fooling ourselves that the advertising images and industry are innocent and innocuous. The blunt truth is that nicotine industry advertising is promoting and pushing a deadly, addictive drug, even though it may not look like drug pushing when done by executives in three piece suits and with beautiful advertising,

Pacific Post keeps tabs on Asian business, trends

by Abe Heffer

Staff writer

A group of UBC student journalists is building bridges to Asian markets out of a tiny office in the basement of the Student Union Building.

With an editorial staff comprising mostly UBC students and alumni, Pacific Post hit the stands on Dec. 16.

Billed as a newspaper that will keep readers in touch with trends and issues affecting Pacific Rim business, the twice-monthly newspaper is the brainchild of UBC alumnus Chung Wong.

"The paper's role is to educate readers in the Lower Mainland on growing Asian market economies affecting local affairs and dominating world development," said Wong, who was bitten by the newspaper bug as a writer with the Ubysey in 1988.

"At the same time, Pacific Post gives students and alumni the opportunity to learn more about career opportunities in Asia by cultivating an understanding of the Asian markets that are affecting UBC specifically and British Columbia in general."

Wong first began building editorial bridges to Asia while attending UBC as editor of POW (Pacific of the West) in 1992. He sharpened POW's general focus and the newspaper was reborn as Pacific Post, drawing on the skills of a core group that includes editor John Gray and managing editor Gregor Young.

The premier issue of Pacific Post included stories on Malaysian billionaire Robert Kuok, Prime Minister Jean Chretien's trip to China, and investment opportunities in Shanghai.



Abe Heffer photo

Pacific Post is the brainchild of UBC alumnus and former Ubysey writer Chung Wong.

Pacific Post's circulation stands at 15,000. The newspaper is available at retail outlets, hotels, and shopping malls at approximately 100 downtown Vancouver locations. In addition, 3,100 issues are inserted in Ming Pao Daily, a Chinese-language newspaper which serves the Lower Mainland; 3,800 issues are distributed at no cost to downtown Vancouver offices; and another 1,000 are distributed in Asia.

The newspaper includes a full-time business manager and advertising representative, and has a marketing office in downtown Vancouver.

Writes Wong in his Jan. 6 editorial: "As long as the support continues, the wheels will be turning at this paper."

News Digest

UBC's Senate, at its Jan. 18 meeting, approved a new calendar statement on transfer credit policy to advise applicants that not all courses taken in degree programs at other post-secondary institutions may be given transfer credit towards a UBC degree program.

Senate endorsed a one-year suspension of the combined Bachelor of Laws (LLB) and Master of Business Administration (MBA) program because of extensive revisions being made to the MBA program.

The Faculty of Pharmaceutical Sciences has been granted four new graduate courses in toxicology. The faculty has identified toxicology as an area of increasing importance in society and cited a large gap between the numbers of toxicologists being trained and positions available in government and industry where informed decisions are made on environmental and other toxicological questions.

Fourteen individuals and groups are the first recipients of the Michael Smith Awards for Science Promotion. The nationwide competition is named after Michael Smith, director of UBC's Biotechnology Laboratory and co-recipient of the Nobel Prize in Chemistry in 1993. Smith donated his cash award of about \$500,000 to support schizophrenia research and science promotion.

Among the winners are the Calgary Science Network, Le Club des debrouillards, Acadia University and the Newfoundland and Labrador chapter of Women in Science and Engineering.

The Michael Smith Awards for Science Promotion were presented by Industry Canada during a ceremony held recently in Ottawa.

The Science Council of British Columbia is seeking nominations for its annual Science and Engineering Awards.

Established in 1980, the awards are given in the categories of industrial innovation, engineering and applied sciences, health sciences, natural sciences, science communication, entrepreneurial science and overall career achievement in science and technology.

The deadline for nominations is March 31, 1995.

For more information, call Jennifer Wolfe or Rhonda Livingstone at 438-2752.

Calendar

January 29 through February 11

Monday, Jan. 30

History Lecture

In Hunger's Terrible Shadow: Changing Gender Roles In French Food Riots/Society, 1690s-1850s. Dr. Cynthia Bouton, professor, History, Texas A & M U. Buchanan A-204 at 12:30pm. Call 822-5748.

President's Advisory Committee on Lectures

Dream And Spectacle In The Project Of 15th Century Ferrara And The Piazza Nuova. David Strauss, architect, Seattle. Lasserre 104 at 12:30pm. Call 822-4436.

President's Advisory Committee on Lectures

Urbanism In 15th Century North Italian City States. David Strauss, architect, Seattle. Green College recreation lounge at 4:30pm. Call 822-4436.

Red Cross Blood Donor Clinic

Totem Park Commons Block Ballroom from 3-9pm. Call 879-6001 loc. 418.

Mechanical Engineering Seminar

On Energy Dissipation Through Liquid Sloshing And Suppression Of Wind Induced Instabilities. Andreas Albat, PhD student. CEME 1202 from 3:30-4:30pm. Refreshments. Call 822-6671.

Biochemistry Seminar

Matrix Metalloproteinases: Regulation, Mutagenesis And Function. Dr. Chris Overall, Dentistry. IRC #4 at 3:45pm. Refreshments at 3:30pm. Call 822-9871.

Comparative Physiology Seminar

Fetal Drug Deposition & Effects. Dan Rurak, BC Research Institute for Child/Family Health. BioSciences 2449 at 4:30pm. Call Dr. Randall at 822-5709.

Tuesday, Jan. 31

Red Cross Blood Donor Clinic

IRC Main Lobby from 9:30am-3:30pm. Call 879-6001 loc. 418.

Animal Science Seminar Series

Techniques For Detecting Macrophage Activity In Fish. Jimmy Pegg, MSc student. MacMillan 256 at 12:30pm. Refreshments. Call 822-4593.

Pharmaceutical Sciences Seminar

Multi-media Teaching Tools. Colin Ticoak, assoc. member of Pharmaceutical Chemistry, asst. professor of Radiology, Medicine. IRC #3 at 12:30pm. Call 822-4645.

Botany Seminar

Oleosin Gene Expression And Application In The Production Of Antibody Fragments In Canola. Dr. Aine Plant, Biological Science, SFU. BioSciences 2000 from 12:30-1:30pm. Call 822-2133.

Oceanography Seminar

Dynamic Vs Thermodynamic Effects Of Greenhouse Gas Warming. Dr. George Boer, Canadian Centre for Climate Modelling/Analysis, Atmospheric Environment Service, UVic. BioSciences 1465 at 3:30pm. Call 822-4511.

President's Advisory Committee On Lectures

Comparative History: A Vantage Point On Gendered Behaviour In Food Riots. Dr. Cynthia Bouton, professor, History, Texas A & M U. Buchanan Penthouse from 4:30-6pm. Call 822-5748.

Green College Seminar

Legal Culture In The People's Republic Of China. Pitman Potter, Centre for Asian Legal Studies. Law. Green College coach house at 5:30pm. Call 822-8660.

Wednesday, Feb. 1

Orthopaedics Grand Rounds

IML - 2 The Spinal Cord In Space. Chair: Dr. R.W. McGraw. Speakers: Dr. John Ledsome/Dr. Peter Wing/Team. Vancouver Hosp/HSC Eye Care Centre auditorium at 7am. Call 875-4272.

Financial Planning: Noon-Hour Lecture Series

UBC Faculty Pension Investments. Rob Heinkel/Christie McLeod, Faculty Pension Plan. Angus 110 from 12:30-1:20pm. Sponsored by Faculty Association/Continuing Studies. Call 822-1433.

Microbiology/Immunology Seminar

Issues In Antiviral Chemotherapy. Dr. Stephen Sacks, Infectious Diseases. Wesbrook 201 from 12-1:30pm. Call 822-3308.

Music Concert

Chamber Music For One Player with pianist Laurent Philippe. Music recital hall at 12:30pm. Admission \$2.50. Call 822-5574.

Forest Sciences Seminar Series

Soil Microorganisms And Tree Growth: The Below-ground Connection. Dr. Chris Chanway, Forest Sciences. MacMillan 160 from 12:30-1:30pm. Call 822-9377.

Applied Mathematics Colloquium

Boundary Layer Resolving Spectral Methods. Dr. Tao Tang, Mathematics, SFU. Math 203 at 3:30pm. Call 822-4584.

Women's Studies Lecture

Earth Honoring: Western Desires And Indigenous Knowledges. Jane Jacobs. Women's Studies Centre from 3:30-5pm. Call 822-9171.

Pharmaceutical Sciences Seminar

Tamoxifen For Primary Prevention Of Breast Cancer. Robin O'Brien, PharmD. student, Clinical Pharmacy. Vancouver Hosp/HSC UBC Pavilion G-279 from 4-5pm. Call 822-4645.

Respiratory Seminar Series

Aids And The Lung. Dr. Lindsay Lawson, clinical assoc. professor, Medicine. Vancouver Hosp/HSC Laurel Pavilion Taylor-Fidler conference room from 5-6pm. Call 822-7069.

Green College Punishment/Crime Series

The Cultures Of Punishment And Crime. Richard Ericson, Law. Anthropology/Sociology. Green College coach house at 5:30pm. Call 822-8660.

Thursday, Feb. 2

Pathology/Laboratory Medicine Lecture

Residents Presentations. Drs. R. Tan/A. Ostry. Vancouver Hosp/

HSC Eye Care Centre auditorium at 8am. Call 875-4577.

Computer Science Invited Speaker Seminar Series

Repository Systems. Dr. Philip Bernstein, Microsoft Corp. CCSR/CS 208 from 11:30am-1pm. Call 822-0557.

Political Science Lecture

The Prospects For Democracy In Russia. Prof. Alexander Balitsky, Khabarovsk State Pedagogical University, Buchanan B218 from 12:30-1:30pm. Call 822-2717.

Fine Arts Gallery Lecture/Discussion

The Body And Restraints Social, Erotic And Aesthetic. Carolee Schneemann. Lasserre 104 at 12:30pm. Call 822-2759.

Faculty Development Seminar

A Brown Bag Work Group: Developing New Teaching Skills. Gail Riddell and colleagues. David Lam basement seminar room from 12:30-2pm. Call 822-9149. Repeated on Feb. 9.

Physics Colloquium

Gen: George Green. D. Mary Cannell. George Green Memorial Fund. Hennings 201 at 4pm. Call 822-3853.

Green College Seminar

Twins - Did You Start Off As One? Dr. Judith Hall, Pediatrics/Medical Genetics. Green College coach house at 5:30pm. Call 822-8660.

Friday, Feb. 3

Pediatrics Grand Rounds

The Pediatrician's Role In Cancer Management In The 90s. Dr. Sheila Pritchard, clinical assoc. professor; Dr. Ron Anderson, clinical assist. professor; Dr. Jeff Davis, director, Bone Marrow Transplant; Cindy Stutzer, clinical nurse specialist, Oncology/Hematology. GF Strong auditorium at 9am. Call 875-2307.

Health Care/Epidemiology Rounds

Sensing Ambient Air Quality Objectives. Dr. Ray Copes, medical specialist, Ministry of Health. Mather 253 from 9-10am. Call 822-2772.

Occupational Hygiene Program Seminar

Environmental Exposure Modeling: The EcoLate Software Program. Dr. Frank Gobas, professor, Research/Environmental Management, SFU. CEME 1202 from 12:30-1:30pm. Call 822-9595.

Pharmaceutical Sciences Seminar

Studies On Synaptic Plasticity. Dr. B. Sastry, Pharmacology/Therapeutics. IRC #1 from 12:30-1:30pm. Call 822-4645.

Fisheries Centre Seminar

Sustainable Communities Off/Fish/Fishers. Memorial University Eco-Research Project. Dr. Rosemary Ommers, Memorial U. of Newfoundland. Fisheries Centre Ralf Yorke room Hut B-8 from 1:30-2:30pm. Call 822-2731.

Joint Universities

Mathematics/Statistics Day One Fish, Two Fish, Red Fish, Blue Fish: Counting Fish: Giuga's Impossibly Hard Conjecture On Primality: Diffusions On Fractal State Spaces. C. Schwarz; J.M. Borwein; M.T. Barlow. SFU

Halpern Centre main campus from 2:30-5:30pm. Sponsored by UBC/SFU/UVic. RSVP by Jan. 27. Call Judy Currie at 291-4238.

Chemical Engineering Weekly Seminar

Neural Network And Epidemiology. Dr. Tony Plate, postdoctoral fellow. ChemEngineering 206 at 3:30pm. Coffee. Call 822-3238.

Theoretical Chemistry Seminars

Theory Of Resonances. G. Wei. Chemistry 402 central wing at 4pm. Call 822-3997.

Saturday, Feb. 4

Vancouver Institute Lecture

Getting To Know Canada. Dr. Jill Ker Conway, former president, Smith College. Amherst, Mass. IRC #2 at 8:15pm. Call 822-3131.

Sunday, Feb. 5

MOA Classical Indian Dance

Spotlight On India. MOA great hall at 2pm. Free with Museum admission. Call 822-4604.

Monday, Feb. 6

Mechanical Engineering Seminar

A Fatigue Crack Initiation Model For Composite Patches On Metallic Aircraft Structures. Andreas Albat, PhD student. CEME 1202 from 3:30-4:30pm. Refreshments. Call 822-6671.

1995 Comparative Physiology Seminar

Physiological Energetics Of Developing Marine Fish Embryos And Larvae. Dr. Nigel Finn, Zoology, Bergen, Norway. BioSciences 2449 at 4:30pm. Call Dr. Hochachka at 822-3372.

Green College Seminar

The Coming Quebec Referendum. H. Alan Cairns/R. Kenneth Carty, Political Science. Green College coach house at 5:30pm. Call 822-8660.

Tuesday, Feb. 7

Faculty Women's Club Meeting

Simple Financial Strategies: Minimize Income Tax/Maximize Income. James Rogers. Cecil Green Park main floor at 10am. Call 535-7995.

Centre for Chinese Research Seminar

Chinese Religions: The State Of The Field. Prof. Daniel Overmyer, Asian Studies. Asian Centre 604. 3:30-5pm. Advance copies of paper available. Call 822-2629.

Pharmaceutical Sciences Seminar

Hydromorphone Analysis And Pharmacokinetics. Ming Zheng, grad student. IRC #3 at 12:30pm. Call 822-4645.

Environmental Programs Seminar

Flavour Of The Month: Toxics And Our Perception Of Risk. Shona Kelly, Health Care/Epidemiology. IRC #5 from 12:30-1:30pm. Call 822-2029.

