

## OFFICE OF THE VICE-PRESIDENT, RESEARCH

*Memorandum*

TO: Members of Senate

FROM: Bruce P. Clayman  
Vice-President, Research

SUBJECT: CRC Strategic Plan


DATE: August 4, 2000

I am pleased to enclose a copy of the year 2000 Strategic Research Plan (SRP) that was developed as a required component of our applications for Canada Research Chairs (CRC) through the process described below. The SRP and its summary will be posted on SFU's website; the summary will also be posted on the website of the CRC program, along with the summaries of the SRP's of all other Canadian universities that receive Chairs under the program. We will have the opportunity to update the SRP annually.

As stated in the SRP, SFU developed a comprehensive, bottom-up academic planning process in 1997/1998. Each Department and each School (at SFU, Schools and Departments are equivalent administrative units) prepared a three-year plan highlighting, among other things, research directions, staff requirements and infrastructure needs. These plans informed the three-year plans of SFU's five academic Faculties, which in turn were incorporated into a single planning document for the University. The (then) most senior academic planning body, the Senate Committee on Academic Planning, reviewed this document. The year 2000/01 will mark the second iteration of this three-year academic planning process.

On the basis of these earlier planning documents, the CRC Strategic Research Plan was collaboratively developed over the last several months by the Faculty Deans (in consultation with their Departments and Schools), the Vice Presidents, Academic and Research and the President. It was presented for comments to the Chairs of all Departments/Schools, and the final version was approved on July 12, 2000 by the newly-created Senate Committee on University Priorities, the university's senior planning body, which approval is specified by the CRC program.

It is presented to Senate for information and advice.



Attachment

NOTE: SCAR suggests that in the future, the updated plan should come to Senate for consideration prior to submission.

**CANADA RESEARCH CHAIRS - STRATEGIC RESEARCH PLAN**  
**SIMON FRASER UNIVERSITY**  
21 July 2000

## **I. INTRODUCTION**

The Canada Research Chairs (CRC) program will, in combination with the Canada Foundation for Innovation (CFI) and the British Columbia Knowledge Development Fund (BCKDF), significantly enhance the contribution Simon Fraser University (SFU) will make to society in its essential role as a primary centre for learning, discovery, innovation, and scholarly inquiry.

Faculty renewal and retention over the next decade comprise both a significant opportunity and a challenge for SFU. Nearly one-third of the faculty complement will retire during this period. An equal number may leave the University for new opportunities at other institutions across the country and elsewhere in the world - principally in the United States. The University will use the vacancies arising from faculty turnover to change its disciplinary mix, increase support in high-priority areas, and create new programming initiatives that meet the needs of the emergent knowledge-based society and economy.

The CRC program is of vital importance to SFU's success in meeting the faculty renewal and retention challenge of the next decade. Tier I Chairs provide the University with the opportunity to appoint distinguished researchers with exceptional research records and provide competitive research support to help retain the world-class personnel we have already at our institution. This will ensure that our leading research programs continue uninterrupted and with additional resources.

In recent years, SFU has attracted a number of outstanding young faculty members. Their research programs are starting to take root, forming the basis of exciting new research directions. Recruitment over the next decade, aided by the appointment of Tier II Chairs, will seek to further support these new research directions, building cross-disciplinary research bridges wherever possible.

SFU has forged significant synergistic research alliances with other universities in the province as well as innovative collaborations with a wide range of community partners. Several prominent examples are:

- ◆ SFU was one of TRIUMF's four founding universities and is a member of the consortium of universities that manages TRIUMF as a joint venture.
- ◆ SFU was a founding member of the Western Canadian Universities Marine Biological Society (WCUMBS) in 1972 and has been one of the primary users of the Bamfield Marine Station (BMS) since that time.
- ◆ SFU is one of the major partners for a new collaborative initiative involving BC's universities, industry, NRC, TRILabs and others to develop the New Media Innovation Centre (NewMIC) in Vancouver. NewMIC will be an application-driven collaborative research centre for the design, creation and dissemination of new media tools and

resources for educational, telecommunication, entertainment and cultural archival applications.

- ◆ SFU is the host institution for the TeleLearning Network of Centres of Excellence (TL\*RN).
- ◆ SFU is the host institution for the McDonnell Project in Philosophy and the Neurosciences.
- ◆ SFU is one of four Canadian universities participating in a major SSHRC/MRCI funded project to document the History of the Book in Canada.
- ◆ The Cooperative Resource Management Institute (CRMI) at SFU was established to coordinate multidisciplinary, collaborative research programs involving experts from SFU, research scientists from the Canada Department of Fisheries and Oceans and other resource management agencies.
- ◆ SFU is a partner in the Georgia Basin Futures Project based at the Sustainable Development Research Institute at UBC. This \$2.5 M SSHRC-funded project will examine possible models to enhance human well-being while protecting ecological health in the Georgia Basin of BC over the next 40 years.
- ◆ SFU also has major association with the following other Centres of Excellence: Mathematics of Information Technology and Complex Systems (MITACS), Institute for Robotics and Intelligent Systems (IRIS), Canadian Institute for Telecommunications Research (CITR), Canadian Bacterial Disease Network (CBDN), Microelectronic Devices, Circuits and Systems (MICRONET), and Geomatics for Informed Decisions (GEOIDE). The University will also participate in the newly created AquaNet. Finally, SFU co-hosts Research on Immigration and Integration in the Metropolis (RIIM) - a SSHRC Centre of Excellence.

## II. STRATEGIC RESEARCH PLAN COMPONENTS

### 1. Objectives of the Plan

SFU's Strategic Research Plan is designed to meet the following five objectives:

- ◆ build upon our existing strengths and research excellence and maintain our reputation as the best comprehensive university in Canada;
- ◆ support and create opportunities for the pursuit of new knowledge, discovery and innovation;
- ◆ promote strategic alliances and cross-disciplinary research within the University and seek new collaborations with all our communities to foster intellectual, social, cultural, and economic development in the province of BC;
- ◆ recruit and retain outstanding faculty to enhance research capacity and provide leadership for new initiatives and key research programs; and
- ◆ enrich the learning experience of our students through participation in, and exposure to, the ground-breaking research and new knowledge being generated by our outstanding researchers so they can fully participate in the knowledge society of the 21<sup>st</sup> Century.

