



## **Backgrounder: Canada-California Strategic Innovation Partnership (CCSIP) Announces Selection of 15 Bilateral Projects Following First Call for Proposals**

### **Overview of Selected Projects: Canada-California Collaborative Events**

#### **CCSIP Collaborative Event: Developing an International Health Surveillance, Research and Education Network to Accelerate the Detection of Public Health Threats and Address Critical Global Health Issues**

The rapid, global spread of diseases like the H1N1 influenza, and previously SARS, highlights how much we live in an inter-connected world and why the global community needs to work together in developing health programs. In 2006 alone, G8 governments, foundations and organizations committed \$17 billion to global health projects and services. Concurrently, there have been substantial advances in information and communication technologies worldwide. Yet despite these new technology-based resources and interest in global health, few health science innovations are readily implemented in high-burden, low- and middle-income settings. Leveraging support from CCSIP, researchers from McGill University and the University of California San Francisco are addressing this challenge. Drawing on extensive experience in working with thousands of health care professional in hundreds of countries, they aim to create an integrated global health surveillance, research and education network. The scientists will host a bilateral workshop that brings together multinational, multi-disciplinary teams of researchers, educators and industry experts to identify the steps and technologies necessary to establish this network across Canada, with potential for use around the world. A key priority: the development and implementation of systems that support healthcare workers in almost real-time, enabling the early detection of potential public health threats. The workshop will provide an excellent opportunity to develop high-quality educational and training programs for field-based health workers in remote settings, helping to improve the quality of care, job satisfaction and retention of these professions. Longer-term, the Canada-California led network promises to develop novel approaches to address critical global health issues such as pandemics and implement innovative health care programs in low income regions where they are often needed most.

#### **CCSIP Collaborative Event: Developing Green-Manufacturing Processes for Organic Electronics to Help Canada and California to Capitalize on a Multi-Billion Dollar Global Market**

As traditional electronics are composed of many chemicals, inorganic silicon and metals, current manufacturing processes are resource and energy-intensive, and often generate toxic by-products that threaten our ecosystem and human health. A Canada-California research team aims to tackle this challenge by collaborating on the R&D and manufacture of 'organic' or carbon-based electronics that reduce the negative impact on our environment. With support from CCSIP and leadership from the University of Western Ontario and the University of California Berkeley, the team will host bilateral workshops to explore the development of environmentally friendly manufacturing processes for organic

electronics. More specifically, the team will exploit its recent invention in cross-linking organic molecules that consume virtually no chemicals and thermal energy, to develop 'green' or environmentally friendly manufacturing processes for organic electronics. As the global market expected to reach \$300 billion by 2025, there are many potential applications for this technology—from the production of roll-up displays for computers and cell phones, supply solar panels to power portable equipment, and flexible sensors for health-care products that can be worn. This bilateral initiative will increase the global competitiveness of Canada and California in this market by enabling the creation of new R&D, education and training strategies, and supporting the development of highly qualified personnel with the expertise required by organic electronics companies.

### **CCSIP Collaborative Event: Combining Canada and California Expertise in Biomedical Photonics to Improve the Diagnosis and Treatment of Infectious Disease**

In developing countries, malaria kills one million children every year; 9.5 million people are in immediate need of life-saving AIDS drugs; and tuberculosis remains the seventh-leading cause of death worldwide. Despite international efforts, these diseases continue to present a significant threat to global health. Biophotonics (which combine photons or tiny units of light and biological materials) have played an essential role in making medical technologies more efficient, cost-effective and less invasive. They also have the potential to develop diagnostic and therapeutics for these and other life-threatening diseases. With support from CCSIP, researchers at the Center for Biophotonics Science and Technology at the University of California Davis, and the Canadian Institute for Photonic Innovations at Laval University, together with the University of Toronto and the University Health Network, aim to seize this opportunity. The bilateral research team will host a symposium to explore collaborative R&D approaches for light-based tools and techniques that improve the characterization, diagnosis and treatment of infectious disease. Initial areas of R&D focus include 'photodynamic therapy', a non-invasive and low-cost method that could be used to neutralize malaria directly in red blood cells and laser trap-assisted 3D video microscopy, a potential new research platform to study HIV transmission between immune cells. The event will bring together researchers from different disciplines, stimulating knowledge exchange and new training opportunities for students. Longer-term, the team aims to launch a cooperative R&D program for new biotechnologies that accelerates technology transfer and helps emerging Canadian and Californian companies to capitalize on the global biophotonics market valued at \$53 billion.