Botany Seminar

Biological And Physical Interaction Dynamics Producing Structure In A High Intertidal Algal Community. Jeong Ha Kim, PhD candidate, Botany. BioSciences 2000 from 12:30-1:30pm. Call 822-2133.

Oceanography Seminar

Three Dimensional Simulation Of Dense Bottom Plumes Over A Continental Slope. Dr. Lin Jiang, Naval Postgraduate School, Monterey, Cal. BioSciences 1465 at 3:30pm. Call 822-4511

Green College Seminar

Newspapers As A Vehicle For Social Change. Patricia Graham, senior editor, The Vancouver Sun. Green College coach house at 5:30pm. Call 822-8660.

Wednesday, Feb. 8

Orthopaedics Grand Rounds

Case Presentations For Royal Columbian Hospital. Chair: Dr. R.W. McGraw. Speaker: Dr. M. Piper. Vancouver Hosp/HSC Eye Care Centre auditorium at 7am. Call 875-4272.

Financial Planning: Noon-Hour Lecture Series

UBC Faculty Pension Operations/Benefits. Stan Hamilton/Dianne Perepelecta, Faculty Pension Plan. Angus 110 from 12:30-1:20pm. Sponsored by Faculty Association/Continuing Studies. Call 822-1433.

Microbiology/Immunology Seminar

New Models For The Mechanism Of Transcription Elongation And Its Regulation. Dr. Michael Chamberlin, Biochemistry/Molecular Biology, U. of Calif., Berkeley, Calif. Wesbrook 201 from 12-1:30pm. Call 822-3308.

UBC REPORTS

CALENDAR POLICY AND DEADLINES

The *UBC Reports* Calendar lists university-related or university-sponsored events on campus and off campus within the Lower Mainland.

Calendar items must be submitted on forms available from the UBC Community Relations Office, 207-6328 Memorial Road, Vancouver, B.C. V6T 1Z2. Phone: 822-3131. Fax: 822-2684. Please limit to 35 words. Submissions for the Calendar's Notices section may be limited due to space.

Deadline for the February 9 issue of *UBC Reports* — which covers the period February 12 to February 25 — is noon, January 31.



The Economic Impact of the University of British Columbia

Researched & Written by Walter Sudmant
Edited & Designed by Ashley Lambert-Maberly
Office of Budget and Planning

Introduction

The economic impact of universities is widely recognized to go well beyond the results of traditional regional economic impact analysis. Though the simple multiplier effects of employment and spending by the University of British Columbia are indeed substantial, the most significant economic impacts are from higher incomes, higher productivity, higher employment levels, innovation, and knowledge creation brought about by the research and teaching activities of the University. Until recently, universities have measured their own economic impact in terms of their spending and employment in the regional economy, drawing from the traditional research on regional economic impact. Of course, it has always been recognized that these studies ignore the fundamental economic impacts of the university, but only recently have universities begun the more difficult task of quantifying their economic impact more broadly. The University of Massachusetts and Ohio State University have recently completed such studies. Our study draws on the results of a variety of university studies, as well as the literature on returns to investment in university education, and economic impact of research in order to provide some quantitative estimates and a theoretical framework for the economic impact of the University of British Columbia.

In order to fully capture the economic impact of the university this analysis combines and adapts five distinct models for estimation and quantification of economic impact.

1. **The returns to investment in university education resulting from higher incomes, levels of employment and productivity of university graduates**
2. **Regional "spillover" effects from universities to firms**
3. **The regional economic impact model**

This model does not distinguish the university from any other enterprise, but uses traditional concepts of income and employment multipliers to quantify the economic impact of the expenditures of the university.

4. **The export base model**

This model expands on the regional impact model by considering some university activities as exports.

5. **Research as a source of jobs and economic growth**

Each of these models has been developed independently, and the research and available information on the various areas often do not overlap or complement one another. For example, the regional economic impact model has been applied by numerous universities, and is rooted in well established theory of regional economic development; quantification of the economic impact from this model can be very precise, and much of the necessary data is available and provided by the university itself. Similarly, numerous studies have examined the returns to post-secondary education, though rarely with respect to individual institutions. In contrast, the research on the relationship between university research and economic growth and spillovers is more recent, tends to be based on national or even international data and evidence, and quantification is much more difficult. This paper represents the first attempt to bring these models together, for an overall summary

of the economic impact of the University of British Columbia. Obviously it is not possible to replicate studies for each of the above models (though we do so for models 2 and 3). Rather, we combine available information with the findings of existing research in an attempt to provide some insights as well as estimates of the overall economic impact.

Model 1: The Returns to Investment in University Education

Undoubtedly one of the largest economic impacts of the university on society is the increased earnings of university graduates. The earnings arise not only from higher wages and salaries to highly skilled workers, but as a result of businesses started or expanded by graduates. These higher earnings are an obvious and well documented observation, however, a number of issues must be addressed in the quantification of this differential. Care must be taken to distinguish between private returns, returns to government in the form of increased taxes, and total returns to society; adjustments must be made for natural abilities which are highly correlated with university graduation; costs must reflect not only direct spending, but foregone earnings and costs associated with fixed assets and depreciation; and results are sensitive to the interest rate used in net present value calculations.

The general idea is illustrated in figure 1 (Stager, 1987). An individual foregoes earnings in the present in order to obtain the net earnings differential over the rest of the working lifetime. Several key concepts are useful in considering lifetime earnings.

1. Discounted present value is a calculation used to reflect the fact that future earnings are less valuable than current earnings; therefore, in order to compare, the future earnings must be discounted by some factor (usually 3 percent, disregarding inflation).
2. Social versus private rate of return: since Canadian education is subsidized by government, the returns to the individual are greater than if the individual paid the full cost. Therefore, a fair public policy calculation must take into account both the costs to government and returns to government from increased tax revenue of university education. Social rate of return refers to the rate of return after inclusion of these factors.
3. Internal rate of return: The lifetime earnings equation can be expressed as a series of costs & benefits; as long as the benefits (discounted) exceed the costs, the investment (private or public) in university education is worthwhile economically. The internal rate of return is the discount rate which makes costs exactly equal to benefits.

Conventional studies look at economic impact simply in terms of university expenditure (on salaries, etc.) while ignoring more important and effective measures of impact.

This study will examine all five models, including a more detailed analysis of both the regional economic impact model (the traditional approach) and the re-

University graduates earn higher salaries and excel in business. Increased earnings are returned to society through taxation and spending.

4. The discounted present value of the excess of benefits over costs is defined as the net present value of the education. Net present value can also be converted to an annual income stream; that is, we can refer to the economic value of investment in education either as a lump sum or as a stream of annual income differentials.

Studies show that the increase in income of a university graduate is greater than the total cost of their education. Furthermore, the ratio of increased earnings to costs is rising.

In understanding the validity of any estimate of the returns to university education, three key points must be kept in mind. First, all studies show a positive social rate of return on university education. That is, whatever reasonable assumptions are made about the numbers, the results always show that the present value of the increase in lifetime earnings resulting from a university degree is greater than the total (government plus private) cost. The question of whether universities yield a positive social return is not at issue. Second, quantitative estimates of the benefit can vary widely, both among different studies, and of course among different degrees. For example, one widely used measure, the internal rate of return across all degrees, varies from a low of 6% (V&H, 1981) to a high 12% (Bluestone, 1993). Using another measure, the estimated annual income stream varies from \$12,000 (Stats Can) to \$18,750 (Bluestone). Third, the return on university education is steadily increasing as the earnings gap due to education widens - an observation noted in numerous labour market studies worldwide.

The advantage of university graduates over others in the labour market is expected to grow.

Together, these three points suggest that we may readily make conservative and uncontentious estimates of the returns to university education by selecting the more conservative assumptions for the calculation, as follows:

Table One summarizes the results of a number of studies on returns to post-secondary education. All studies utilize the same basic concepts. The elements in a calculation of private returns is illustrated in the Graph below [Stager, page 67]. To extend the concept to social returns, two major elements must be added: the institution's (or government's) cost per degree granted, including estimates for costs associated with capital and depreciation; and the earnings differentials which must be calculated gross of taxes. The results of such a calculation can be summarized in a variety of ways. Table One shows internal social rates of return, as well as the equivalent income stream differentials (Note that individuals' income streams will reflect the shape shown in the lifetime earnings curve in figure One. The income stream equivalent is simply another, sometimes more useful way to state the results of rate of return calculations, based on current costs). In order to simplify the calculations we use

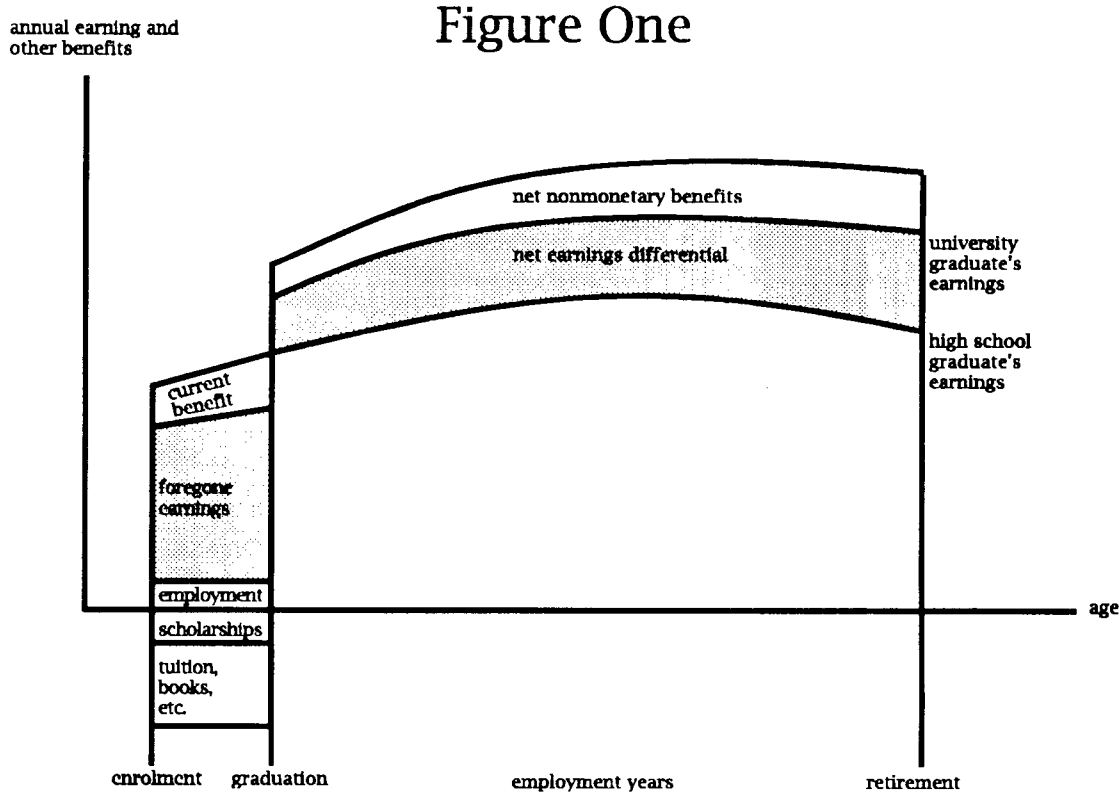


Figure One

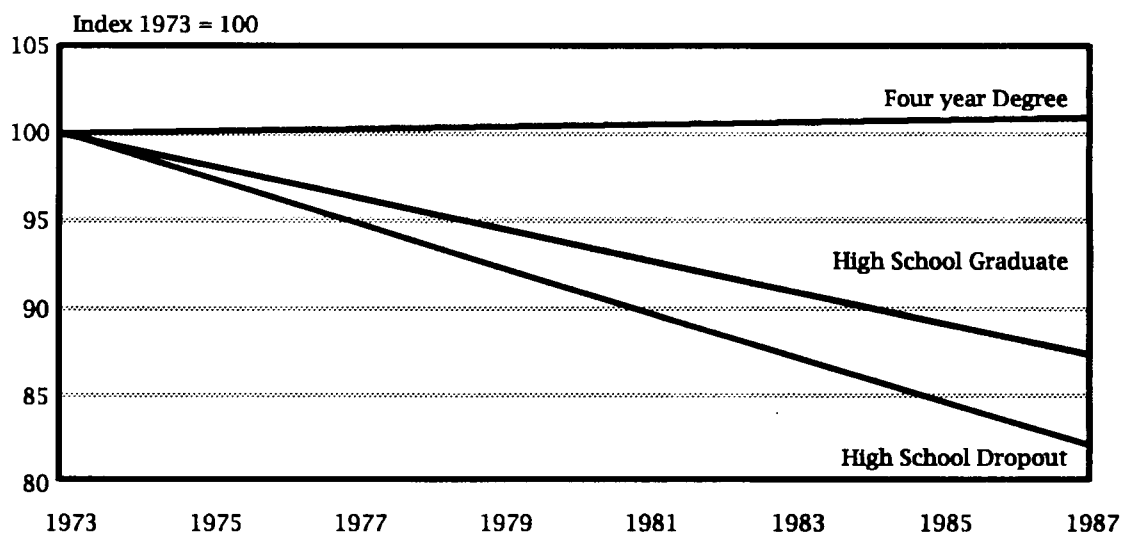
Table One
Rates of Return to University Education
Summary of the Studies

Study	Social Rate of Return	Adjusted for Ability	Implied or Derived Annual Income Stream Due to University Education*
Stager 1989	12.00%	9.00%	16,500
Stager 1960	14.90%	/	19,500
Vaillancourt & Henriques	6-9.00%	/	9,500-13,000
Constantatos & West	9.89%	7.58%	11,500
Bluestone	12.00%	/	16,500
Statistics Canada	/	/	12,000

* Based on 35 years of employment, average over all occupations and degrees

Figure Two

Educational Attainment and Growth in Net Annual Earnings



the average rate of return over all university degrees. This is equivalent to another conservative assumption for the application to UBC graduates, since the mix of degrees awarded by UBC tends to have a higher rate of return than average (see table Two).