## 2. Major Research Thrusts

SFU recognizes the outstanding contributions of all researchers at, and associated with, the University. The 10 research areas listed below have been singled out for inclusion in this Strategic Research Plan on the basis of their current level of, or potential for, research excellence; their ability to foster the development of innovative research programs elsewhere in the University; their ability to encourage collaboration among SFU researchers and external partners; their potential to establish research niches within the province of BC; and their ability to contribute to the objectives of the Strategic Research Plan. The order presented is alphabetical and does not convey any prioritization.

Behaviour, Culture, and Social Relations	Chemical and Structural Biology and Biological Physics
Economy	Education
Environment	Health
Language, Communication and Information Dissemination	Materials Science
Policy, Management and Leadership	Technology

## 3. CFI Infrastructure Requirements

The support for infrastructure offered by CFI in support of the CRC program and the flexibility of CRC funding is critically important to the success of SFU's research strategy. To continue as one of the best comprehensive universities in Canada and to support and increase its research potential and excellence, SFU must invest in the most advanced infrastructure for its researchers. Universities in British Columbia have been severely challenged to provide state-of-the-art research facilities and equipment to enable their faculty to engage in leading edge research. The creative ways in which BC universities have provided advanced infrastructure to their researchers is testimony to the commitment of the universities to their research missions.

Specific requests for infrastructure to CFI will be identified at the time of each Chair nomination. These requests will be developed in consideration of priorities for CFI funding outlined in brief in the *Institutional Research and Training Development Plan* submitted earlier this year and updated annually; the CFI Plan will ultimately be integrated with this CRC Plan. While details of specific requests for infrastructure cannot be made prior to completion of Chair nominations, experience has demonstrated that Chairs associated with the Health, Chemical and Structural Biology and Biological Physics, Materials Science, and Technology research thrusts will have more substantial infrastructure requirements than Chairs in the other areas of the SFU Strategic Research Plan.

## 4. Assessment Strategy

The overall effectiveness of the Strategic Research Plan for SFU will depend in large part on the comprehensiveness of, and internal commitment to, a clearly defined assessment strategy. The assessment strategy envisioned for SFU incorporates both short-term and long-term

stewardship to ensure that the objectives of the Plan are being met and significant progress is being made.

The committee of academic Deans, together with the Vice Presidents, Academic and Research will annually assess SFU's success in meeting the objectives outlined in the Strategic Research Plan. The assessment will occur at two levels: a detailed review of the specific objectives defined for the Chairs nominated for each research thrust and a global review of how well the Plan meets its five major objectives. The annual review will also assess the degree to which the Plan has been integrated with other initiatives at the University and whether opportunities for inter-institutional and inter-sectoral collaborations have been explored and pursued. In addition, the assessment will evaluate the extent to which the research environment at the University is being stimulated by the Plan and whether the new initiatives undertaken have taken root.

On the basis of the annual review, an updated Strategic Research Plan will be considered by the University's most senior academic planning body, the Senate Committee on University Priorities. An updated Plan will then be forwarded to the CRC Secretariat.

## 5. Expected Outcomes and Indications of Success

At an institutional level, the University will evaluate the overall successfulness of the Plan according to the goals and suggested indicators outlined below for each of the Plan's five objectives. Additional milestones and outcomes may be identified as part of a specific Chair nomination if appropriate.

- (1) Existing research programs within each strategic research cluster should demonstrate clear evidence of enhancement. Major research discoveries, successful application of new technologies, increased publication activity in leading peer-reviewed journals and books from recognized scholarly presses, recognition of research by the academic and non-academic community, heightened success in obtaining external research funding from national granting agencies and other funding sources, will all be taken as such evidence.
- (2) Innovative new research programs should have begun and, where possible, there should be indications of early successes. The ability to discern new initiatives and show how they are contributing to new research directions for the University will be considered a sign of achievement of the Plan's second objective.
- (3) Research that brings together members from across traditional disciplines and which promotes strategic alliances across the University should be on the rise. Similarly, research programs that extend beyond the University through partnerships and collaborations with the community should involve strengthening existing partnerships and collaborations and initiating new relationships. The adoption of cross-disciplinary research approaches to provide enhanced learning environments for students should also be in evidence.
- (4) Outstanding scholars will be leading each of the major research thrusts. An increasing faculty complement, expanding research productivity, and the attraction to the University of both senior and junior researchers who seek to participate in the research programs will be viewed by the University as a clear sign of success of the Strategic Research Plan.

(5) The learning experience of our students through participation in, and exposure to, ground-breaking research should be enriched by the recruitment and retention of leading scholars across the University. Enhanced incorporation of research into graduate and undergraduate programming, expansion of student participation in research programs, increased student understanding of diverse research approaches, paradigms, and perspectives, and heightened satisfaction by graduates in their educational experiences, will all be seen as indications of the University's success in meeting this final objective of the Strategic Research Plan.

## **6. Institutional Planning and Approval Process**

SFU developed a comprehensive, bottom-up academic planning process in 1997/1998. Each Department and each School (at SFU, Schools and Departments are equivalent administrative units) prepared a three-year plan, highlighting among other things research directions, staff requirements and infrastructure needs. These plans informed the three-year plans of SFU's five academic Faculties, which in turn were incorporated into a single planning document for the University. The (then) most senior academic planning body, the Senate Committee on Academic Planning, reviewed this document. The year 2000/01 will mark the second iteration of this three-year academic planning process.

On the basis of these earlier planning documents the current Plan has been collaboratively developed by the academic Deans (in consultation with their Departments and Schools), the Vice Presidents, Academic and Research and the President. It was presented for comments to the Chairs of all academic Departments/Schools, and has been approved by the newly created Senate Committee on University Priorities.

## **III. A FOCUSED VIEW OF SFU's RESEARCH THRUSTS**

### **1. Behaviour, Culture, and Social Relations**

SFU has a tradition of research excellence in Social Science and Humanities disciplines across its broad-based Departments, Schools and programs in the Faculty of Arts, in the School of Communication in the Faculty of Applied Sciences, and in the Faculty of Education. Over time, diversification has produced both specialized interdisciplinary programs and an increasing emphasis on applied professional programs. Today, SFU is renowned nationally and internationally for basic and applied research in the Social Sciences and Humanities.

Each of the three areas - Behaviour, Culture and Social Relations - has a unique purpose, focus and research strength at the University. Nonetheless, we grouped them together in our Strategic Research Plan because of their underlying common anchor to the Social Sciences and Humanities. Positions sought through the CRC program will enhance our current strengths across these areas and offer the potential for multi-perspective approaches to research questions that cross their borders.

