

## **BCIT INSTITUTIONAL RESEARCH PLAN SUMMARY**

This Strategic Research Plan has been prepared to describe the directions that research at BCIT is taking. The plan is intended to inform those reviewing the fit between specific applications to the Canada Foundation for Innovation (CFI) or to the Canada Research Chairs (CRC) programs and BCIT's broader research plans.

Created in 1964 as an Institute of Technology, BCIT has evolved into a unique polytechnic institution within Canada's post-secondary community. Its strength is founded on an understanding that in the new economy, the nation's people are its greatest resource, and knowledge is a strategic asset contributing to long term economic development, productivity and competitiveness.

The BCIT polytechnic model is characterized by a culture of direct interaction with BC and Canadian industry and support for business development initiatives; a focus on career-oriented training designed to fulfill long term economic development needs; a broad range of educational programming at levels from trades certificates, through technology diplomas, to undergraduate and graduate degrees; and a focus on research activities that are aimed at increasing economic activity.

BCIT's Institutional Mandate states that it is "a province-wide, innovative organization, specializing in advanced technology training and focusing on those [educational and research] initiatives that increase the level of economic activity, entrepreneurial activity and employment in the province". Within this context, the Institute is specifically called upon to engage in technology transfer and contracted applied research. Therefore, research at BCIT is focused on innovation via multi-disciplinary, collaborative, industry-relevant activities that build upon the Institute's existing strengths in key sectors and disciplines.

Growth of research activities is vital to increasing BCIT's impact provincially and nationally. The aim is to expedite the application of new knowledge for the benefit of British Columbians and Canadians by integrating highly qualified faculty, industry partnerships, academic partnerships, visionary research programs, state of the art infrastructure, an entrepreneurial campus culture and ambitious technology transfer objectives.

### **BCIT Research Clusters**

Initially, BCIT established research niches based on the needs of local industry. Over the past decade, these niches have evolved into a series of research clusters, centered around a multi-disciplinary research vision. There are four research clusters at BCIT: Information Technology, Health Technology, Engineering Technology, and Chemical and Biological Sciences.

The clusters are concentrations of highly qualified faculty, industry partners, academic collaborators and state-of-the-art facilities, which all serve the research needs of the local and national community. They reach out primarily to small- and medium-sized enterprises, and occasionally, larger enterprises, providing access to BCIT's research facilities, expertise and contacts. At the same time, the clusters also seek out academic collaborators at the universities, in order to play an important role in bridging the significant chasm between basic research and actual industrial application. In this way, the clusters provide opportunities for research training of both BCIT and university graduates.

The research foci of each cluster are driven by the external needs the cluster addresses. When the unique expertise in another cluster is required in a project, there is also considerable sharing of skills and facilities, cutting across all the clusters. In selecting research foci, the clusters place considerable emphasis on topics that are relevant to industry and that can be approached collaboratively with industry, recognizing that in some fields, industry is at the leading edge.

The **Information Technology Research Cluster** draws from the following academic departments: Computer Systems Technology, Electrical & Electronic Engineering, Geographic Information Systems, and Biotechnology. Several other academic departments also contribute to the cluster when their media content and/or expertise is required in the development of computer-based training applications. Research activities are centered within BCIT's Group for Advanced Information Technology (GAIT), and its associated major facilities: the Internet Engineering Laboratory (IEL), and the Canadian Bioinformatics Resource Industry (CBRI) Lab.

Research themes in this cluster fall into four primary areas: internet network applications and engineering, cyberspace security, advanced software solutions, and computer-based training (CBT). Current activities include: next generation internet infrastructure R&D; internet-based solutions; critical infrastructure security solutions; educational CBT solutions; bioinformatics solutions; system prototyping; knowledge based systems solutions; and computer-based software simulations and HQP training through interaction with students and industry.

Our Information Technology Research Cluster has a key partnership with BCNET, the provincial research and education network. Michael Hrybyk, a former Director of BCIT's GAIT Group, is President of BCNET, a non-profit society with industry and academic institutional members dedicated to bringing the next generation internet to the region. BCIT has also developed research collaborations with university researchers and their graduate students, especially from the University of Victoria and UBC, as a result of BCIT's unique facilities and its contracts with CANARIE.

Plans for future development of this research cluster include expansion of cyberspace security research – an industry-supported research chair is being developed - and the proposed Pacific Institute for Network Performance and Integrity Lab being submitted to the 2003 CFI Innovation Fund competition.