Table One also includes an adjustment to the social rate of return. Clearly not all of the increases in earnings observed for university graduates are directly due to education. University students are a select group, both in terms of natural ability and socio-economic status, and as such are predisposed to higher earnings prior to entering university. Estimates for the effects of selection range from

Table Two

Rates of Return

for Selected Bachelor and 1st Professional Degree Programs Ontario, 1985

Program	Private		Total	
	Males	Females	Males	Females
Arts & Science:				
Teaching	4.0	10.2	3.8	8.6
Other Occupations	4.4	6.9	3.6	3.8
Commerce				
Accountants	13.1	20.6	11.4	17.1
Managers	14.0	15.2	12.1	11.8
Social Work (BSW)	/	9.0	/	5.6
Law	13.6	/	11.6	/
Engineering	14.0	/	10.7	/
Architecture	6.0	/	4.5	/
Nursing	/	17.8	/	11.8
Pharmacy	17.4	20.7	14.0	13.1
Medicine	21.6	19.6	15.2	12.2
Dentistry	22.4	/	15.5	/
All Occupations	14.0	15.2	12.1	11.8

Table Three

Total Lifetime Earnings and Rates of Return to University Education

A. The total cost of the average university degree	
1. Annual operating expenses (Provincial Government Funding)	\$280,000,000
2. Annual operating expenses (Student Tuition and Other Income)	\$70,000,000
Total Annual operating expenses	\$350,000,000
3. Additional indirect costs of capital, land, etc. (Stager: add 60%)	\$210,000,000
Total Institutional cost	\$560,000,000
B. Divide by average number of degrees per year output (steady state)	
1. Institutional cost per degree	\$93,333
2. Provincial Government cost per degree (A1+A3)/B	\$82,000
C. Average foregone earnings per degree (including factor for probability of unemployment)	
	\$54,000
D. Other costs borne by student	
	\$3,000
Total cost per degree (B1+C+D)	\$150,333
Equivalent annual income stream at 7.58% over 35 years	\$11,500
Net present value of \$11,500 income stream at real rate of 3%	\$258,603
Net present value of the degree, in excess of all costs	\$108,270
Total payback ratio	1.72

The calculation above is the total return (private and government) on total investment (private and government). Following the work of Bluestone, we can also estimate the returns to government. Using a marginal tax rate of 40% the degree holder pays an additional net present value of \$103,442 in taxes; table 3 estimates the total cost to government of production of the average university degree to be \$82,000 (once again, including indirect costs of capital, etc.). Therefore there is a real total return to government of 126%, purely in the form of additional tax revenue resulting from the subsidization of universities. In fact the return could be considered much greater, since we have made no adjustments to university costs for the research component, nor have we considered multiplier effects of higher incomes, as did Bluestone. If we assume one third of government costs are for support of research, the benefits of which we measure elsewhere, then the payback ratio increases to 189%.

For every dollar spent by government in support of the university, \$1.26 is returned (on a present discounted value basis) in the form of taxes. This significant return is somewhat lower than the much less conservative estimate of the University of Massachusetts study which calculates a return of \$1.57.

20 to 30 percent of the income differential. Rates of return have been adjusted downward accordingly so that we can unequivocally interpret the results as being purely the result of the effects of university education.

In keeping with the principle of conservative estimates, we select the lowest rate of return, that of C&W, of 7.58%. Note that we have selected a rate considerably lower than that implied by the U of M study. The major reason for the discrepancy lies in the U of M assumption that the current trends toward higher differentials for university education will continue (as in fig. 2 above). Our results deliberately and conservatively assume the differential in the future will be the same as that in the past. Given current costs (table 3) this translates into an annual income stream of \$11,500; that is, the average degree granted by UBC generates an income stream of \$11,500 per year beyond the earnings which would have been generated had the degree not been granted.

From this figure we can make the following statements:

We can compute the present discounted value of the lifetime earnings differential and compare with actual costs, yielding the overall dollar return. Discounting at three percent (the figure used by Bluestone, etc.; riskless real rate of interest used for cost benefit, etc.) the net present value of the earnings increment due to the average university degree is \$258,603. Using the total cost figure per degree of (table 3) of \$150,333 results in a payback ratio of 172 percent on total investment.

The average UBC graduate earns a minimum of \$11,500 annually in excess of probable earnings

For every dollar that society invests in university education, \$1.72 is returned.

Government is returned 126% of their investment in the form of additional tax revenue resulting from university subsidy.

Or consider this: every year (in steady-state) the government invests \$82,000 and receives an income stream of \$4,600 annually from higher taxes alone!

This works out to a real rate of return of 5.6%.

Model 2: Regional Spillover Effects from Research

Certainly the economic impacts of research are international as model 5 below will demonstrate. However, a most dramatic and more easily observable impact of university research takes the form of spillover effects on innovation,

The heavy commitment to research of major universities invariably affects commercial innovation and job creation in the local economy.

productivity and job creation in the region surrounding a major research university. Case studies have confirmed the central roles played by universities such as Stanford and MIT in the development of centres of high technology commercial innovation in the surrounding regions. Innovative commercial development cannot exist without the supply of talent and ideas provided by university graduates, students, and faculty.

(from Economic and Social Impacts of UBC's NCE Program, University-Industry Liaison Office, January 1994)

- Because of PENCE (the Protein Engineering Network of Centres of Excellence), UBC successfully recruited a faculty member with an international reputation and expertise in Nuclear Magnetic Resonance Spectroscopy, an important contemporary analytical technology used to conduct sophisticated research.

U.S. Patents Received: no other Canadian university earned a place in the top 50!

- Companies with research agreements and Network associations, such as Microtek R&D and StressGen, have attracted world experts to live and work in British Columbia.

- Network and technology transfer managers, knowledgeable in both business and science, have built and continue to forge strong links between industry and UBC scientists.

- Internationally respected researchers and scientists come to the NCEs at UBC to work on a temporary basis (265 have visited during the last three years).

- Talented students attend UBC to receive up-to-date undergraduate and graduate training, forming a highly skilled labour pool for B.C.'s developing and future knowledge-based industries.

UBC research accounts for 6,391 jobs and \$826 million in annual revenue.

For each \$3 million spent on research, 2.5 patents are generated.

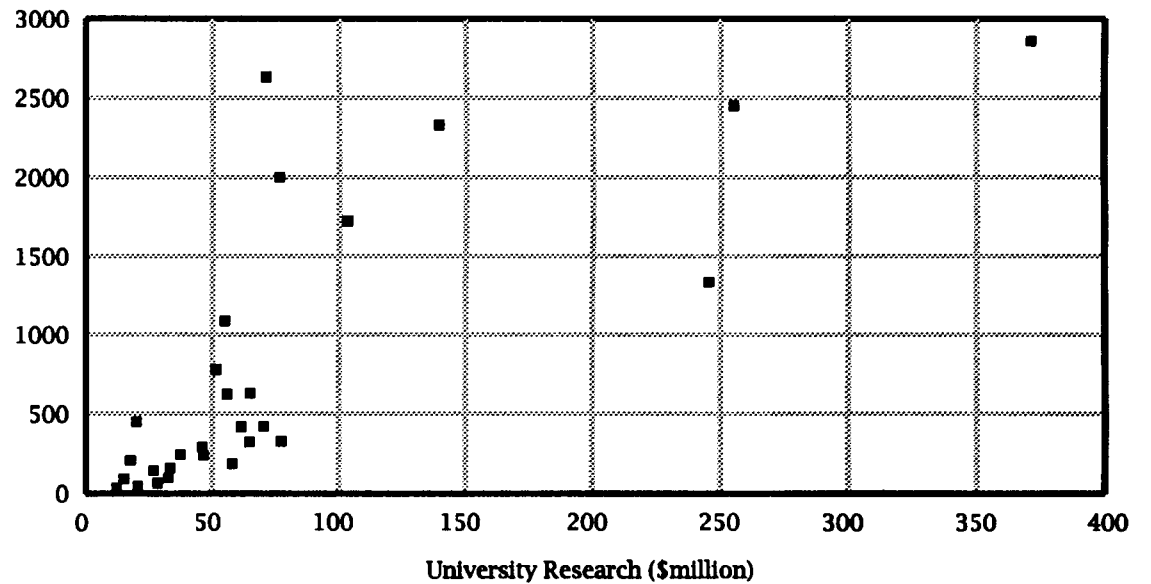
60% of all research ongoing in British Columbia is undertaken by UBC itself.

A recent attempt to quantify this 'spillover' effect has been made by the Harvard economist A.B. Jaffe. While his research utilizes complex econometric modelling, the idea can be illustrated simply. Figure 3 shows the data on university expenditure on research and the number of corporate patents granted in a number of U.S. states. There is a clear positive relationship. However, many other factors contribute to an explanation for the number of patents granted in a region (in particular, corporate spending on Research and Development). The objective achieved by Jaffe's research is to develop a model which computes the effect of university spending on patents granted while controlling, or holding constant, the other factors. The results show the significant

Figure Three

U.S. Patents Granted versus

University Research Expenditure for 29 States



Note: 10 year averages, from Jaffe, A.B., 1989

Table Four

U.S. Patents Received for 1991 & 1992

Top Universities in North America

1 MIT	231	11 SUNY	54
2 California	168	12 Washington (St. Louis)	49
3 Texas	158	13 John Hopkins	46
4 Stanford	101	14 Pennsylvania	45
5 Florida	94	15 Michigan	44
6 Wisconsin	88	16 British Columbia	39
7 Cornell	84	17 Rockefeller	38
8 Cal Tech	72	18 Virginia Tech	36
9 Minnesota	63	19 Ohio State	36
10 Iowa State	61	20 NC State	36

Table Five

Economic Impact

of High-Technology Companies Evolved from UBC

Total Number of Companies	94
Total Sales	\$592,000,000
Total Number of Employees	4,519
B.C. Companies	91
as a Percent:	96.81%
Canadian Companies	2
as a Percent:	2.13%
Other Companies	1
as a Percent:	1.06%
Total Companies	94
as a Percent:	100.00%

effect of university research on corporate patents. In other words, the very existence of a research intensive university has a positive impact on the levels of technology and innovation in the local region.

The Research and Development environment in British Columbia is substantially different from the states analyzed by Jaffe in that a much larger fraction of research takes place at the University of British Columbia relative to private corporations (UBC accounts for 60% of all British Columbia research activity). Nevertheless, we can apply Jaffe's set of equations to British Columbia data, with one adjustment. Research and Development expenditure in Canada is at one-half the U.S. level. Using data

Table Six

Economic Impact of Spillover Research

Companies Evolving Directly from UBC Research

Number	94
Revenue	\$592 million
Employees	4,519
Average Revenue	\$6 million
Average Employees	48
Cumulative Number of Licensed Technologies	115
Number of Companies per Licensed Technology	0.82
Assuming 1 licensed technology per patent:	
Spillover Patents/Technologies (note 1)	48
Spillover Companies (.82 x 48)	39
Spillover Revenue (39 x \$6 million)	\$234 million
Spillover Jobs (48 average employees x 39)	1,872

note 1: Difference resulting from substituting "0" for UBC research spending in equation 1 of Appendix A.

from the "World Competitiveness Report," requires that predicted levels of research for British Columbia be adjusted accordingly. Though the application of the model to British Columbia is somewhat crude (i.e. the model was developed for U.S. states over a different time period), the calculation serves two purposes. First, the validity of the model for BC can be checked against actual data; second, we can obtain an estimate, or at least some sense of the order of magnitude of the elusive spillover effect. The results (Appendix A) predict 68 patents awarded to BC industry in 1990/91. If we add to 68 the approximately 20 patents granted to BC universities we obtain a prediction from the model of 88 patents granted to British Columbians in 1990/91. In fact, there were 87 patents received by British Columbians. While the accuracy of the model may well be coincidental, we may safely assume that Jaffe's qualitative results can be generalized to the UBC. The activities of UBC have a significant effect on overall innovation.

Once the relationship between research and corporate patents has been established, other economic impacts can be roughly estimated. For UBC we have data on spin-off companies (companies created by UBC technology or know-how). The relationship between patents, licensed technologies, jobs, and revenue is extremely volatile, and not well quantified. However, to obtain an appreciation for the magnitude of the results of the Jaffe model, we calculate the impact of spillover research based on the average revenue and jobs created for those 94 spin-off companies for which we do have detailed data.

The Jaffe model indicates that (at current levels of Research spending) for every \$3 million in university research expenditure, one patent is generated outside of the university, as the result of the spillover effect. This is in addition to the estimated 1.5 patents per \$3 million generated directly by university research. Tables 5 and 6 show that in addition to the \$600 million in revenue and 4,500 jobs evolving from University of British Columbia research, the spillover effect of research induced by the presence of the University results in an additional \$234 million annually, and 1872 jobs (see Appendix A for further details).

Model 3: The Traditional Regional Economic Impact Model

With a total revenue of \$687 million annually, UBC exerts enormous economic impact on the local region.

The University is the 6th largest employer in the Greater Vancouver Regional District, and is directly responsible for 14,000 full-time and part-time jobs. In addition, the University is indirectly responsible for local spending from students, visitors, conference attendees, etc. The traditional economic impact model estimates the stimulative effect on the local economy of the expenditures of an enterprise in the region. While this conventional approach does provide important information for local decision makers, it is not necessarily the model of economic impact that UBC should choose to emphasize, since the regional model does not address those far more important economic impacts of UBC which result from teaching and research.

UBC is the 6th largest employer in the GVRD with 14,000 full and part-time jobs. The presence of UBC also encourages spending from others (e.g. students and visitors.).

A detailed series of calculations for the Regional Economic Impact Model can be found in Appendix B, showing the economic impact of the University of British Columbia on the surrounding region through the use of a regional multiplier. These specific findings are summarized below.

Local purchases of \$196 million generate local income of \$177 million, using local value added statistics for the Greater Vancouver Regional District. Salaries and wages generate \$354 million in local income. External to the UBC accounts, visitors and students generate an additional \$45 million in local income. Direct university spending results in local income of \$576 million. The multiplier effect brings the total economic impact on the GVRD to \$859 million, corresponding to approximately 14,000 jobs.

Perhaps the most important result of these conclusions is the relationship between government funding of universities and income and job creation. This study shows that every \$1 million in provincial grants to the University of British Columbia generates \$2.5 million in personal income and 25 jobs through the local multiplier effect.

Model 4: Export Base Model

The export base model responds to a fundamental criticism of the regional impact model. The model fails to consider alternative uses of the resources devoted to the university. In other words, it could be argued that similar economic impacts could be derived from other types of government expenditure, or even from reduced taxation and the resulting increase in private consumption. The regional impact model does not distinguish between spending which is brought into the local economy as a result of the existence of the university, and spending which would have taken place in any case. The export base model provides a simple modification to the regional impact model, in that it extracts the local spending which would not have taken place without the university. The university is considered in economic terms as an "exporter" in the sense that money flows into the province as a direct result of the university (eg research funding, visitors, foreign students); or, in the sense of keeping economic activity inside the province which would otherwise go elsewhere.