## Behaviour

There are two prominent streams of behavioural research at SFU. The first stream is focused in Psychology and Criminology. Researchers are examining such topics as the role of cognitive biases in irrational thinking, biopsychological analysis of behaviour, the geo-spatial distribution of criminal behaviours, victimization of the elderly, the utility of restorative justice and the determinants of interpersonal violence.

This research is complemented and extended by several important Centres and Institutes that are either the products of joint initiatives with other universities and/or community partners or which have been developed at the sole initiative of SFU researchers. An example is the Mental Health, Law and Policy Institute which was established in 1991 to promote interdisciplinary collaboration in research and training in these areas. The primary participating academic units are the Department of Psychology and the School of Criminology. There are also formal ties with the BC Forensic Psychiatric Services Commission, BC Corrections Branch, Ministry of the Attorney General, and the Faculty of Law at UBC.

The second research stream spans a number of Social Science and Humanities disciplines - including Sociology, Anthropology, Political Science, Humanities, Philosophy, Women's Studies, English, Education and the Contemporary Arts - and are described here under the general term "behavioural difference." Examples of current research in this area include the investigation of differences in voting behaviour, the study of differences between elite and popular social behaviours and the examination of gender differences in behaviour. These research programs bring social, cultural, historical and population-based approaches, methods of inquiry, levels of analysis and research perspectives to the study and understanding of issues in contemporary society.

## Culture

As the Canadian population becomes increasingly heterogeneous, as the western world increases its impact on cultures around the globe, and as borders become increasingly permeable to human migration, culture as an area of study and understanding is increasingly important. The impact of the western world on cultures around the globe has been, and continues to be, a critical area of research for SFU faculty members within such disciplines as post-colonial studies, cultural studies and history, gender studies, and francophone and native studies, who are interested in exploring, questioning, and challenging this impact. SFU has a well-earned reputation for research excellence in this area. Faculty members in the Departments of English, Humanities, French, History, Contemporary Arts, Archaeology, Philosophy, School of Resource and Environmental Management and the Faculty of Education are engaged in research that includes: assessment of cultural policies, practices and products within and beyond Canada, research and discovery of our cultural past, expansion of cultural resource management for First Nations, and application of cultural studies in the areas of immigration and integration as part of the Vancouver Centre for Research on Immigration and Integration in the Metropolis (RIIM). RIIM is one of four Canadian research centres dedicated

to studying the impact of immigrants to Canada on local economics, the family, educational systems and the physical infrastructure of cities.

### Social Relations

While many researchers in the Social Sciences and Humanities at SFU study social relations in one form or another, the challenges confronting an increasingly diverse and urban-oriented multi-cultural society is an important unifying theme. As the world population increasingly gravitates towards cities, the role for research into urban areas and urban issues becomes more urgent. SFU is well positioned to provide critical insight into these areas as a critical mass of researchers are already recognized for their contributions in these areas. For example, within the Faculty of Education an international research project is being conducted which examines how teachers can be more ably prepared for the challenges of teaching in inner-city urban centres. The Institute for Canadian Urban Research Studies housed within SFU's School of Criminology complements individual research programs by bringing together researchers from across disciplines to more fully explore urban issues.

Researchers at SFU have also gained national and international prominence for their research into the routines and organizations that emerge from social relationships, and for research into the changing social relations occurring within the context of the mediating roles of science, technology and innovation.

## 2. Chemical and Structural Biology and Biological Physics

Faculty members in the Departments of Chemistry, Molecular Biology and Biochemistry, and the School of Kinesiology have been very active in establishing infrastructure and securing substantial research funding that has enabled them to achieve an international reputation in the area of Chemical and Structural Biology. The group uses a broad range of techniques such as (glyco)peptide synthesis and purification, microcalorimetry, kinetic analysis of ligand-receptor binding, MALDI-TOF mass spectrometry, high-field NMR spectroscopy, kinetic analysis on different time scales, combinatorial molecular biology techniques, and spectroscopic analysis by ORD, CD, UV-visible, and fluorimetry. Future growth in this area is expected to contribute to our understanding of interfacial structures such as those that are membrane-bound, phage-bound, resin-bound, or on cell-surfaces.

This research ties in well with initiatives in Physics. Over the past decade the Department of Physics has built a strong group of researchers in soft condensed matter Physics whose interests fall into the general category of Biophysics. The areas of overlap include the mechanical and dynamical properties of DNA and chromosomes, enzyme mechanisms, protein-membrane interactions, and the regulation and control in an RNA world. The Chemical and Structural Biology group have received CFI funding for a facility for automated solution and solid phase synthesis that will also have the capabilities for combinatorial chemical synthesis. An application for additional funding from the BCKDF is pending. Combinatorial libraries are used to solve problems in Biochemistry, Molecular Biology, Evolution and primordial Chemistry, Pharmacology, and the Biomedical Sciences.



The combination of approaches being pursued by these Biochemists, Chemists, Molecular Biologists, and Physicists will contribute to our fundamental understanding of the world around us and will lead to collaborations with biotechnology and pharmaceutical firms who rely on these methods for drug design. Dedicating chairs from the CRC program to the Chemical and Structural Biology and Biological Physics research thrust will enable SFU to build upon its acknowledged strengths that cross both Departmental and Faculty lines. The research programs of these Chairs will have considerable spin-off benefits for the research programs being developed under the Health research thrust, as well (see below).

### 3. Economy

SFU researchers have made significant contributions to societal understanding of economic systems, exchange relations, world markets, economic development and the ways in which policy, governance and internalization influence them. This expertise has been applied at the local, national, and international levels.

At the local level, SFU initiated the Community Economic Development (CED) Centre in 1990. The CED Centre engages in collaboration with communities in BC and with individuals, institutions and organizations working in CED. One example of such a collaboration is a 2 year research project funded by Forest Renewal BC which seeks to help communities strengthen local economic capacity by identifying and developing the most promising and appropriate CED strategies.

Economic policy, analysis and development are strong research areas at SFU. Other important strengths within the economy area include the analysis of state and market interactions in regulatory systems, alternative forms of economic development, the effect of judicial systems on economic behaviour of producers and consumers, the cost and delivery of health care, the impact of globalization on economic activity and more generally, the role of public policy in an era of internationalization.