The **Health Technology Research Cluster** draws from the following academic departments: Basic Health Sciences; Biomedical Engineering; Prosthetics and Orthotics, Environmental Health Sciences, Physics, Building Sciences, Mechanical and Manufacturing Technology, and Electrical and Electronic Technology. Its research activities are centered within the Health Technology Research Group (HTRG), and its associated major R&D facilities: the Dr. Tong Louie Living Lab, and the Centre for Rehabilitation Engineering (CREATE). The latter were both established with financial support from CFI, BCKDF and private donors.

The core competence of this research cluster is medical and assistive device development and evaluation. Research themes include: development and evaluation of devices to reduce injury to workers, surgical tools, assistive devices, diagnostic devices (including imaging devices), and implants. The benefits to Canada of our research work in this field are: development of the medical and assistive device industry; social and economic benefits through reduction of injury to workers; and improvement in quality of life.

Our principal collaboration is with the Neil Squire Foundation's R&D Group which focuses on research and creation of devices, technologies and products for people with disabilities, older

adults, and people recovering from illnesses or injury. The Neil Squire Foundation's R&D Group is co-located with us at BCIT's Burnaby Campus. Other collaborations include the Medical Device Development Centre at the Vancouver General Hospital, and the Gerontology Research Centre at Simon Fraser University.

The major impacts achieved by this research cluster are evidenced by new products that have been successfully commercialized. Examples include an emergency intraosseous infusion device by P yng Medical Corp., an early lung cancer detection device by Xillix Technologies Corp., and a video laryngoscope by Saturn Biomedical Systems Inc. Currently, a novel patient lift device is nearing commercialization. Our work has also impacted CSA standards.

Our plans for future development of this research cluster include increased collaboration with partners outside of BC, increased focus on generation of intellectual property and commercialization of products, and expansion into the field of Telehealth.

The **Engineering Technology Research Cluster** draws from the following academic departments: Automation and Robotics, Electrical and Computer Engineering Technology, Electrical Trades, Mechanical and Manufacturing Technology, Building Technologies, Environmental Engineering, and Fish, Wildlife and Recreation. Its research activities are centered around Automation & Electronics, Photovoltaics, Building Science and Fish & Wildlife research groups, and their associated research facilities. The major R&D facilities established by this cluster are the Photovoltaic Energy Applied Research Lab (PEARL) and Power Tower, which have been equipped through infrastructure grants from the CFI and BCKDF. The Building Science group is currently establishing two research facilities – the Building Envelope Test Hut and the Green Roof Demonstration Facility; and the Fish & Wildlife group is establishing the Fish, Wildlife & Recreation Centre of Excellence.

The core competence of the Automation and Electronics research group is in mechanical design, process and machine automation and electronic device development, with special emphasis on proof-of-concept and pre-production prototyping. The Photovoltaics research group specializes in mechanical, electrical and electronic engineering for photovoltaic and other renewable energy systems. The major impact achieved by this group has been the stimulation of a small but growing photovoltaic manufacturing industry in Canada. We plan to conduct projects on the benefits of integrating photovoltaics with other renewable and/or distributed energy systems such as fuel cells, wind energy and small hydroelectric systems.

The Building Science research group is an initiative by BCIT's School of Construction and the Environment, and its activities are currently focused on building envelopes and green roofs. The former is a collaboration with CMHC, the Homeowner Protection Office, Forintek and a group of industry stakeholders to study moisture management strategies for building assemblies. The latter is a collaboration with the Institute for Research in Construction at the NRC - a Green Roofs Research Facility has been proposed, to collect objective research data in the geographical context of the temperate rain forest climate of South Western British Columbia. The proposed Canada Research Chair in Building Envelope and Rain Control will bring research at BCIT to a new level by integrating basic and applied research approaches and integrating the Institute's research program with the complementary program of Canada's leading researchers in this area at Concordia University.

The **Chemical and Biological Sciences Research Cluster** draws from the following academic departments: Food Technology, Forensic Sciences, Chemistry, Biotechnology and Environmental Sciences. Its research facilities are the Herbal Evaluation and Analysis

Laboratory (HEAL), the Food Processing Resource Centre (FPRC), and the Advanced Instrumentation Lab and Forensic DNA Lab.

Currently the research focus of the HEAL group centers around Natural Health Products (NHPs) and Functional Foods (FF). These products are recognized by Industry Canada as having a marked impact on Canadian healthcare and allied industries, through their potential to improve health, reduce healthcare costs and create jobs. The major barrier to realization of these benefits is the uncertainty of product quality, safety and efficacy. Therefore this group's vision is a cohesive multi-disciplinary research program for NHP characterization, based on the priorities identified by Health Canada and Industry Canada. Core research themes within HEAL and others in this cluster include: botanical authentication, chemical characterization, reference material, method development - quality control, product development and formulation, herb-drug interactions, contaminants, toxicology, genetic marker identification, pharmacological activity and pharmacokinetics.