Table 7 summarizes the results in two categories. The first category lists sources of revenue to the University of British Columbia comprising revenue which would not otherwise accrue to British Columbia. The largest such source is the research funding from the federal granting agencies of approximately \$83 million. Attached to each source is an "export factor"; an estimate of the

The university attracts expenditures which would have gone elsewhere had UBC not existed (e.g. research funding, out-of-province students).

fraction of the total revenue which would be lost to the province without the existence of the university. For example, the export factor for research grants is 100%, since all of that revenue would disappear were it not for the University of British Columbia. On the other hand, we cannot assume that all fee revenue would move elsewhere if the university did not exist. We make the assumption (taken from the University of Massachusetts study) that 43 percent of domestic students would go out of province for university education if the University of British Columbia did not exist, hence 43 percent of domestic fee revenue is counted as "export" (this also includes the assumption that the other universities are at full capacity).

The second category of "export" consists of those expenses made in British Columbia which would not otherwise be made in the province. Although many industrial and commercial expenditures could fall under this category, we ignore this in the export model and include them only under the "research spillover model." For the export base model we consider only two types of expenditure: student spending and visitor spending. For visitor spending the export factor is 100 percent; for student spending the factor is 43 percent (as above) for domestic students, and of course, 100 percent for foreign students, for an average of 50 percent (see Appendix A on student spending).

The overall result is that the University of British Columbia can be viewed as a British Columbia exporter, with approximately \$200 million in out of province revenue. Once again the multipliers can be applied for income and employment. The results (table 7) show approximately \$300 million in income and 4,800 jobs. Unlike the traditional economic impact model, these results can be stated as net positive increments to British Columbia's economy, beyond the contribution of the Provincial government. Therefore, the University as an export/revenue generating organization returns more to the province than the annual provincial operating grant.

Model 5: Research as a Source of Productivity Growth

The regional spillover model is a very localized analysis of the worldwide economic impacts of research. Certainly the existence of a university stimulates local economic activity

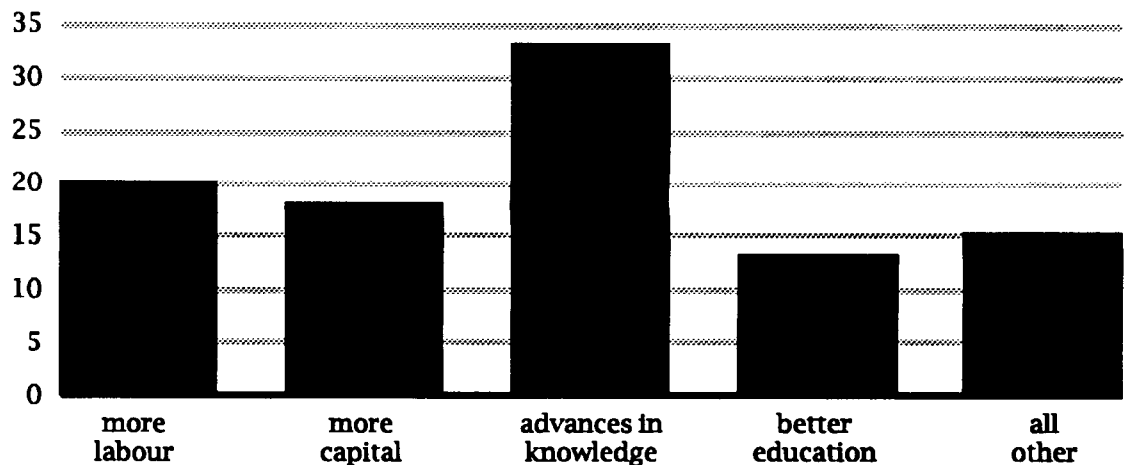
Table Seven

Export Base Model Revenues and Expenditures

		(\$000)	
Sources of Revenue for Export Base model			
Government of Canada Research Grants	83,449	100%	"Export" 83,449
Government of Canada, other	3,497	100%	3,497
Foreign fees	5,000	100%	5,000
Domestic fees	43,000	43%	18,490
Bequests and Donations	16,132	50%	8,066
Non-Government Research Grants/contracts	36,125	100%	36,125
Sub-total: internal to university			154,627
Sources of Spending for Export Base Model			
Student Spending	71,378	50%	35,689
Visitor spending (UBC conferences)	3,000	100%	3,000
UBC Conference centre	5,157	100%	5,157
Sub-total external to university			43,846
Total UBC "exports"			198,473
Income multiplier			1.49
Total Economic Impact			295,725
Job multiplier (as per Appendix B)	16.3 jobs per \$million		
Total job creation			4,820

Figure Four

Contributions of Selected Factors to Real Economic Growth in the U.S. 1948 to 1978



in innovative fields, but far more important is the cumulative and symbiotic effects of new knowledge on world economies. Universities are key participants in this process. Figure 4 summarizes the results of the study by E.F. Dennison on accounting for U.S. economic growth. His, and a number of other studies agree that the principle driver of economic growth is knowledge creation, and that advances in knowledge are responsible for approximately 35 percent of real growth. Universities have a central role in the production of new knowledge and adaptation to technological change. This process takes place not only through the mechanism of research discoveries, but by providing the population with the technical, social and entrepreneurial skills to use new knowledge.

Quantification of this profound function of the university to any degree of accuracy is probably impossible. Yet, the magnitude overwhelms all other economic impacts. If we assume that advances in knowledge as defined by Dennison are proportional to research, then the University of British Columbia is responsible for 60 percent of knowledge advances originating in B.C., and 60 percent of the training necessary to apply innovations arising from the rest of the world. If we accept that a similar fraction of British Columbia economic growth is due to innovation and knowledge creation (ie. 35 percent), then approximately \$500 million in annual economic growth can be attributed to the University of British Columbia.

UBC's presence here draws \$300 million in out-of-province revenue, creating 4,800 jobs.

The total economic impact from out-of-province revenue alone exceeds UBC's annual provincial operating grant!

Economic growth is fueled by advances in knowledge. Universities are at the forefront of knowledge creation and technological change.

Estimating that 35% of growth is propelled by knowledge advances suggests UBC contributes an annual \$500 million to the B.C. economy.

Table Eight

Total Annual Economic Impact

1. Lifetime earnings and productivity of graduates		
Net present value of total benefit - total cost per degree	Benefit	\$258,603
	Cost	\$150,333
	Value	\$108,270
multiplied by approx 6,000 degrees awarded annually		
		\$649,620,000
2. Local economic impact of research		
	Direct effects	\$600,000,000
	Indirect (spillover) effects	\$234,000,000
3. Export effects		
		\$300,000,000
4. Sources of Economic growth		
		\$500,000,000
Total Economic impact		
		\$2,283,620,000

Summary

This research represents the first attempt ever to quantify the total economic impact of the University, comprising all of the complex components for which quantitative models exist.

The quantification is at best an estimate, and at worst, only a ballpark order of magnitude. However, the assumptions have been selected conservatively, and wherever possible, models have been verified empirically, or corroborated with the research of others. Table 8 summarizes the results of each model (the regional model has been excluded in favour of the more conservative export

model). The total economic impact is estimated at \$2.3 billion annually—where 'economic impact' can be considered synonymous with wealth creation. By way of comparison, the GDP of the Province of British Columbia for 1990/91 was \$74 billion; the forest and logging sector GDP (excluding forest products manufacturing) was \$1.4 billion, mining was \$1.9 billion. Whatever reasonable assumptions are made concerning economic impact, the University of British Columbia, as does any major research university, makes a massive contribution to the economy.

A conservative estimate suggests UBC's economic impact to be \$2.3 billion annually—equivalent to over 3% of the entire GDP for British Columbia.

Appendix A

Modelling the relationship between University research and total patents Jaffe's model applied to British Columbia

Equation 1: Industrial R&D expenditure (dollar figures are in 1972 U.S. millions)

Model variable	Model Coefficient a	Actual BC Value 1990/91 x	a log(x)
University R&D spending	0.704	33.52	2.4725
Manufacturing value added ratio	0.725	0.5	-0.5025
Population ('000)	0.131	3100	1.0531
constant	0.704	1	0.704
		Log of industry R&D	3.7271
		Industrial R&D as predicted by U.S. model	41.56
		Industrial R&D adjusted for Canada	20.011

Equation 2: Corporate patents (dollar figures are in 1972 U.S. millions)

Model variable	Model Coefficient a	BC Value 1990/91 x	a log(x)
Industrial R&D (from eq. 1)	0.94	20.01	2.8165
University R&D spending	0.103	33.52	0.3618
Population	0.131	3100	1.0531
		Log of corporate patents	4.2314
		corporate patents	69

Appendix A

By altering the values for university Research and Development spending, we obtain estimates of the spillover effects:

1. Sensitivity of corporate patents = 1 patent per \$3 million in university research in 1990/91.
2. Removal of UBC R&D spending implies 48 fewer patents.

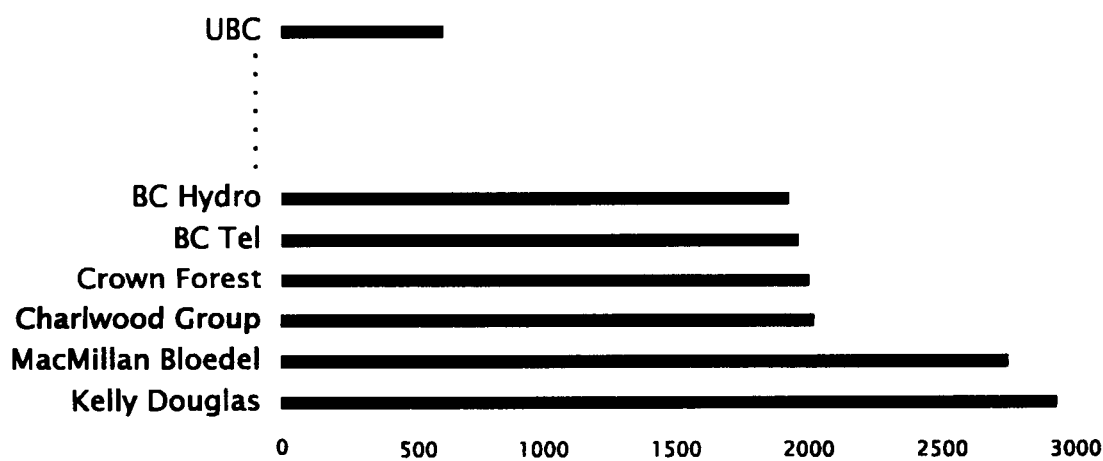
Sources of Revenue

1992/93 (thousands)

		%
Government of Canada	\$86,946	12.7%
Province of British Columbia	\$343,246	50.0%
Other Governments	\$3,185	0.5%
Sub-total Government	\$433,377	63.1%
Student fees (credit)	\$55,164	8.0%
Student fees (non-credit)	\$18,190	2.6%
Bequests, donations and non government grant	\$52,257	7.6%
Sales and services	\$81,186	11.8%
Investment Income	\$26,955	3.9%
Loans	\$19,700	2.9%
Sub-total non-government	\$253,452	36.9%
Total Revenue	\$686,829	100.0%

- Over \$550 million of UBC spending is spent locally, primarily in salaries.
- Approximately 80 percent of UBC spending is in the local economy.
- The LVA ratio for UBC spending is relatively high, at 59 percent (the LVA for the wood industry is 49 percent, 10 percent for the chemical and petroleum industry, and 37 percent for the food and beverage industry.)
- University spending is job intensive, with 59 percent of total spending and over 70 percent of General Purpose Operating spent on salaries and benefits.
- As an indicator of job intensiveness of university spending, UBC ranks 25th in terms of revenue, but sixth in terms of the number of employees.
- Seventy percent of university purchases of goods and services are local.
- Over \$90 million is returned to the provincial and federal government in the form of income taxes.

Annual Revenue of 24 largest firms in GVRD and UBC

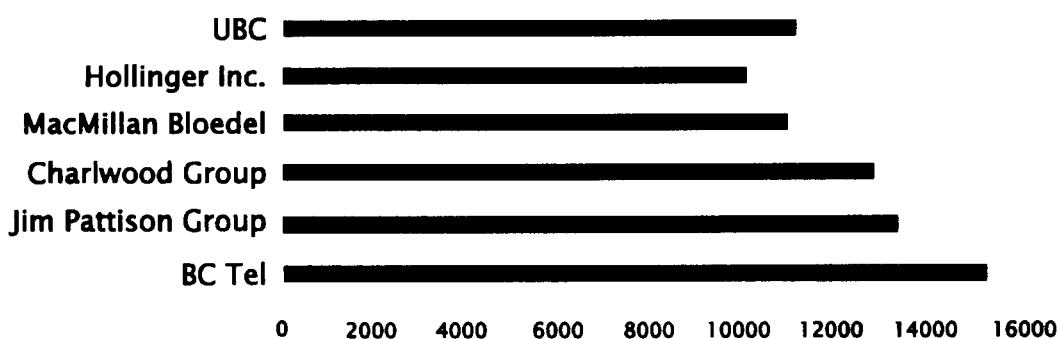


UBC is labour intensive.

It ranks 6th in terms of employees, but only 25th in terms of total revenue.

With students included in the employee count, we even rise to 4th place!

Employment



Student Spending

- In addition to direct University spending, UBC generates over \$70 million in student spending (funds expended in the local economy and not counted in University revenue.)
- Making the conservative assumption that only full-time students have an impact on the local economy (i.e. part-time students would be here anyway), UBC gives rise to spending by almost 24,000 full-time students. These calculations include estimates only for those expenses not paid directly to the university (e.g. tuition, books, residence fees).

Appendix B

Sources of Revenue

- Total revenue for 1992/93 for the University of British Columbia was \$687 million.
- Less than 50 percent of total revenue was in the form of grants from the provincial government.
- For every \$1 million in provincial funding, UBC generates an additional \$1 million in other sources of revenue.
- Much of the University's revenue is from sources outside the province, including \$87 million from the Government of Canada.
- UBC generates \$136 million in revenue from sponsored research grants and contracts. Sponsored research alone would rank as one of the

province's major revenue producers, exceeding the revenues of British Columbia firms such as BC Petroleum, and among the top 100 firms in the province.

- Bequests, donations and non-government grants account for over \$52 million in revenue annually.

University Spending

- Nearly 5,000 full-time graduate students are attracted to UBC, many from other provinces and countries. Approximately 25 percent of full-time graduates are foreign students. Spending by graduate students in the local economy is undoubt-

We can use the concept of Local Value Added (LVA) to compare UBC with other industries. Local Value Added is the ratio of salaries and profits to the total output; therefore it can be thought of as the contribution to inputs made by workers and entrepreneurs to obtain the final output.

edly higher than the estimates used here.