Economy research at SFU is housed primarily in the Departments of Economics and Geography and in the Faculty of Business Administration. The linkages between these units are well developed. A collaboration between the Department of Economics and the School of Resource and Environmental Management on the economics of common property resources and sustainable resource development has also been initiated. Economics research questions are also being addressed by faculty with interest in fisheries research. For example, researchers across a variety of academic areas (Archaeology, Biological Sciences, Business Administration, Economics, Geography, Law, Mathematics, Resources and Environmental Management, Sociology, and Anthropology) have joined the Institute for Fisheries Analysis (FIA) to study issues that include the basic biology, ecology and population dynamics of exploitable fish stocks, the bio-economic and socio-political framework of fisheries regulation and management, the socio-economic well-being of fishing communities, industrial and commercial developments related to fisheries, and the political economy of the fishing industry.

Simon Fraser University also has important research strength in the area of Political Economy within its Department of Political Science. The sub-field of Political Economy has given the Department's Ph.D. program a unique profile in Western Canada and has led to SFU becoming an increasingly important centre for the study of Political Science in Canada. The strengths of existing faculty members combined with the research being undertaken by doctoral students results in a very strong research program within the Department.

The appointment of CRC Chairs will facilitate the expansion of existing research programs in the Economy area. They will also be strategically identified to enhance the cross-Faculty links already forged.

#### 4. Education

The knowledge-based society of the 21<sup>st</sup> Century requires that universities expend considerable energy investigating means to improve access to, quality of, and delivery of knowledge and learning. Education as a research area addresses the fundamental practical and philosophical questions concerning what it is to be human, to be cultured, to be educated. Within this context researchers in the Faculty of Education have particular strength in the areas of applied cognitive psychology, curriculum development, teacher education, child development, persons and society leadership, cultural studies, and philosophical foundations.

Building on these strengths, the Faculty of Education will focus over the next three to five years on the exploration of the foundational questions concerning education and related work in disciplines associated with the Humanities and Social Sciences. Related to these questions are others more directly concerned with the coherence, viability, and sensibility of major programs of research and scholarly inquiry that have influenced and continue to influence educational theory and practice. Directly linked to these overall goals will be research into question of means to educational ends, and, in turn, more immediate questions of, e.g. contemporary curriculum demands, school organization, teaching methods, and the meaningful integration of emerging learning technologies. More specific research will pursue the following areas of inquiry: the nature of individual development and its relation to curriculum design and content; the nature of educational theory, in particular questions to do with the differing types of research appropriate to different questions; epistemological issues, especially regarding the adjudication of knowledge claims and research findings related to learning, development and other key educational concepts; moral and social education including issues of diversity and difference; and issues of leadership and administration.

The designation of CRC Chairs to the Education research thrust will build on the excellence of existing faculty (SFU has two of a very few Fellows of the Royal Society of Canada in the field of education) and ensure the Faculty of Education achieves its strategic research goals.

## 5. Environment

Environmental issues will continue to engage public policy in the 21<sup>st</sup> Century. SFU has great strength and vibrant cross-Faculty collaborations in this area. Chairs from the CRC program will be used to develop new understandings of environmental issues in society and to expand already well-developed partnerships with our external communities. Given the existing excellence of faculty already at SFU in this area, the CRC program may also be used for the purpose of retaining distinguished researchers.

Environmental Biology is an area of significant interest and teaching emphasis in the Department of Biological Sciences. The Centre for Environmental Biology is home to two graduate programs, the Masters in Pest Management and the Masters in Environmental Toxicology. These programs combine research, practical training and a solid theoretical foundation. Related faculty research strength is found in Behavioural, Chemical, and Applied Ecology, as well as Environmental Physiology and Toxicology. Through two NSERC industrial Research Chairs, strong research groups in forest insect ecology and in wildlife ecology were established. Moreover, several faculty research groups focus on behavioural and physiological studies in aquatic ecosystems. These projects are linked to external partners such as BC Hydro, Department of Fisheries and Oceans, Environment Canada, the Bamfield Marine Station, and industrial partners.

SFU has substantial research expertise in Geography and the Earth Sciences. The collaboration between these two areas, across two Faculties, is a model for successful strategic alliances. Within the Department of Geography in the Faculty of Arts, Physical Geographers are engaged in the study of climatology, geomorphology, hydrology, terrain, and soil research. This research is extended by the Institute for Quaternary Research, established in 1984, whose goal is to serve Western Canada as a centre for paleo-environmental, surficial geological and related archaeological investigations. Researchers across a number of Departments at SFU participate in this Institute.

Complementing expertise in Geography, the Department of Earth Sciences in the Faculty of Science offers considerable research strength in surface processes relating to earthquake hazards, slope stability, terrain analysis, applied Geomorphology and groundwater Hydrology. The CRC program offers the opportunity to build upon the leadership and research excellence already at SFU in these areas and potentially extend the model of collaboration to other units on campus. The Department of Earth Sciences is also home to two research chairs (Shrum and Forest Renewal B.C.) and several other faculty members with research programs in Environmental Geology.

The School of Resource and Environmental Management makes an important contribution to the University's Environment research thrust. There are currently active research groups within the School studying such areas as aboriginal issues, co-management, energy, environmental economics, environmental toxicology, forest ecology, tourism and recreation resource management, and Geographic Information Systems (GIS). As with many other areas within the School, research in fisheries science and management enjoys international

recognition for its research. SFU research in the area of conservation and management of fish populations is strengthened by its Cooperative Resource Management Institute (CRMI) which brings together SFU researchers and experts from DFO. A CRC Chair in the area of Fisheries Science and Management will enable SFU to retain its research excellence in this area and expand the research programs currently underway. Researchers in the School are also working on fisheries topics such as economic valuation of habitat for producing fish, co-management arrangements to foster sustainable fisheries, and decision support systems that help managers and users make more informed decisions in the face of complex tradeoffs.

GIS research has a strong presence at SFU in both the Faculty of Arts in the Department of Geography and in the School of Resource and Environmental Management within the Faculty of Applied Sciences. The Department of Geography hosts leading research in Spatial Information Systems (SIS) and remote sensing. Further, it is the only University in Canada to be equipped with its own remote sensing aircraft. Regarded as one of the best universities in GIS and SIS research in the country, SFU offers undergraduate and graduate training in GIS within the Department of Geography and graduate work in GIS within the School of Resource and Environmental Management.

Considerable strength in environmental research exists in other Departments at SFU as well. The area of the "built environment" has research leaders working from within the Gerontology Research Centre (GRC) and has connections to the School of Resource and Environmental Management in the area of sustainable urban development and the built form. Environmental Economics is also an active part of research programs within the Department of Economics with particular focus on the potential of tax schemes, economic policy issues, and environmentally rooted economic incentives.

Environmental research is also being conducted in less obvious locations such as in the School for the Contemporary Arts where a research program in landscape aesthetics has been initiated; in the Department of English where a new area of environmental literature is emerging; and in the Department of History where research into environmental change is adding to our understanding of our impact on nature and the environment.