BCIT's Food Processing Resource Centre pursues a related goal of developing innovative value-added food and nutraceutical products, in support of BC's agri-food and seafood sectors. The capabilities of the FPRC have recently been enhanced through major infrastructure grants from Western Economic Diversification and the BC Ministry of Agriculture, Food and Fisheries.

### **How Success in Meeting the Objectives is Measured**

BCIT measures success in meeting its contract research objectives by evaluating the number and value of projects done for external clients; client satisfaction; and the involvement of teaching faculty and students. BCIT supports the creation of new business ventures and we attempt to measure the impact of BCIT's research efforts on the growth of targeted emerging industries (e.g. medical devices or photovoltaics-related industries in the province of BC).

Publication in refereed research and other journals is encouraged, but at the present time, is not the primary criterion for measuring success. Success in winning grant funding is considered a measure of success, but BCIT's involvement in grant-funded research is still at an emergent stage. BCIT, in partnership with SFU, was awarded its first infrastructure grant by CFI in 1998. BCIT then received three CFI grants on its own in 1999. BCIT has put in place the necessary institutional policies to meet NSERC's requirements concerning policies on Integrity in Research and Research Ethics applied to human subjects. A Research Ethics Board operates at BCIT, and it normally meets monthly. Procedures have also been put in place for administration of major grants.

As the level of grant-funded research increases, it is expected that the number of BCIT-owned discoveries, patents and spin-off ventures will increase.

### **BCIT's Planning and Approval Process**

Each research cluster is responsible for planning its own research themes. Such plans are informed by the needs of external stakeholders, and the limitations imposed by the Institute's budget and space considerations. Clusters that require resources that exceed the Institute's existing capabilities must generate such additional resources themselves through contracts, grants and/or donations. The Dean of Applied Research is responsible for compiling the plans of the clusters into an overarching research plan for the Institute. Operating Plans are developed annually. Strategic planning is a more or less continuous process, with a three to five year horizon. Input to strategic and operational plans is received from the Technology

Centre's Advisory Committee, a body of some 15 mostly external representatives, which generally includes one member of BCIT's Board of Governors. Plans are submitted to the Technology Centre's VP, and to the President, for final approval.

Plans for the future include the establishment of externally funded and/or endowed research chairs. Initiatives are currently underway with respect to BC's Leading Edge Endowment Fund and the Canada Research Chairs program. These initiatives coincide with BCIT receiving provincial approval in the summer of 2002 to grant applied Master's degrees. A number of "internal BCIT research chairs" have been created. These are faculty level positions for which the major job requirement is conducting applied research. Holders of such positions at BCIT have no, or very limited, teaching responsibilities. Opportunities for teaching release are available to other faculty members who wish to become involved in research.

## **Conclusion**

To conclude, the impact of BCIT research is felt by:

- All British Columbians and Canadians, through internet security protocols created by our information technology researchers, medical devices created by our health technology researchers, safer natural health products evaluated by our natural health product researchers, better building materials and systems created by our building technology researchers, and others.
- BCIT students at all levels (undergraduate and forthcoming graduate degree programs and industry-partnered training and certification programs) who are transferring into industry and further academic studies with a broader, deeper skills base.
- BCIT's faculty, who are attracted and retained by the opportunity to maintain their currency through involvement in leading-edge research projects that utilize their academic qualifications and industrial work experience.
- Academic partners such as all the universities in BC, plus others across Canada and internationally; public sector partners such as the Government of BC, Government of Canada, Health Canada, Vancouver Coastal Health Authority, Industry Canada, Western Economic Diversification, Workers' Compensation Board of BC; plus existing and emerging research networks such as the National Centre for Excellence in Natural Health Product Research, Pacific Institute for Network Performance and Integrity Studies.
- Industry collaborators, in particular, small and medium sized enterprises in key sectors such as information technology, medical devices, manufacturing, construction etc.; large enterprises in telecommunications, energy, natural resources, and health care; industry associations such as the BC Technology Industries Association (BCTIA), BC Medical Device Industry Association (BCMeDIA), Canadian Solar Industries Association (CanSIA); major research support agencies such as CANARIE, overseas government agencies such as the UK's National Infrastructure Security Cooperative Centre (NISCC); and technology transfer partners, such as: NRC-IRAP, B.C. Advanced Systems Institute, Innovation and Science Council of B.C., Discovery Parks Trust and University-Industry Liaison Offices.

December 8, 2003