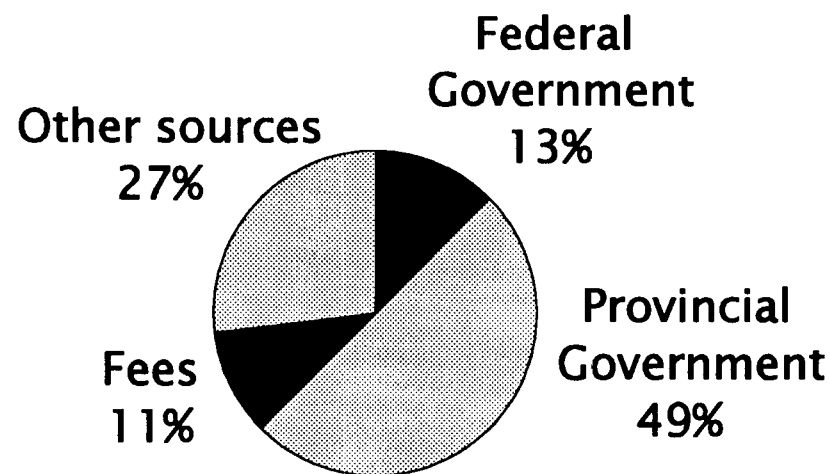
Sources of Revenue

Visitor Spending

- The University of British Columbia is directly responsible for over 40,000 conference centre visits, comprising over 97,000 person days of visitor spending in the province. As the major research university in province with conference facilities, it is safe to assume that nearly all of the associated spending would have gone outside the province.
- Visitors to the UBC Conference Centre alone are estimated to have spent over \$5 million. In addition, there are thousands of visitors to the campus as prospective students, tourists, academic visitors, parents, medical patients, and attendees at special events, for whom we are unable to estimate their impact.
- Based on Tourism Vancouver's estimates of delegates attending conventions in Vancouver, the 14,000 delegates to conferences held at UBC comprise nine percent of the total.

Capital Spending

- In 1992/93 UBC spent \$48 million on Capital projects (excludes debt services), including building renovations, building contracts, and professional fees.
- Approximately \$34 million was spent on contracts and professional fees. Construction is both labour intensive and value-added intensive. These expenditures are estimated to have resulted in full-time employment for 300 person years in 1992/93 above and beyond the employees of the university.
- Capital projects on the UBC campus make up a significant fraction of all construction in the GVRD. In 1992/93 the value of capital expenditure at UBC was equal to approximately 10 percent of all commercial activity in the GVRD (based on build-



Notes: For every dollar of Province of B.C. grants, UBC generates another dollar of revenue from non-provincial government sources.

Almost 20 percent of total revenue is generated by sponsored research.

University Spending

1. Total University Spending, from all funds, 1992/93	\$680,633
Salaries	\$354,137
Benefits	\$46,219
Salaries + Benefits	\$400,356
Non-Salary	\$280,277
2. Spending in Local Economy	
Salaries	\$354,137
Goods and Services (estimated by Purchasing)	\$0
Total spending in local economy	\$354,137
Fraction spent locally	52%

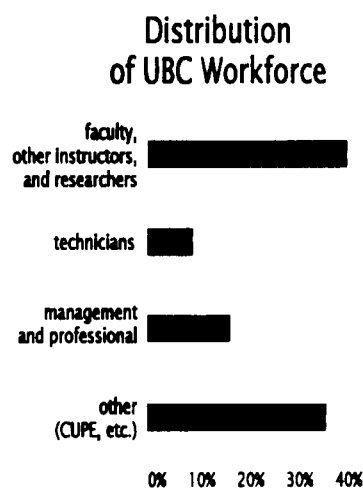
Student Spending

1. Full-time students (assuming only full-time students have an impact)	23,761
2. Distribution by residence	
Home 64.00%	15,207
On campus 19.00%	4,515
Away from home 24.00%	5,703
3. Estimated nine month incremental spending by residence (excluding expenses already counted in direct university expenses, eg. tuition)	(\$000)
Home \$2,000	\$30,414
On campus \$2,000	\$9,029
Away from home \$5,600	\$31,935
Total Student Spending	\$71,378

Visitor Spending

Average Spending per day			\$84
Visitors to UBC Conference Centre			(\$thousands)
Conference delegates:	14,000	x average 3 day stay	\$3,513
Non-affiliated visitors	20,578	x average 2 day stay	\$3,442
Organized tours	6,860	x average 2 day stay	\$1,148
Total Visitor spending	41,438		\$8,103
less University Revenue from Conferences			\$5,157
Net additional spending in local economy			\$2,946

The UBC Workforce



	Total	Full-time	Part-time	FTE
Faculty Staff	3,427	2,063	1,364	2,363
CUPE 116	1,527			966
CUPE 2950 + Office & Tech	1,586	1,430	156	1,477
Children's Service	150			140
Excluded Office	26			24
Farm Workers	21			20
Executives	11	11	0	11
Management and Professional	1,217	1,008	209	1,077
Miscellaneous	522			486
Technicians	659			614
Language Instructors	50			47
Operating Engineers	34			34
Sub-Total	9,230			7,258
Students				
Student Services	2,880		2,880	720
Student Workers	490		490	123
Teaching Assistants	1,546		1,546	387
Sub-Total	4,916			1,229
Total Paid UBC Employees	14,146			8,487
Other categories				
Triumph	395			
UBC paymaster only	23			
Without pay	2,116			
Sub-total	2,534			
Total Staff Headcount	16,680			

ing permit values recorded in 1992).

Employment

- UBC employs over 14,000 staff and faculty, making it the province's 6th largest employer.
- Local spending by UBC employees induces further employment in the local economy. Using an employment multiplier of 1.62 results in a total of approximately 23,000 jobs attributable either directly or indirectly to the University.
- UBC, either directly or indirectly, accounts for approximately three percent of all jobs in the Vancouver Census Metropolitan Area.
- For every \$1 million in grants from the provincial government, UBC creates 67 jobs.
- Fifty-eight percent of the non-student UBC work force consists of professional or technical positions, a much higher fraction than the overall workforce.

Income

Income within the local economy is generated by UBC in several ways:

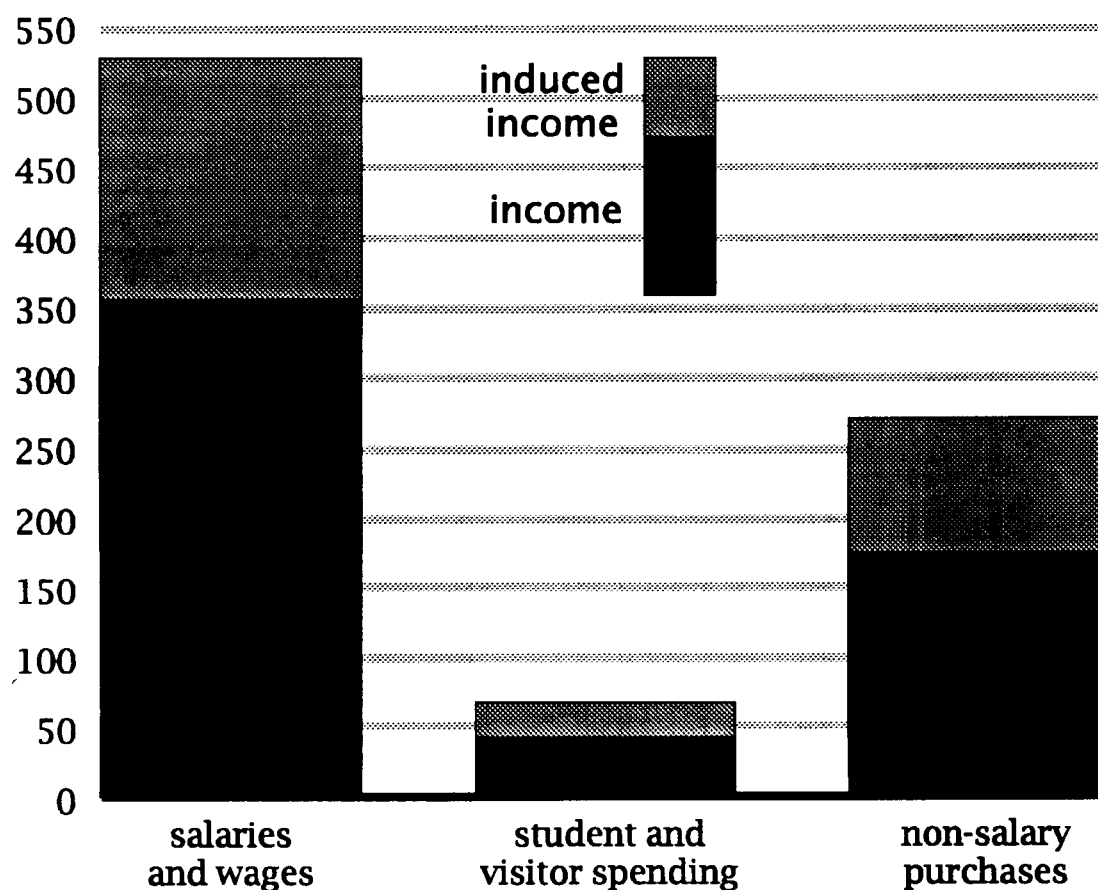
Direct salaries paid to employees
\$354 million

Income from visitor spending is generated when visitors spend in the local economy. This income can be estimated multiplying estimates of visitor spending by the local value added ratio for businesses serving visitors. Using an average service industry ratio of .8 and subtracting that portion of UBC visitor spending already collected as UBC revenue, we estimate income due to visitors at:
\$2 million

Similarly, student spending is estimated to generate income of
\$43 million

Local income is also generated by UBC non-salary purchases. Using object of expense data from financial records, figure 7 shows local non-salary purchases broken down by category. For each category a local value added ratio is estimated (see

Induced Income Generation



Davis, H.C., Economic Base and Input-Output Multipliers: A Comparison for Vancouver, BC, Annals of Regional Science, 9, 1975, 1-89). For example, expenses such as professional fees are responsible for a relatively large ratio of local income to expenses, since nearly all spending becomes local income. Whereas, supplies are often imported, hence a lesser degree of local income is generated. The resulting calculation shows local income generated of **\$177 million**

Finally, induced income refers to the fact that for

every dollar of income, some fraction is again spent in the local economy, and continues to generate further income. The induced income for the Vancouver region can be estimated by use of the income multiplier (Davis, 1986) of 1.49. Total induced income is estimated as

\$282 million

Total direct and induced income is estimated at **\$858 million**

For every \$1 million in provincial grants to UBC, \$2.5 million in personal income is generated.

Local Income Generated

1. Local Income generated from University Purchases

Distribution of purchases by type and local value added

Type of expense	Purchases		Estimated LVA	Local Income Generated
Supplies	\$93,000	35.36%	0.50	\$46,500
Construction/Renovation	\$46,000	17.49%	0.80	\$36,800
Travel/Moving	\$46,000	17.49%	0.90	\$41,400
Food and Beverage	\$29,000	11.03%	0.53	\$15,370
Furniture	\$21,000	7.98%	0.50	\$10,500
Professional Fees	\$16,000	6.08%	0.91	\$14,560
Scholarships and Bursaries	\$12,000	4.56%	1.00	\$12,000
Total Non-Salary	\$196,194			\$177,130
2. Gross Income from salaries and wages				\$354,137
3. Total Local income generated from first round of UBC spending				\$531,267
4. Visitor Spending				\$2,946
5. Student spending				\$71,378
Total first round income generated by UBC				\$576,450
Income Multiplier for Lower Mainland				1.49
Total Economic Impact of UBC on GVRD Income				\$858,911

Appendix C

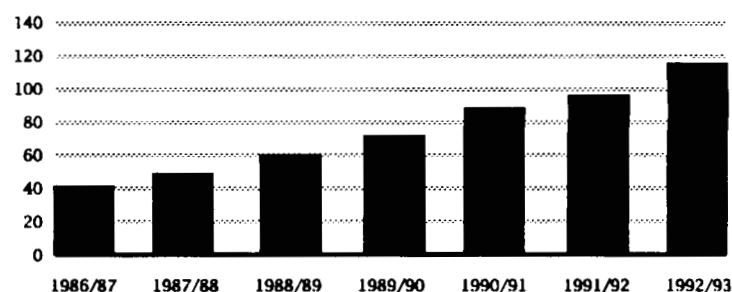
UBC Technology Transfer Licenses by Region

	Number of Technologies Licensed	Number of License Agreements	Number of Companies per Region	Percent of Companies per Region
B.C. Companies	72	46	39	70%
Canadian Companies	8	7	4	7%
Foreign Companies	35	14	13	23%
Total	115	67	56	100%

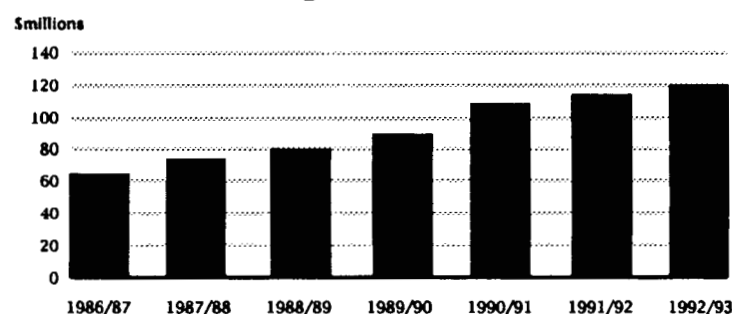
UBC Research Funding by Faculty 1992/93 (estimated)

	\$	%
Total Research Funding	120,559,221	100.00%
Agricultural Sciences	3,981,599	3.30%
Applied Science	15,733,846	13.05%
Arts	5,843,770	4.85%
Commerce and Business Administration	1,446,190	1.20%
Dentistry	1,260,270	1.05%
Education	3,887,812	3.22%
Forestry	4,969,690	4.12%
Graduate Studies	3,234,593	2.68%
Law	781,336	0.65%
Medicine	44,074,262	36.56%
Pharmaceutical Sciences	2,513,242	2.08%
Science	29,630,027	24.58%
Health Sciences	1,228,808	1.02%
Other	1,973,776	1.64%

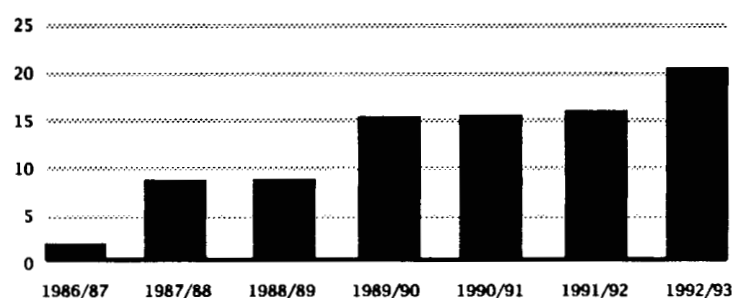
Cumulative Number of Technologies Licensed



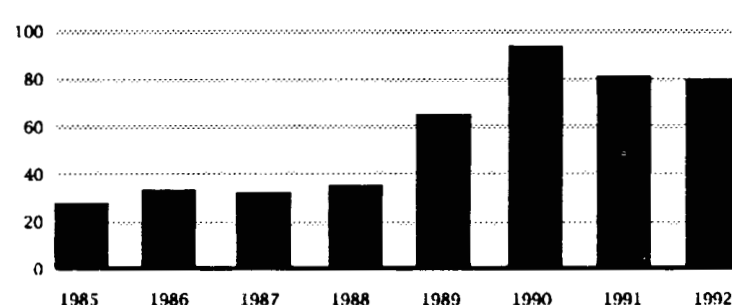
Research Funding



Royalties, Industrial Grants, Contracts and Collaborative Agreements



Growth of Annual Technology Disclosures



Appendix D

Some Case Studies

The four major sources of economic impact summarized in this study are very general effects, applicable to any major research university. However every university will generate economic impacts and outputs specific to that institution. It would be impossible to enumerate, let alone measure, all of the ways in which UBC makes its impact as distinct from other universities. (More specific information is available from publications such as "Economic and Social Impacts of the University of British Columbia's Networks of Centres of Excellence Program," prepared by the University-Industry Liaison Office, and our University inventories of research.)