## 6. Health

SFU has a long history of health research and education. With over 10% of our current faculty complement actively involved in health research, SFU has moved to consolidate health programming at the University. The Institute for Health Research and Education (IHRE) will enhance and support the excellent research programs currently underway by existing faculty. The Institute will also be the vehicle for SFU to embark on ambitious new research programs and recruit ten new faculty members who complement and expand our current base of expertise.

CRC Chairs will be used to build strategically upon existing health-related research (now attracting funding in excess of \$3 M annually), to strengthen research across sectoral boundaries, to broaden graduate programming, and to position the University to take full

advantage of expanded CIHR funding. Within the Humanities and Social Sciences, it is envisioned that four clusters of health-related research could be enhanced by the addition of Canada Research Chairs: the social roots of disease, the organization and social dynamics of clinical practice, factors structuring health-related institutions, systems and policies, and Mental Health. In the Sciences and Applied Sciences, Chairs are likely to be positioned in Biomedical Engineering; Cellular Biology and Physiology; Genetics, Genomics and Bioinformatics; and, Health Information Technology. Two further areas that round out SFU's health research expertise are Neuropsychology and Neurophysiology, and Health Education and Management.

### *Social Roots of Disease*

The deep social roots of many forms of disease and physical suffering remain untouched by remedies directed at the individual's body alone. People in different social positions and/or of varied cultural backgrounds respond to medical knowledge, practices, and technologies in diverse ways, as they come to terms with their own health. Social, historical, economic, pedagogical and ethical perspectives brought to these issues by the Social Sciences and Humanities address concrete problems at many levels, from the large-scale processes that structure the social determinants of health to the context-specific shape of various health-related beliefs and behaviours, and from policy formation to interpersonal and subjective interactions in health-care delivery.

Researchers at SFU in the School of Criminology, Departments of Psychology, Sociology, Anthropology, History and the Faculty of Education are actively engaged in studying the social roots of disease in the following areas: patterns of social inequality and their relation to disease, interactions between social location and health/illness, health-related beliefs and behaviours, interpersonal relationships and their relation to health and disease, historical and political context of personal suffering and ideals of health, individual and group experiences of illness and health care, and relations between cognition and physical health.

### *Organization and Social Dynamics of Clinical Practice*

This area of health research will be vital to helping citizens of the 21<sup>st</sup> Century interact with their health care systems and understand their own health. As economic questions continue to drive investigations into new models of health care and as alternative treatments become more prevalent, individuals will increasingly want and need knowledge about their options and seek better understanding of their experiences.

SFU researchers across a number of Departments in the Faculty of Arts (Humanities, Psychology, Women's Studies, English), in the School of Communication in the Faculty of Applied Sciences, and in the Faculty of Education are well positioned to assist in developing this knowledge and understanding. At present, strong research programs are examining issues such as the relationship between technology and the management of illness, communication and reflective practice in clinical settings, the ethical dimension of clinical decision-making, the subjective experience of illness and of treatment, changing social meanings of disease

categories and clinical work, and the relation between biomedicine and other therapeutic systems. The Lifestrains Project (a collaboration between SFU researchers and the Pomelo Project) is one example of the results of research in this area. This Project brought attention to the global politics of new biotechnologies, including the mapping of the human genome, the patenting of life forms, and the introduction of new reproductive technologies.

### *Factors Structuring Health-related Institutions, Systems and Policies*

Medical knowledge and clinical practice are mediated by social, political, economic, and cultural processes that have profound effects on health-care delivery. Rapid social change and technological innovation pose significant new dilemmas about the place and transmission of health care in modern society.

SFU has research strength in five key areas within this health research stream: economics of health-care delivery; historical transformation of medical systems, knowledge, and clinical practice; political, social, and cultural constraints on policies and programs; effects and implications of policy on the health of population; and the role of public advocacy and knowledge outside the medical establishment. These research strengths have particular importance for several other areas of SFU's Strategic Research Plan (namely Economy and Policy, Management and Leadership) and represent the degree to which the Plan has been developed to derive a coherent vision for the University's future.

### *Mental Health*

A number of researchers across the Faculty of Arts, particularly in the Departments of Gerontology, Sociology, Anthropology, Political Science, Psychology and the School of Criminology are engaged in research programs contributing to the Mental Health area. The Mental Health, Law and Policy Institute, established in 1991, extends this research, promoting interdisciplinary collaboration across its three subject areas. Research in the Mental Health area is also expanded by faculty members in the School of Kinesiology who are advancing understanding and treatment for Alzheimer's disease.

### *Biomedical Engineering*

Population aging will generate a growing need for assistive and health-monitoring devices. Recruitment of CRC Chairs with expertise in human structure and function and their relation to health and movement will be sought to expand on the research expertise in the Faculty of Applied Sciences which covers movement and its control, regulation and adaptation of physiological systems, and growth, development and aging. Current research programs span both basic research and applied outcomes research in the areas of health promotion, prevention of injury and disease, functional evaluation and rehabilitation, ergonomics/human factors, and environmental, exercise and work physiology.

SFU has already begun to expand its research capacity in this area. A new Centre of Injury Prevention, Mobility and Aging will complement the GRC and its Dr. Tong Louie Living

- Laboratory (developed jointly with BCIT with the assistance of CFI and BCKDF funding). This important initiative is the locus of novel research and development projects in the design and testing of living environments for the elderly.

### Developmental Disabilities

For the past five years, researchers in Kinesiology at SFU, in conjunction with the Canadian Down Syndrome Research Foundation (DSRF), and co-investigators have been working to develop the *Down Syndrome and Developmental Disabilities Research Centre*. This unique research centre flows from an already dynamic partnership among the DSRF, SFU and Children's & Women's Health Centre. The new Centre will bring together researchers from around the world with expertise in Down syndrome, brain mapping and plasticity. The research generated from this centre will have a significant impact on researchers in a variety of disciplines including Kinesiology, Psychology, Gerontology, Medical Physics, Cognitive Science, Childhood Education, Biomedical Engineering and Health Policy. Once the centre has been completed (construction will commence in 2000), SFU will be positioned at the forefront of health research on development disabilities. A CRC Chair in this area will enable SFU to build upon existing strength and ensure the full realization of the potential of this new research facility.