In the following section we highlight a number of examples and cases specific to the University of British Columbia, some of which are implicitly included within the broad areas of impact summarized, other which represent impacts which will be made in the future.

Hospitals and Health Care

The Vancouver Hospital and Science Centre is highly integrated with the UBC Faculty of Medicine and School of Nursing. The UBC pavillion on campus is one of the two major sites for the Hospital, which altogether employs approximately 8,000 employees. This symbiosis between the University and Hospitals has resulted in Vancouver's prominence in medical care and research; Vancouver is recognized as the location of the fourth or fifth largest medical complex in North America. While the economic impact of medical care and research is implicitly included under the area of "knowledge creation and dissemination," it

is a very significant to note that "many UBC discoveries have resulted in significant reductions in health care costs and better care, putting people back to work earlier....prevention of death and disabilities can also have a positive economic impact" (Dr. M.J. Hollenberg).

The World of Opportunity Campaign

The over \$325 million raised by this campaign and post-campaign projects, in addition to the "export factor" already considered, will generate significant economic activity for the province. The creation of 60 new chairs at the University will result in an estimated \$60 million in additional research income over the next ten years—very little, if any of this income would flow to British Columbia in the absence of these chairs.

The campaign will generate over \$100 million in construction on campus, with all of the corresponding multiplier effects. As an indication of the enormous magnitude of the construction projects generated by the campaign, total commercial building values for the City of Vancouver for 1992 were \$149 million.

Hampton Place

The development of University land for residential housing will eventually generate \$60 million for capital and endowment programs. Interest being generated by this fund is already funding research in the social sciences. In addition, the completion of more than 300 housing units on the first three sites with another 125 under construction on the next two sites has had a significant impact on the

residential construction industry. The two sites under construction add about \$30 million of activity to the industry and at least another \$100 million of construction can be expected on the remaining sites.

Private and Government Industrial Research

The Pulp and Paper Research Institute of Canada (PAPRICAN), located on the campus of the University of British Columbia, generates approximately \$4.5 million in revenue annually, and is funded primarily by the Canadian Pulp and Paper Industry. PAPRICAN employs 148 people including 41 scientists, engineers and research supervisors, and brings approximately \$2.8 million in research funding to the province.

Forintek, a wood products research organization funded by the Canadian wood products industry, employs 85 full-time equivalent staff on the campus of the University of British Columbia, and has annual revenues of over \$14 million.

Agriculture Canada employs 56 staff in agricultural research on the UBC campus, and makes annual expenditures of approximately \$4 million.

The National Research Council Institute for Machinery Research will be housed in a new \$11 million facility located on the UBC campus. The focus of the facility will be on research into the operation of high technology machine equipment. It will employ in excess of 100 people with an operating budget anticipated to reach \$150 million per year.

Calendar

January 29 through February 11

Music Concert

Kathleen Rudolph, flute; Rita Costanzi, harp; Terence Dawson, piano; John Rudolph, percussion. Music recital hall at 12:30pm. Admission \$2.50. Call 822-5574.

Poetry Reading

Glamour Treatment For The Mentally Insane. Cathryn Van Dusen. Lasserre 105 at 12:30pm. Sponsored by The Canada Council. Call 822-2759.

French Colloquium

La Critique Textuelle Et Les Chansonniers Du Moyen Age. Ineke Hardy, MA student. Buchanan Tower 799 from 2:30-3:30pm. Call 822-2879.

Applied Mathematics Faculty Presentations

Modelling Atmospheric Boundary Layer Flows. Dr. Douw Steyn. Geography, Math 203 at 3:30pm. Call 822-4584.

Geography Colloquium

The Colour Of Work. Dan Hiebert. Geography 201 at 3:30pm. Refreshments. Call 822-4929.

Women's Studies Lecture

Sex And Empire Building: Prostitution In The Making And Resisting Of World Orders. Suzanne Baustad. Women's Studies Centre from 3:30-5pm. Call 822-9171.

Pharmaceutical Sciences Seminar

Risk-benefit Assessment Of Nicotine Preparations In Smoking Cessation. Jane Kirkpatrick, PharmD student, Clinical Pharmacy. Vancouver Hosp/HSC UBC Pavilion G-279 from 4-5pm. Call 822-4645.

Respiratory Seminar Series

Five Years Of Lung Transplant In BC. Dr. David Ostrow, assoc. professor, Medicine. Vancouver Hosp/HSC Laurel Pavilion Taylor-Fiddler conference room from 5-6pm. Call 822-7069.

Ethnic Studies Program Committee

Empires, Emigres And Aliens: Young People's Negotiations Of Popular Racisms In Canada. Leslie G. Roman/Timothy J. Stanley. Green College recreation lounge at 8pm. Call 822-5129.

Eating Disorder Session

The Tyranny Of Body Image. Slide presentation by Mediawatch and panel discussion. SUB 207-209 from 12:30-2:20pm. Call Eating Disorder Resource Centre of BC at 631-5313.

Thursday, Feb. 9

Pathology/Laboratory Medicine Lecture

Graduate Student Presentations. Steven Drews/Allan Rempel, grad students. Vancouver Hosp/HSC Eye Care Centre auditorium at 8am. Call 875-4577.

ArtsFest '95

UBC Symphony Orchestra. Soloist Andrea Bell; Jesse Read, conductor. Old Auditorium at 12:30pm. Program includes Bartok Concerto for Orchestra/Saint-Saens Cello Concerto. Call 822-5574.

Film Screening/Talk

The Homoerotic Body In Painting And History: Two Films From The Tangled Garden. Ken Anderlini. Lasserre 104 at 12:30pm. Call 822-2759.

Faculty Development Seminar

A Brown Bag Work Group: Developing New Teaching Skills. Gail Riddell and colleagues. David Lam Building basement seminar room from 12:30-2pm. Call 822-9149.

CICSR Distinguished Lecture Series

Work-oriented System Design. Dr. Lucy Suchman, Xerox Palo Alto Research Centre, Palo Alto, Calif. CICSR/CS 208 at 4pm. Call 822-6894.

Physics Colloquium

Indust: Nano-Technology, Applied To Surfaces. Roger H. Appeldorn, 3M Company. Hennings 201 at 4pm. Call 822-3853.

Leon/Thea Koerner Memorial Lecture

Deviant Behavior In Children/Laboratory Alcohol Consumption: Laboratory Studies Of Reciprocal Effects. Prof. William E. Pelham, Western Psychiatric Institute, Pittsburgh, Pa. Kenny 2510 Peter Suedfeld lounge from 4-5pm. Co-sponsored by Psychology. Call 822-3078.

BC Research Seminar

Information Superhighway: Exploring The Internet And A View Of The Future. Linda Harasim, assoc. professor, Communications, SFU; Frances Atkinson, Academic Computing, SFU; Deb Reidlinger, Stentor Alliance of Telephone Companies. BC Research auditorium at 7:30pm. Reservations required. Call 222-5505 ext. 856.

Green College Law/Society Seminar

Doing Legal History Right: Problems, Perils And Prospects Of Interdisciplinarity. Dr. Carolyn Strange, Criminology, U. of Toronto. Green College coach house at 8pm. Call 822-8660.

Friday, Feb. 10

Pediatrics Grand Rounds

To Err Is Human. Dr. David Dix/Dr. Eiko Waida, chief residents. GF Strong auditorium at 9am. Call 875-2307.

Health Care/Epidemiology Rounds

Cohort Study Of BC Sawmill Workers Exposed To Chlorophenates. Dr. Clyde Hertzman, assoc. professor. Mather 253 from 9-10am. Call 822-2772.

ArtsFest '95

UBC Jazz Ensemble. Alan Matheson, guest trumpet/piano soloist; Fred Stride, director; music of Duke Ellington. Music recital hall at 12:30pm. Call 822-5574.

Techniques For Teaching Second Languages Workshop

Second Language Teaching Conference. Carr Hall conference room at 12:30pm. Hosted by The English Language Institute/The Centre for Intercultural Language Studies. Call 822-1525/5457.

Music Performance

UBC Symphony Orchestra. Andrea Bell, guest soloist; Jesse Read, conductor. Old Auditorium at 8pm. Program includes Bartok Concerto for Orchestra/Saint-Saens Cello Concerto. Call 822-5574.

Pharmaceutical Sciences Seminar

Intracellular Calcium Responses

In Airway Epithelial Cells. Dr. Robert Harris, research associate, Pharmacology/Toxicology, IRC #1 from 12:30-1:30pm. Call 822-4645.

Occupational Hygiene Program Seminar

Aerosol Composition In The Fraser Valley. Dr. Sara Pryor, post doctoral fellow, Geography, CEME 1202 from 12:30-1:30pm. Call 822-9595.

Mathematics Colloquium

Wavelet Transforms And Properties Of Functions. Dr. John Fournier, Math 104 at 3:30pm.

Notices

Student Housing

A service offered by the AMS has been established to provide a housing listing service for both students and landlords. This service utilizes a computer voice messaging system. Students call 822-9844, landlords call 1-900-451-5585 (touch-tone calling) or 822-0888, info only.

Friday Morning Tour

School/College Liaison tours provide prospective UBC students with an overview of campus activities, facilities and services. Brock Hall 204 from 9:30-11am. Reservations one week in advance. Call 822-4319.

Counselling Psychology Study

Midlife Daughters/Daughters-In-Law. Daughters, who are caring for a parent in a care facility, are needed for a study on stress and coping. Involves one evening small group discussion with women similar to yourself. Call Allison at 822-9199.

Acne Study

Must be able to attend 4 visits over 3 months. Seeking 18-35 years of age with moderate acne. Honorarium will be paid upon completion. Call Sherry in Dermatology at 875-5296.

Grad Centre Activities

Dance To A Latin Beat. Every Thur. at the Graduate Centre at 8:30pm. To find out more about free Mon. movies (presently Japanese) in the penthouse at the Grad Centre, free Tai Chi and other activities call the hot-line at 822-0999.

International Student Services

Women's Support Group. Jennie Campbell, International Student Advisor/Program Coordinator, International House every Thurs. between 4-5pm. Call 822-5021.

Campus Tours

School and College Liaison tours provide prospective UBC students with an overview of campus activities/faculties/services. Fridays at 9:30am. Reservations required one week in advance. Call 822-4319.

UBC Libraries

Library branches and divisions are offering more than 100 training/tutorial sessions this term. Learn how to use the online catalogue/information system, or one of more than 75 electronic databases in the library. Check branches/divisions for times and dates. Call 822-3096.

Clinical Research Support Group

Under the auspices of Health

Refreshments. Call 822-2666.

Chemical Engineering Weekly Seminar

The Thermodynamics And Mechanism Of Protein Adsorption. Susan Liu, grad student, Chem Engineering 206 at 3:30pm. Coffee at 3:15pm. Call 822-3238.

Theoretical Chemistry Seminars

A Realistic Potential For Hydrocarbons: An Example Of A Many Body Potential. M. Blair, Chemistry, Chemistry 402 central wing at 4pm. Call 822-3997.

Saturday, Feb. 11

Regent College Workshop

The Historical Jesus: Who Was The Pre-Easter Jesus?; The Death And Resurrection Of Jesus; Jesus And Life Today. Marcus Borg/N. Thomas Wright. Regent College main auditorium from 10am-4:30pm. Fee \$25. Call 228-1820.

Vancouver Institute Lecture

An Evening With Robert Bateman: Artist And Environmentalist. Robert Bateman, IRC #2 at 8:15pm. Call 822-3131.

Care/Epidemiology. Provides Methodological, biostatistical, computational and analytical support for health researchers. Call 822-4530.

Disability Resource Centre

The centre provides consultation and information for faculty members with students with disabilities. Guidebooks/services for students and faculty available. Call 822-5844.

Women Students' Office

We are taking registration for January groups including Mature Women Students; Self-esteem; Assertiveness Training, and Women of Colour and Meditation. Personal counselling and advocacy are available to women students. Call 822-2415 or drop by Brock Hall 203.

Equity Office

Advisors are available to discuss questions or concerns. We are prepared to help any UBC student, or member of staff or faculty who is experiencing discrimination or harassment, including sexual harassment, find a satisfactory resolution. Call 822-6353.

Continuing Studies Writing Centre

Writing 098: Preparation For University Writing And The LPI. Winter Session. Call 822-9564.

Research Study Volunteers Required

Role Stress In Dual-earner Parents Of Pre-school Children. Wendy Hall, UBC School of Nursing. Participants will complete 2 short questionnaires only. Honorarium offered. Call 686-0877.

A Study on Hearing and Age

Senior (65 yrs. or older) and junior (20-25 yrs.) volunteers are need. Expected to attend 3 one-hour appointments at UBC. Experiments will examine how hearing and communication abilities differ with age. Honorarium. Call 822-9474.

Dermatology Studies Volunteers Required

Genital Herpes. 16 yrs/older. Approx. 8 visits over one-yr. period. All patients will be treated with medication. No con-

trol group. Call 875-5296.

Skin Infection

Looking for participants with infections such as infected wounds, burns, boils, seborrheic cysts or impetigo. 18 yrs/older. 4 visits over maximum 26 days. Honorarium. Call 875-5296.

Audiology/Speech Sciences Study

Volunteers needed with normal hearing, who are native-English speakers; 18-35 years old, with no previous instruction in linguistics to participate in a study of speech perception in noise. Honorarium paid. Call 822-5054.

Statistical Consulting/Research Laboratory

SCARL is operated by the Dept. of Statistics to provide statistical advice to faculty/staff/students. During Term 2, 94/95, up to 3 hours of free advice is available for selected clients. Call 822-4037.

Faculty and Staff Volleyball

Mondays/Wednesdays Gym B. Every Wednesday, 12-5pm. Drop-in or attend regularly for recreation. Call 822-4479.

Badminton Club

Faculty/staff/grad students welcome. Osborne Gym A. Fridays from 6:30-9:30pm. \$15 yr; \$2 drop in. John Amor, Geophysics/Astronomy. Call 822-6933.

Surplus Equipment

Recycling Facility (SERF) Disposal of all surplus items. Every Wednesday, 12-5pm. Task Force Bldg., 2352 Health Sciences Mall. Call Vince at 822-2582/Rich at 822-2813.

Fine Arts Gallery


Open Tues.-Fri from 10am-5pm. Saturdays 12pm-5pm. Free admission. Basement of Main Library. Call 822-2759.

Nitobe Garden

Winter hours are Mon-Fri from 10am-2:30pm. Admission is free. Call 822-6038.

Botanical Garden

Open daily from 11am-5pm. Shop in the Garden, call 822-4529; garden information, 822-9666.



Red Cross Blood Donor Clinics
Monday, Jan. 30 3:00-9:00 pm
Totem Park Commons Block Ballroom
Tuesday, Jan. 31 9:30 am - 3:30 pm
IRC Main Lobby



TOWARDS A TUITION POLICY

Draft #5

The University of British Columbia has a special (national and international) role in a well-articulated provincial system of higher education. A well-defined vision and mission drive strategic planning to achieve its goals and priorities. The University is committed to effectiveness, efficiency and accountability and every avenue is explored to limit expenditures and to generate additional sources of revenue.

Maintaining the quality required to achieve its mission depends on stopping the erosion of operating funds, i.e. on maintaining the real value of the provincial grant and tuition fees. UBC will continue, by all methods possible, to achieve greater effectiveness and efficiency and, in doing so, will be accountable to the people of British Columbia. Any continuing savings will be used to enhance academic activities. The University will also make every effort to raise endowment funds from private sources to support chairs and professorships to attract and retain exceptional faculty and thereby to reinforce the margin of excellence.

With these commitments firmly in place, the University will determine future tuition fee increases in a manner that offsets any reduction in the provincial grant in constant dollars per weighted full-time equivalent student. Constant dollars will be calculated using an inflation index appropriate to the University including imposed and regulatory costs, e.g. mandated increases in the cost of benefits. (The resulting index is expected to be about one or two percent higher than CPI.) Tuition fee increases will provide an additional allocation equal to one-third of the basic annual increase to fund scholarships for the most outstanding students and bursaries for those in greatest need.

The sections which follow say something about the University's special role and strategic planning, steps taken to enhance effectiveness, efficiency and accountability and to gain access to additional resources. The policy on tuition fees is proposed in the light of the evidence of careful planning and decision-making designed to ensure that the people of British Columbia get the greatest possible return on the resources entrusted to the University to carry out its mission. We also recognize that governments and citizens are observing that a university education is not only an investment for the benefit of society in general but that it confers a private benefit on the individual. An issue with which we are engaged is the determination of an appropriate balance between public and private investment for public and private benefit.

This policy draft is being put forward for review and discussion. Please direct comments to President David Strangway.

UBC's Special Role

A recent economic impact study has shown that UBC makes a major contribution to British Columbia's economy. It is now recognized as one of the principal job creators in the province. In an increasingly knowledge-intensive world, the province requires an outstanding university, among the best in Canada and the world, not only for economic but for social and cultural leadership.

1. A diverse and well articulated post-secondary system is now well established in the province and within this system UBC can and must play a very special role.
2. Outstanding research and teaching in core academic fields and in the professions are essential to the future prosperity of the province.
3. In addition to teaching and research, the University provides benefits to British Columbians in many ways, e.g. the enhancement of the arts, the transfer of technology.
4. Carrying out the University's special role requires that we maintain the quality of teaching, learning, research and service at UBC.
5. We plan to maintain the policy in place since 1965 that the student body at UBC should be 28,000 (22,000 undergraduate and 6,000 graduate students).
6. We recognize that the quality of the faculty is key to our mission.
7. We recognize that the quality and efficiency of support staff are key to our mission.

Commitment to Effectiveness, Efficiency and Accountability

1. Effectiveness and efficiency have improved dramatically and are reflected in the awarding of 40% more degrees annually now than ten years ago.
2. The increased retention rate of undergraduate students is the product of an admission process that selects students with the highest academic standards and of a variety of other strategies designed to provide support for personal and academic growth while students are at the University.
3. Graduate students are equally rigorously selected and are now being consulted as faculties work to improve retention and completion rates in graduate programs.
4. Since 1981/82 UBC has absorbed a 27% reduction in the constant dollar value of the provincial grant per weighted student and has accordingly improved its efficiency (or its productivity) dramatically. The effective value of the provincial grant has been reduced even further by the requirement that the University absorb without incremental funding the costs arising from government legislation and regulation and from mandatory or fixed costs in such areas as Unemployment In-

surance, Canada Pension Plan, equity, safety, environment, Workers' Compensation, utility rates, insurance rates, Freedom of Information and Protection of Privacy. We can no longer absorb added fiscal demands without commensurate funding.

5. Major reengineering projects are now under way to seek further efficiencies. The principles of continuous quality improvement are applied explicitly in a number of departments and in several additional projects.
6. We have raised awareness of the importance of stewardship and have introduced incentives for fiscal responsibility by allowing carry-forward of surpluses and deficits as a first credit or first charge against the following year's budget of a faculty.
7. Both efficiency and accountability are served by the policy of requiring an increasing number of self-funding ancillaries to operate on a break-even basis with no subsidies (including salaries and benefits, capital and space operating costs):
 - Bookstore
 - Athletics and Sports Services (complete by 95/96)
 - Biomedical Communications (complete by 95/96)
 - Educational Measurement Research Group
 - Computing and Communications (complete by 95/96)
 - UBC Press
 - Media Services
 - University Computing Services
 - Information Systems Management
 - Telecommunications Services
 - Food Services
 - Housing and Conferences

(note:- Any minor remaining subsidies have been identified and will be removed by the end of the 1995/1996 fiscal year.)

8. Many units, sub-units or programs - not referred to as ancillaries - generate their own revenues and do not receive support from the general provincial operating grant or from credit tuition revenue. They carry forward 100% of any year-end deficit or surplus and cover all their costs including the cost of employee benefits. These principles apply either to the entire budget of the unit or, at least, to a designated portion of its functions and its budget:
 - Oyster River Farm
 - Medical Student Alumni Centre
 - UBC/Ritsumeikan (academic program)
 - Library photocopying
 - Interlibrary loans
 - Student Health Service (designated portion)
 - Animal Care Centre (budgeted portion)
 - Campus Planning and Development (capital portion)
 - University Industry Liaison Office (budgeted portion)
 - University Research Forests
 - Green College
 - Academic Equipment Fund
 - Cooperative Education Fund
 - Graduate Student Awards Fund
 - Oral Medicine Clinic
 - Partnership Costs of University

- College Programs
- Teacher Education Expansion
- Teaching and Learning Enhancement Fund
- Student Aid Fund
- Development Office (budgeted portion)
- Pacific Educational Press
- Distance Education Office (Faculty of Education)

9. A number of programs operate now (or will in the near future) with special purpose budgets supported either wholly or largely by endowment income. These programs cover their own costs including the cost of employee benefits:

- Disability Resource Centre (budgeted portion)
- Rick Hansen National Fellow
- Graduate Program in Occupational Hygiene (budgeted portion)
- Peter Wall Institute for Advanced Studies
- Social Science and Humanities Research Fund
- endowed chairs
- endowed professorships
- MAGIC (budgeted portion)
- Centre for Applied Ethics (budgeted portion)

10. Many units or sub-units have a significant part of their operation supported by outside revenue. As of 1995/1996, year-end shortfalls or excesses in budgeted outside revenue will be carried forward to reward stewardship and enhance accountability. Such units include:

- Belkin Art Gallery (future)
- Frederic Wood Theatre
- Child Study Centre
- Museum of Anthropology
- Botanical Garden (moving towards self-sufficiency)
- South Campus Farm
- Faculty of Medicine (MSP revenue)
- Chan Shun Centre for the Performing Arts (future)
- Dental Clinic

11. Continuing studies across all faculties and units have been mandated to operate on a self-sufficient basis, i.e. they carry forward year-end deficits or surpluses. Faculties are reimbursed by these units for the cost of services provided through them to students and to the public.

12. An aggressive early retirement program has provided both budget reduction and faculty renewal opportunities. It has been a significant factor in our ability to maintain a faculty renewal rate of at least 5% per year. Thus tenure has not been a barrier to appropriate levels of renewal and change.

13. The costs of operating our physical plant have been kept consistently among the lowest in Canada.

14. UBC is one of the few universities in Canada that has already had to eliminate selected academic programs (and the associated tenured faculty).

15. Major steps have been taken and continue to be taken to reduce the unnecessary usage of utilities - electricity, water, gas, etc.

16. To assess their standing, effectiveness and efficiency we now review



THE UNIVERSITY OF BRITISH COLUMBIA

TOWARDS A TUITION POLICY

Draft #5

- every academic and service program periodically (every five to seven years) with appropriate national and international comparisons.
17. The year-round usage of the campus is increasing sharply. Within the next few years, we will have as many students in the two terms of the summer session as in the two terms of the winter session. Some programs are operating officially, and the whole University is operating, in effect, on a trimester basis.
 18. In search of greater effectiveness and efficiency, we have embarked on a review of academic organization, including the nature and size of departments and faculties. Already some departments in each of several faculties have merged and others have been eliminated.
 19. The entire 1994/95 provincial innovation grant equal to one percent of the operating grant has been allocated to the training of faculty and staff, the acquisition of current technology, the implementation of new applications in each of the faculties and networking of those applications across the University. We are committed to maintaining the student/faculty ratio as a fundamental element in the quality of education and we are seeking to enhance the quality of the learning environment through the innovative use of technology.
 20. We have increased substantially the support of student aid through operating budgets, endowments and part-time work opportunities and this, together with provincial and federal loan programs, means that no student, otherwise admissible, is denied the opportunity to study at UBC for personal financial reasons alone.
- Commitment to Maximizing Resources**
1. With the participation of the provincial government we have conducted the most successful fundraising campaign in Canadian history to support academic enrichment through buildings and endowments.
 2. We have used wisely the Hampton Place income to develop an endowment base to support UBC's mission and to enhance fundraising activities for university priorities by providing matching funds (and there will be more opportunities on the South Campus for similar projects in the future).
 3. Based on widely accepted space standards, UBC is short of space and we will continue to seek all possible means to correct this shortfall and to deal with maintenance, and the refurbishment of existing space or its replacement when acceptable standards cannot be achieved through refurbishment.
 4. We will be recommending annual graduate tuition fees to ensure that full tuition is paid as long as graduate students remain enrolled and that fees are based on full or part-time study, clearly defined.
 5. For some new and redeveloped graduate programs in professional fields, tuition fees are being established at a level which will recover all or most of the program operating costs, both direct and indirect, e.g. DPharm. and MBA.
 6. As new programs, particularly in fields which serve specific needs of industry and society, external endowment and operating funds are being sought, e.g. advanced wood products processing, fire protection engineering, vocational rehabilitation counselling.
 7. We are developing the policy framework to enable faculties to plan for full cost recovery for a predetermined number of international students - not to exceed 15% of enrolment - in undergraduate and professional graduate programs.
 8. We are maximizing the return to UBC and to the creators of intellectual property developed in the University, through royalties on patents, through licences and through the creation of companies in which the University takes equity as appropriate.
 9. We are now recovering at least part of the cost to UBC for a number of services provided:
 - processing of applications
 - issuing of transcripts
 - administration of ancillaries
 - overhead costs of conducting research on contract
 10. The judicious use of campus facilities for academic conferences has generated sufficient revenue to facilitate the building of student residences and thereby enabled us to reach our goal of accommodating 25% of students on campus. Any further construction of residences will be aimed at addressing requirements for the mix, e.g. meeting the need for family housing for older students, students with children, single parents.
 11. The building of faculty and staff rental accommodation has been a significant factor in enabling us to recruit outstanding faculty.

UBC REPORTS ADVERTISING RATES

Circulation: 37,000

Distribution: Twice monthly on the UBC campus and in The Courier on Vancouver's West Side

Mechanical Requirements

Page Size: 15.5" x 10.25"

Columns: five per page

Black and white copy only

Display ad rates:

\$14.70 per column inch, GST not included

Full page (10.25" x 15") \$787.00

1/2 page (10.25" x 7.5") \$525.00

1/4 page (6" x 7") \$315.00

1/8 page (4" x 4.75") \$142.00

1/16 page (1 7/8" x 5") \$73.00

Business card (4" x 2") \$59.00

Classified ad rates:

\$15.75 for 35 words or less, GST included

1/8 page

2 columns (4" x 4.75")

\$142.00

1/16

1 column (1 7/8" x 5")

\$73.00

For advertising information
call: (604) 822-3131

Business card
2 columns (4" x 2")
\$59.00

1/4
3 columns (6" x 5")
\$315

1/2
5 columns (10.25" x 7.5")
\$525



Take A Seat

Michael Kelly, director of Athletic and Sport Facilities, takes his seat among the 2,307 that are being installed at War Memorial Gym. Ninety-five per cent of the new individual theatre-style seats are now in place. The gym's upgrading includes the installation of 600 retractable platform seats at floor level, new scoreboards and basketball backboards, and plans for an improved sound system.

Abe Heffer photo

Drug info line will aid B.C. consumers

by **Connie Filletti**

Staff writer

UBC's Faculty of Pharmaceutical Sciences is participating in a new initiative designed to provide seniors with drug information.

The project, known as the British Columbia Seniors Medication Information Line (B.C. SMILE), is expected to begin in April and will cost approximately \$315,000 over three years.