### Cellular Biology and Physiology

In addition to SFU's research strength at the molecular level, there is a growing emphasis on basic biomedical studies at the cellular, organ, and organismal level. Research in these areas is often directly related to specific diseases, and current expertise includes diabetes, cancer, cardiovascular and neurobiological research. Expertise with the chemistry and biochemistry of the different cell constituents, e.g. carbohydrates, peptides, proteins, lipids, and nucleic acids, is available. Kinesiologists and Biologists provide valuable insight into the physiological processes; structural and mechanistic chemists provide a molecular basis for biological recognition events; and, biochemists and molecular biologists provide the bridge that connect the two areas. This strength allows the team to investigate problems of an interdisciplinary nature and provides a research base for the study of diseases and drug, diagnostic, and vaccine design.

While research strength at the molecular and cellular level is an essential prerequisite for clinical advances, more expertise will be needed to bridge these fields, especially in physiology. Key appointments in emerging fields such as molecular physiology will provide crucial links between molecular and cellular biologists and physiologists, and enhance the clinical relevance of current research.

### Genetics, Genomics and Bioinformatics

The early 21<sup>st</sup> Century will be devoted to understanding the sequences of genomes that have begun to emerge from international consortia such as the Human Genome Project. Genome BC

will provide the provincial infrastructure to carry out large scale sequencing projects, mapping initiatives, and studies of gene expression.

We will build upon this strength by taking the information that is produced at these large centres and interpreting it through methods involving Developmental Genetics at the molecular level and by considering evolutionary implications and patterns. Understanding how genomes evolve and how genes are regulated requires new approaches. These lie in the areas of Computer Science, Information Technology, and pattern recognition, and require novel algorithms produced by Mathematicians and Statisticians. This combination of expertise in Molecular Biology and Computation is producing a new breed of scientist - Bioinformaticians.

### Health Information Technology

As suggested above, the human genome project has resulted in an explosion in bioinformation and bioinformatics research (comprising computational molecular biology, biological databases and genome bioinformatics). SFU has a core group of excellent faculty members working within the School of Computing Science, and the Departments of Mathematics, Statistics, and Molecular Biology and Biochemistry and this research area is well positioned to become a leading centre of bioinformatic research in Canada.

SFU also has significant research strength in the Medical Visualization area. This research has a wide range of potential applications and is useful to health care professionals for the purposes of diagnosis, surgery, research and telemedicine. Research at SFU is focused in the areas of computer-aided diagnosis, image and volume display and compression, and workstation design for radiologists and involves researchers from a number of Applied Sciences and Science disciplines (Computing Science, Communication, Engineering Science, Kinesiology, and Mathematics). A number of well-developed and important partnerships have been developed with several Vancouver hospitals and local industrial partners such as ALI Technologies, and MTL. This research is being supported by the Science Council of BC, the BC Cancer Agency, and charitable health foundations.

### Neuropsychology and Neurophysiology

SFU has significant research strength in the Faculties of Arts, Science and Applied Sciences in Neuropsychology and Neurophysiology. In the Department of Psychology, researchers are investigating such areas as neural mechanisms of circadian rhythms, adult neuropsychological assessment, neurocognitive disorders in medical and psychiatric patients, neuropsychology of memory, molecular neurobiology of reproductive behaviour, and human neuropsychology. In the Faculty of Science, several Biologists are working in the areas of neuroethology, neural control of behaviour in simple organisms, neurophysiology of synaptic release and modulation, calcium imaging, and voltage-sensitive dye recording of neural activity. In the Faculty of Applied Sciences, Kinesiologists are engaged in research in neuroscience, neural control of movement, and neuroprosthetic rehabilitation.



## Health Education and Management

Health care in the 21<sup>st</sup> Century will be revolutionized by new delivery models, technological innovation and alternative approaches to health and wellness, with concomitant cost implications. Researchers in SFU's Faculties of Business Administration and Education can make significant contributions in the areas of Technology Management, Ethics, Policy Analysis, Organizational Management, and Health Education. Health-care Management research is rapidly expanding as demand for new management models and training within the health care system accelerates. In conjunction with community partners, SFU seeks to expand in this area, taking a leading role in both research and programming.

## 7. Language, Communication and Information Dissemination

SFU has made significant research contributions in the area of language, communication and information dissemination. Researchers are involved in the study of language (with expertise ranging from Phonology through Comparative Semantics to Artificial Intelligence), in the development of understanding of Epistemology and Ontology, and in the study of French language, literature, culture and the intersection of the three. One important focal point for researchers in this area is the attention to native languages whose continued existence is increasingly threatened. Another is the attention to the learning of English-as-a-Second-Language that is so much a part of the Canadian urban setting. Research on the creation and dissemination of the printed word from both historical and contemporary perspectives rounds out Language research undertaken at the University.

Another contribution to research in this area arises from a more technologically-based exploration into Language and Communication. The explosion of global Internet activity makes it crucial that we gain a better understanding of language. Researchers in the fields of Cognitive Science, Linguistics, Philosophy, Psychology, Computing Science and Education are engaged in answering research questions that surround this area.

The Department of Linguistics at SFU is a showcase for the study of second language acquisition. Home to the Intelligent Language Tutor, located in the Institute for Language Training within the Department, SFU researchers have obtained significant funding from the Greek Government and the European Union to study the difficulties in acquiring a second language. Initially starting with the Greek language, the methodologies developed will be transferable to other languages in the future.

Telematics, which is the convergence of telecommunications, networks, and computer applications, is a multidisciplinary research area. At SFU, researchers in this field are predominantly housed in the School of Communication, but are also in the Schools of Engineering and Computing Science, the Departments of Mathematics, Statistics and Geography, and the Faculty of Education. At one level, Telematics addresses computer applications for wireless telecommunications and GIS; at another it addresses policy issues for implementation of computer-assisted learning and distance education. This latter application

is of particular significance for the Education and a Knowledge-Based Society research thrust described earlier in this Plan.

## 8. Materials Science

In 1996, a prominent group of Materials Scientists at SFU and UBC formed the Pacific Centre for Advanced Materials and Microstructures (PCAMM) to serve as a focal point of expertise and research facilities in advanced electronic and optical materials and microfabrication. Building on a solid local base of research in surface science and thin film growth, PCAMM currently comprises over 20 researchers who address materials problems relevant to advanced, electronic materials and process technologies. PCAMM has a CFI application pending that will greatly enhance the infrastructure at both institutions.

Faculty members in the Departments of Chemistry and Physics and in the School of Engineering Science share a common interest in Materials Science. The Chemists work on piezoelectric and ferroelectric devices, conducting polymers, proton-exchange membranes for fuel cells, photolithography, molecular magnetic materials, and artificial noses, while the Physicists complement this by creating and studying electronic and magnetic materials with nanometer-size components. Examples of the latter include ultrathin magnetic films, quantum wires and dots, molecular wires and nanoscale magnetic particles. These systems are of great fundamental as well as practical importance since advanced electronic devices of the future will be based on these technologies. The Engineering Scientists are an integral part of this network. In order to advance the emerging collaborative program in modern Materials Science and reinforce our position as the Canadian leader in this area we intend to recruit CRC Chairs with expertise that includes magnetic nanostructures or aspects of surface science.

Although TRIUMF-related research is very diverse, many aspects complement research in Materials Science and therefore justifies inclusion within this section of the Plan. TRIUMF is a unique particle beam facility, the only one of its kind in the world. Research carried out at TRIUMF includes nuclear astrophysics, atomic physics, condensed matter physics and material science, radiopharmaceutical chemistry, physical chemistry and applied sciences. Currently SFU faculty affiliated with TRIUMF are engaged in research in one of 7 areas: Solid-state Physics: Magnetism and High Temperature Superconductors; Muonium Chemistry: Hydrogen Atom Kinetics and Organic Free Radicals; Nuclear Astrophysics; Fundamental Symmetries; Particle Physics; Radiopharmaceutical Chemistry; and Nuclear Structure Studies. TRIUMF has achieved international recognition for the development and application of the muon spin rotation (muSR technique). SFU researchers have played key roles in the development and current building program at TRIUMF. The new ISAC facility and the recently funded ISAC-2, currently under development, provide radioactive heavy ion beams unparalleled in the world. A new detection facility called DRAGON, which measures the rates of reactions that occur in explosive nucleosynthesis events in the universe and which involve radioactive reactants, is an example of the cutting-edge science being undertaken by TRIUMF researchers. The appointment of a CRC Chair to this area will ensure that SFU researchers continue to play a prominent role in the continuation of this world-class facility.

## 9. Policy, Management and Leadership

SFU has research strengths across four of its five Faculties in the area of Policy, Management and Leadership. In the Faculty of Arts, policy questions are addressed in a number of diverse contexts, particularly by faculty members in the Departments of Criminology, Economics and Political Science. Within the Faculty of Applied Sciences (most notably in the School of Communication), policy questions are being addressed primarily in connection with technology and the management of technological change. Within the Faculty of Education, policy questions are being addressed in terms of how they may or may not encourage ideas-based innovative leadership.

Existing Business Administration faculty have considerable expertise in the areas of policy analysis (particularly in the areas of Canadian merger policies, cognitive errors in decision-making, corporate strategy on organization survival and efficiency in public enterprise), applied ethics, the impact of organizations on the environment and knowledge management. Research excellence in diverse types of "Knowledge Management" are being developed, particularly with regard to applied technology and its impact upon knowledge retention, diffusion and creation. Innovative programs are also being initiated. For example, the new MBA in Management of Technology (MOT) promotes joint research and education in technology and innovation. It is also an important example within the Faculty of Business Administration of collaboration with industry as the program is directed by a Business Council including the Faculty and nine high-tech industry partners.

The identification of CRC Chairs in the Policy, Management and Leadership area will capitalize upon existing strengths and enable the university to move in new directions. Further, it will present an opportunity for the University to strengthen bridges between researchers in the Faculties of Business Administration and Education with those in the Departments of Political Science, Economics and Communication.

The University-wide Health Initiative, when combined with the significant research expertise in Policy, Management and Leadership across disciplinary boundaries, also represents an exciting opportunity for the development of new research programs into the areas of Biotechnology and Health-Care Administration. Regional Health Boards within the province have already expressed a desire to collaborate with the University in these areas and the time is ripe for attracting new funding to the University from CIHR to engage in such new research initiatives.

## 10. Technology

Although Technology could be viewed solely as a research tool or methodological approach to other research, at SFU considerable research excellence is evident across Faculties in the discovery, development and application of new information technology, computational science, high technology, and learning technologies. The appointment of CRC Chairs in the Technology area will extend our present expertise in these areas.

## High Performance Computing and the Sciences

SFU is home to faculty members from several different disciplines who come together as part of MITACS (Mathematics of Information Technology and Complex Systems), PIMS (Pacific Institute of Mathematics), and CECM (Centre for Experimental and Constructive Mathematics). These groups link computing science, industrial and applied Mathematics, Pure Mathematics, and Statistics. Research in the Faculty of Arts is also connected through such ventures as electronic publishing. An application to CFI and BCKDF for a regional high performance computing facility will increase the interactions among these groups and bring in faculty members from Chemistry, Communication, Physics, and Engineering Science. Currently, there is a large number of faculty members at SFU engaging in ground-breaking research in the Computational Science area. They have strong ties to industry; together they bring in more than \$1M annually in funding through partnerships with Ballard Power, IBM, and Maple Software.

With the changing face of computation and demand for high performance computing across the economy, it is crucial that SFU establish a competitive environment in parallel computing and integrate it into research and research training throughout the University. While the addition of this infrastructure is in the CFI application mentioned above, SFU will require several new faculty members to lead the integration of computation into research. The addition of new expertise in this area will also enable SFU to develop new technology initiatives (e.g. high performance networking, multimedia, telelearning, telecommunications, biotechnology, the Centre for Dialogue, the TIME Centre, and the on-going Directorships of two IT-related Networks of Centres of Excellence) and will make significant contributions to research programs envisioned under the Health research thrust above.

## Computing Science

SFU has significant strength to offer across a wide range of research areas in Computing Science; specifically in the areas of Information Technology, Health (elaborated upon in the research thrust above), Intelligent Decision Making and Cognitive Science. These areas build upon existing research excellence and provide opportunities for increased collaboration within the university and across the research thrusts identified in this strategic plan.

Information Technology at SFU can be clustered into three areas of specialization: Computer Security, Multimedia, and Internet Computing. At present, no Canadian university offers Computer Security as a key research focus. At SFU, security research involves areas such as cryptography, databases, algorithms, networks, artificial intelligence, probabilistic techniques, number theory, and e-commerce. Researchers in the design of internet resources and multimedia applications are also involved. SFU intends to build on its sizable research base and create Canada's leading group of researchers in security.

The Multimedia area at SFU represents an example of important multi-disciplinary research, including researchers from the Applied Sciences (Computing Science, Communication, Engineering Science, and Kinesiology), Arts (Contemporary Arts and Psychology), Sciences

- (Mathematics), and Education faculties. While already internationally recognized for expertise in Computer Graphics and Visualisation, SFU aims to use CRC Chairs to build Canada's leading group in Multimedia, based on our strengths in computer graphics, image and video processing, and databases.