B.C. SMILE will operate from Monday to Friday, 10:00 a.m. to 4:00 p.m., from the Faculty of Pharmaceutical Sciences. Inquiries will be answered by licensed pharmacists in the faculty.

In addition to a local telephone number for Vancouver residents, seniors, their caregivers and family members living elsewhere in the province can call a toll-free line with any drug-related questions, including adverse reactions, drug and food interactions and the misuse of medications.

John McNeill, dean of the Faculty of Pharmaceutical Sciences, estimated that the service will be able to handle approximately 2,000 calls per month.

There will also be a data line available allowing access to UBC and the B.C. Drug and Poison Information Centre networks.

B.C. SMILE is a joint effort of UBC, the province's Ministry of Health, the B.C. Drug and Poison Information Centre, the Science Council of B.C. and the pharmaceutical industry.

NOTICE

Members of the Campus Planning and Development Review Committee would like to thank those individuals and organizations who have expressed their views on the operations of the Campus Planning and Development Department.

We welcome additional submissions in writing or fax by February 15, 1995 to the Committee:

c/o Office of the Vice-President, Admin. and Finance
Rm. 121, Old Administration Building, Zone 2
6328 Memorial Road, University of British Columbia
Vancouver, B.C. V6T 1Z2 or FAX# (604) 822-3134

Information on the Committee's composition and Terms of Reference may be obtained from the Office of the Vice-President, Administration and Finance

ENQUIRY INTO POLITICAL SCIENCE DEPARTMENT

**ATTENTION:
Political Science Students, Past and Present**

The enquiry into allegations of "pervasive sexism and racism" in the Political Science Department, which began in September of 1994, is entering the final stage of the interview process.

If you have relevant information, positive or negative, about the Department and have not as yet made your views known to me, please contact me as soon as possible, and no later than February 10, 1995. I will not receive submissions from concerned and/or interested students after that date.

Should you have any concerns about confidentiality, I would be pleased to discuss those concerns with you on a confidential basis in advance of a formal interview.

Please contact me either by voice mail at 737-0448, or by mail at #300 - 1275 West 6th Avenue, Vancouver: V6H 1A6. You may speak as long as you wish on my voice mail. If I am not in when you call, kindly leave a phone number and times during which I can return your call.

I am conducting my interviews on Campus, in Room 246 of the Family and Nutritional Sciences building (located behind the bookstore on East Mall). If it is more convenient for you, a meeting may be scheduled at my own office location on West 6th.

Joan I. McEwen

Classified

The classified advertising rate is \$15.75 for 35 words or less. Each additional word is 50 cents. Rate includes GST. Ads must be submitted in writing 10 days before publication date to the UBC Community Relations Office, 207-6328 Memorial Road, Vancouver, B.C., V6T 1Z2, accompanied by payment in cash, cheque (made out to UBC Reports) or internal requisition. Advertising enquiries: 822-3131.

The deadline for the Feb. 9, 1995 issue of UBC Reports is noon, Jan. 31.



Services

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Gavin Wilson photo

A Rose Garden . . . As Promised

Plant Operations gardener John Heady plants some of the 700 roses that are going into the new Rose Garden atop the Marine Drive parkade. The original rose garden was dug up in 1993 to make way for construction of the parkade, which provides space for about 1,000 vehicles.

Steam bath gives flower growers clean, cheap alternative to chemicals

by Gavin Wilson

Staff writer

A UBC plant scientist is demonstrating that some plant disease-causing microbes can't take the heat.

Assoc. Prof. Bob Copeman has developed a method using heat to kill a fungus that attacks cyclamen, a flower crop worth \$2 million per year to Lower Mainland growers.

Growers were having a problem with the Styrofoam trays used for cyclamen seedlings. The containers are frequently reused to save money, but this also makes them prone to a fungal contamination that is difficult to remedy.

The growers could treat the fungus with a powerful brew of chemicals, but would prefer an alternative that is less costly and less hostile to the environment.

Copeman proposed using a "hot room" heated with water from boilers used to heat commercial greenhouses.

He found that storing the containers in 75 C temperatures for two or three days destroys the fungus and does not shrink the Styrofoam.

"It's an environmentally friendly way of decontaminating growing materials such as pots and trays, and it also puts waste heat from boilers to good use," Copeman said.

The method has been adopted by one major grower, and others are expected to follow suit.

Copeman has also developed biological controls for a disease that is a problem even in soilless growing media, such as rock wool and sawdust, which are commonly used in B.C.'s multimillion-dollar greenhouse agriculture industry.

To combat crown and root rot, a major problem wherever greenhouse tomatoes are grown, he has inoculated seeds with closely related non-pathogenic strains of the disease-causing agents.

Commercial-scale trials showed that this method, which avoids the use of chemicals, improved disease protection and boosted yields 18 to 22 per cent compared to untreated control plants.

"We have to encourage people not to rely just on chemicals," Copeman said. "There are often more environmentally friendly ways of accomplishing the same ends. Sometimes they are more expensive and labour intensive, but those are trade-offs we'll have to make."

"In the Faculty of Agricultural Sciences, we feel it is important to encourage students to take an integrated approach that uses several solutions in pest and disease control," he added.

People

by staff writers

Charles Laszlo, a professor of Electrical Engineering, has been appointed director of the Institute of Hearing Accessibility Research (IHEAR) for a five-year term.

IHEAR was established at UBC in July, 1994 to foster research into hearing accessibility and to help people with hearing problems in everyday life.

Laszlo, who joined UBC in 1974, is former director of the university's Clinical Engineering Program, a graduate program that trains engineers to work in hospitals on advanced technologies and health care delivery.

An inventor and advocate for the disabled, Laszlo's areas of research include developing innovative communications technology such as devices that help the hard of hearing use telephones and view instant captioning of speech.

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Prof. Jane Gaskell, assoc. dean of graduate programs and research in the Faculty of Education, has been appointed to the 12-member board of the Social Sciences and Humanities Research Council (SSHRC). A faculty member since 1974, Gaskell's research and publications have focused particularly on the role of women in the education system. She is currently leading a national study looking at 21 "successful" secondary schools across Canada. Gaskell has served as president of the Canadian Society for the Study of Education and the Canadian Association for Foundations of Education. The SSHRC, established in 1978, is the primary federal agency supporting research and research which leads to further understanding of the economy, society and culture.



Gaskell

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Prof. David McClung has received the 1994 Honorary Fellowship Award from the American Association of Avalanche Professionals for his contributions to snow science and practice.

Before coming to UBC in 1991, he conducted research for the Canadian Department of Environment at Canmore, Alberta and with the National Research Council at Vancouver and Rogers Pass.

He is also author of the *Avalanche Handbook*, which contributed to avalanche literature by providing reliable guidelines for avalanche control professionals.

McClung, who holds a joint appointment with the departments of Civil Engineering and Geography, received the award at the association's annual meeting in Snowbird, Utah.

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Bank executive Donald Potvin has been appointed to the University of British Columbia for a three-year term.

Potvin is the senior vice-president, Western Canada commercial and corporate banking division, of the Canadian Imperial Bank of Commerce.

He is also vice-chair of the Salvation Army's advisory board and chair of the board of trustees of St. Paul's Hospital.

The UBC Foundation is responsible for fostering public awareness of UBC, facilitating programs and activities to help increase financial support for the university and for managing its funds and property.

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Prof. Ken Haycock, director of the School of Library, Archival and Information Studies, has been elected chair of the West Vancouver School Board for 1995. Haycock was first elected to the board in 1993 and for the past year has chaired its public education committee.

At UBC, Haycock teaches graduate courses in the management of information agencies and services. A member of more than 30 professional associations, Haycock was also elected North American director for the International Association of School Librarianship in 1994.

UBC nursing faculty win funding for four projects

by Connie Filletti

Staff writer

Several faculty members of UBC's School of Nursing are recipients of 1994 Nursing Research Competition Awards.

A total of \$99,066 in grants was awarded to five research projects, four of which include UBC participation.

Joan Bottorff, an associate professor of Nursing and Elizabeth Davies, a professor of Nursing, are members of a research team awarded \$23,000 to examine palliative care patients' experiences and perspectives on making personal choices about the nursing care they receive.

Elaine Carty, an associate professor of Nursing, and colleagues from B.C.'s Women's Hospital, will use their \$24,949 award to study if interventions such as narcotics, epidural anesthetics, electronic fetal

monitoring, augmentation and forceps delivery are used less if a woman waits until she is in the accelerated stages of labour before going to the hospital.

Former acting director of the School of Nursing Carol Jillings and graduate student Lynne Maxwell were awarded \$18,462 to evaluate family environment factors that may influence cardiovascular risk.

Funding for the Nursing Research Competition Awards is provided by the B.C. Health Research Foundation, the B.C. Medical Services Foundation and the Mr. and Mrs. P.A. Woodward's Foundation.

The competition was created to provide practising clinical nurses and nurse-researchers with educational and research experiences to improve the quality of nursing care and patient health.

Profile

Giving forests a future

Forestry Professor Gene Namkoong is winning recognition for his research into the role of biological diversity in sustainable forest development

by Abe Hefter

Staff writer

A grin steals across Gene Namkoong's face as he displays a letter written to him by United States President Bill Clinton.

"You often wonder whether the work that you think is important has much impact at the global policy level. It's a little scary that people are taking you seriously," says the head of UBC's Forest Sciences Dept. in the Faculty of Forestry.

"I'm not used to that."

Judging by the recognition that Namkoong has garnered recently, it may be something he should get used to.

In addition to receiving a letter from the U.S. president in recognition of his research in the area of forest genetics, Namkoong was awarded the 1994 Marcus Wallenberg Prize for his pioneering work in ensuring biological diversity in the forests of the world.

Namkoong donated the \$110,000 prize toward the establishment of a graduate fellowship in the area of forest conservation biology at UBC. The provincial government added \$95,000 while the federal government contributed \$50,000.

Namkoong also made separate donations to the U.S. Forest Service Program, Seoul National University in Korea, and North Carolina State University, where he studied and taught for 30 years before joining UBC in 1992.

Namkoong's deeply rooted belief in the value of higher education led to his decision to contribute to various scholarships.

"My wife, Carol, and I have been instilled with a basic belief in the value of education. My wife's parents were educators all their lives while my grandfather was a well-known educator in Korea. I wanted to contribute to that strong family tradition."

As a youngster, it was Namkoong's strong family ties that enabled him to escape the streets of New York City. A self-confessed "slum kid," Namkoong and his older brother would leave behind the reality of life in post-depression Manhattan by crossing the George Washington Bridge to the wide-open spaces of a New Jersey campground that often proved to be Namkoong's salvation.

Namkoong's teenage fascination with trees and green spaces grew into a lifelong academic pursuit. After graduating from State University of New York with a master's degree in forestry, Namkoong went to work for the U.S. Forest Service before obtaining his PhD in Genetics and Statistics in 1960 at North Carolina State.

After 10 years of research in the area of mathematical genetics, Namkoong set his academic sights on natural population genetics and its application to breeding trees. He began work with the belief that humans, either deliberately or inadvertently, had affected the long-term evolution of crops with a short-sighted approach to genetic management. The reality of the situation grabbed the world by the

throat in 1970 when a U.S. corn blight wiped out 50 per cent of the crop in the South.

"Here was an entire crop that was threatened," says Namkoong. "When you realize that only three crop species - wheat, rice and maize - provide about 50 per cent of the world's calories, you can see how vulnerable the entire agricultural system is."

Namkoong believes the heart of the problem lies in the fact that there is not enough genetic variation in many crops to ensure their long-term development. Since it is difficult to broaden the base and provide a commercial product at the same time, breeders have concentrated on the most promising varieties, in terms of yield.

"If a crop breeder starts with 10

varieties, he or she may end up with only five because the rest just aren't worth developing. It is important, particularly for trees, that we avoid this short-sighted development of the genetic resource."

The devastation caused by the corn blight led Namkoong to pose several questions: What are optimal levels of diversity? Can you simplify breeding projects to increase diversity? What is the genetic foundation for more diversity?

He began to answer those questions some 10 years later while on sabbatical at Oxford University, where his practical applications began to take root as he studied breeding programs involving tropical trees in Africa and Southeast Asia.

By developing multiple varieties of tropical trees, Namkoong began to take

his theory and put it into practise. He discovered that new programs are more easily developed with multiple varieties than with the traditional forms of breeding, allowing different varieties of trees to develop at different rates.

This application has since been broadly used throughout Asia, Africa and South America. Namkoong's work is also now being supported as a system for maize breeding in independent research at North Carolina State.

"The idea is not to try to overwhelm natural systems with a uniform technology, but to use our understanding to moderate those natural systems for diversity," he explains.

"It is the basis for continued increase in both productivity and in the adaptive evolutionary potential of forests, and is one of the biological keys to sustainable forest development."



Abe Hefter photo

Gene Namkoong

"The idea is not to try to overwhelm natural systems with a uniform technology, but to use our understanding to moderate those natural systems for diversity. It is the basis for continued increase in both productivity and in the adaptive evolutionary potential of forests, and is one of the biological keys to sustainable forest development."

When Namkoong arrived at UBC, Forestry Dean Clark Binkley encouraged him to explore

forestry's "global revolution" as the new head of the Forest Sciences Dept.

"In North America, you could always go elsewhere and get more wood," says Namkoong. "That's not the case any more."

"There are no longer any timber frontiers. How we deal with this situation as professionals is substantially different now than it was even 10 years ago."

According to the Marcus Wallenberg Foundation, Namkoong has few peers in the area of scientific research in the forest industry sector.

Namkoong was in Sweden last September to receive the prize for his "path breaking contributions to quantitative population genetics, tree breeding and management resources, which form a solid scientific basis for the maintenance of biological diversity in forests all over the world."

A year earlier, Michael Smith, director of UBC's Biotechnology Laboratory, had received the Nobel Prize in Chemistry for his discovery of site-directed mutagenesis, a technique which allows scientists to reprogram the genetic code.

"It's interesting that both prizes were awarded as a result of research in the area of genetics," says Namkoong.

"Although Michael's research involves individual gene manipulation and my work looks at multiple gene complexes, our research is complementary in that we are both looking at ways that genetical systems are understandable and adaptable."

Namkoong admits he was surprised to discover he had won the Marcus Wallenberg Prize. Most of the previous prize winners have been involved in chemistry, physics, or the engineering aspects of wood as a material. Others have been involved in various aspects of biology, mostly directed toward increasing productivity.

"In my mind, my research was not in the area in which the prize was awarded. I never considered my work to be of industrial significance."

Others, including Bill Clinton, would disagree.