SFU faculty also have active research programs in the area of Internet Computing which includes web-based telelearning, information retrieval, data and text mining, agent technologies, and data network performance. This area will seek to intensify and broaden research programs, particularly promoting more multi-disciplinary research with other SFU units such as Business Administration, Engineering Science and Communications.

In addition, SFU researchers are recognized for their expertise in Intelligent Decision-Making, particularly in the areas of Applied Algorithms & Optimization and Knowledge-based systems and Intelligent Systems. The former is organized through the Institute of Applied Algorithms and Optimization Research (IAAOR) which brings together faculty from Computing Science, Mathematics and Business Administration. The second area, Knowledge-based Systems and Intelligent Systems is also highly multi-disciplinary with research programs involving faculty members from a number of Arts and Applied Sciences programs.

The area of Cognitive Science is significant to both the Faculties of Arts and Applied Sciences, with faculty from Philosophy, Linguistics, Psychology, Sociology, Anthropology, Computing Science, and Communications collaborating on the study of cognition in artificial and biological systems. The greatest impact within Psychology has been on the sub-fields of psycholinguistics, cognitive Psychology, and developmental Psychology; within Philosophy, on Philosophy of language, philosophical Logic, and Philosophy of mind; within Linguistics, on Semantics, Syntax, Phonology, and Phonetics; and within Computing Science, on automated reasoning and commonsense reasoning, belief revision and scientific discovery, computational linguistics, neurally inspired cognitive-computations models. SFU proposes to use the CRC Chairs to build upon the existing research strengths and enhance the growing international recognition of SFU as a centre for research in Cognitive Science. Such growth will naturally lead to further multi-disciplinary research initiatives and could potentially lead to other Applied Sciences disciplines and the Faculty of Business Administration.

### High Technology

At the local and national level, Canada has two fundamental strengths in the high-technology industry: telecommunications and microelectronics. Introducing a research Chair with expertise in microelectronics with a focus in micro-optical-electronic-mechanical systems ('MOENS') for communications, micro-mirrors in wireless networking, mixed-signal integrated chips, or systems-on-chip will complement our present research capacity in the microelectronics area. In addition, a CRC Chair with interests in wireless and networked communication systems, low-power signal processing and communications ASICs, or digital VLSI circuits and architectures will provide SFU with the strategic mass and expertise to develop a local centre of excellence in the telecommunications area.

A third area of focus at SFU in the high technology sector is in the area of optical engineering. Currently Laval University is the only Canadian university with a concentration in optical engineering. SFU plans to expand in this area (currently represented by two distinguished researchers) in order to meet the increasing demand for engineers in BC with optical engineering backgrounds. A CRC Chair will strengthen current research programs in the area and will contribute to the initiative in biomedical engineering given the widespread use of optical detection methods and laser micromachining in biomedical devices.

### Learning Technology

The growth in market demand for networked solutions in K-12, the post-secondary sector, and the workplace has been phenomenal. Educational technology and online or web-based educational content and programs are rapidly growing segments of the overall education market, with growing access to the Internet and desire for convenience and access to education and training. Three recent SSHRC-funded research programs within the Faculty of Education responded directly to these issues: Gender and Technology, Development of a "Knowledge-Forum", and Design of On-Line Environments in Post-Secondary Education.

SFU is host to the TeleLearning Network of Centres of Excellence (TL\*RN), which is growing in recognition both nationally and internationally. Created in 1995, the partners in the TL\*RN perform, stimulate and track leading TeleLearning research advances in collaboration with university and industry partners throughout the world. Eighty faculty from 24 Canadian universities are evaluating the effectiveness of new learning models, analyzing the costs/benefits and social impact of implementing telelearning, and creating new educational technologies.

The University has also catalyzed the creation of a new entity, the New Media Innovation Centre (NewMIC), which involves BC universities and diverse industrial and governmental partners and which promises to be a significant research presence within the province. With research strengths in software development, user interface design, data mining, databases, new media, wireless solutions, new models of networked learning, and teacher professional development in the use of computers in education, researchers at SFU have received a significant portion of the funding available from both TL\*RN and NewMIC.

In the School of Communication in the Faculty of Applied Sciences, a research team has been looking at policies for telelearning technologies in Canadian universities and colleges, and the new educational paradigm offered by emerging private education providers in the name of lifelong learning for the knowledge-based society. SSHRC funding is now supporting parallel research by this group into the implementation of computer technologies in K-12 and the management of technological and institutional change.

Networked learning and knowledge management provide excellent opportunities for interdisciplinary research. Directing CRC Chairs to this area will encourage the development of additional research links within and among the Faculties of Arts, Applied Sciences, Education and Business Administration. Chairs will also augment the team of researchers

working in knowledge and learning, attract new expertise in policy research and the management of technological change, broaden the scope of the research program to encompass additional issues related to policy, technology and society, and encourage the development of additional research links within TL\*RN.

#### IV. SUMMARIZING OUR INTENTIONS

##### 1. Chair Distribution by Research Thrust, Funding Sector, Level and Strategy

The following table summarizes the University's intentions of recruiting and retention Canada Research Chairs across the ten research thrusts outlined above for *the first two years* of the CRC program. Identification of CRC Chairs for years three, four and five of the CRC program will be identified in future updates of the Plan. These Chairs will be strategically placed to ensure that research at Simon Fraser University continues to develop in line with the objectives outlined in this Plan.

Research Thrust	Primary Sector(s)	Estimated No. of Chairs
Behaviour, Culture, and Social Relations	SSHRC	2
Chemical and Structural Biology and Biological Physics	NSERC	1
Economy	SSHRC	1
Education	SSHRC	2
Environment	NSERC, SSHRC	1
Health	NSERC, SSHRC, MRC	2
Language, Communication and Information Dissemination	SSHRC	1
Materials Science	NSERC	1
Policy, Management and Leadership	SSHRC	2
Technology	NSERC, SSHRC	5

##### 2. Conclusion

The CRC program, in combination with the Canada Foundation for Innovation and the British Columbia Knowledge Development Fund, will significantly enhance the contribution SFU will make to society in its essential role as a primary centre for learning, discovery, invention, and scholarly inquiry. The CRC program will enable us to creatively meet the faculty renewal and retention challenge of the next decade. It will enable us to build upon existing strengths, burgeoning young research programs, and gain leadership in crucial areas.