### **CCSIP Collaborative Event: Transforming Vehicle and Roadside Communications through Wireless Technologies—and Canada-California Collaboration**

Wireless technologies have the potential to significantly improve many features of our automotive transportation system—from enhanced driver and passenger safety to the rapid delivery of information that allows travellers make informed choices and advanced traffic management techniques for road operators. With support from CCSIP, researchers from Université de Sherbrooke, the University of California Berkeley Partners for Advanced Transit and Highways (PATH), University of Toronto, Stanford University and AUTO21 (a Canadian Network of Centres of Excellence in automotive innovation) are joining forces to accelerate the research, development and application of wireless technologies for transportation. The multidisciplinary team will combine their broad expertise, resources and networks, and host two workshops that bring together research, technology and deployment stakeholders from both jurisdictions. This includes government officials with responsibility for the transport sector, such as the California Department of Transportation (Caltrans) and Transport Canada. The objective: to develop a research and deployment action plan on wireless-enabled vehicle and roadside communication. Building on common priorities, the plan will focus on technology-based solutions for the transportation sector that minimize energy requirements and negative impact on the environment. Key outcomes of the workshop include the creation cooperative R&D agenda in automotive research, advanced road transportation and

vehicular technologies with high commercial potential. The exchange and training of graduate students and post-doctoral candidates will help to develop new expertise in this field, and increase downstream benefits to the Canadian and Californian automotive and transportation industries.

### **CCSIP Collaborative Event: Developing 'Canada-California' Sunlighting Solutions that Generate Clean, Natural and Sustainable Energy for Buildings**

Bringing natural sunlight into the workplace offers multiple benefits. In the commercial building sector, as much as one-third of present electricity use is attributed to electric lighting. Technology-based systems that guide sunlight into multi-floor buildings have the potential to reduce lighting operating costs by at least 25 percent, and decrease greenhouse gas emissions from energy production. There is also a powerful argument that improved daylight illumination could help to improve the productivity and retention of employees. To capitalize on these opportunities, researchers at the University of British Columbia and University of California Davis will host four bilateral workshops to explore the collaborative invention, development and demonstration of novel core sunlighting systems. With support from CCSIP, the workshops will bring together participants from academia, government and industry with broad technical knowledge, influence and resources from both Canada and California. The team will identify key priorities, cooperative approaches to R&D and potential demonstration projects that showcase the value of this technology to building inhabitants and owners, real estate developers and facility managers. Canada and California are uniquely suited as strategic partners as they represent a wide range of the latitudes, climates and building types in which such systems could be installed worldwide. The workshop outcomes will shape a longer-term bilateral R&D strategy that identifies industrial partners and enables the training of highly qualified personnel, both of which are essential to the creation of new markets for core sunlighting technology.

## **CCSIP Collaborative Event: Creating a Bilateral Community of Technology Developers to Accelerate Discovery in Learning Sciences and Other Disciplines**

Technology plays a pivotal role in the world of research, enabling scientists, educators and students to share ideas, exchange information and collaborate in highly efficient and cost-effective ways. This allows researchers to draw on the best available materials, practices and technology solutions in their work, improving productivity and accelerating discovery. To promote the exchange of such technologies and maximize their impact in research, technology developers must form strong working relationships, and establish a well-connected and cooperative professional community. With support from CCSIP, the University of California Berkeley and the University of Toronto aim to seize this opportunity, and develop an integrated Canada-California community of technology developers in the learning sciences field. The team will establish a bilateral network of technology professionals; create a shared pool of knowledge; and promote the development, exchange and use of best practices, tools and approaches to help accelerate discovery in various scientific disciplines. The team will host two workshops to explore membership of this community, current and future technologies and their application in learning sciences; and how to increase open source development, information exchange and collaboration among technology innovators. Longer-term, this initiative could lead to the joint development of novel technologies with potential application in research and commercial markets; and facilitate the development of highly skilled personnel for Canadian and Californian universities and technology companies.

## **CCSIP Collaborative Event: Creating a Canada-California Digital Learning Network to Attract, Develop and Retain Dental Talent**

In 2009, the University of California Los Angeles (UCLA) Center for Health Policy Research reported on the growing shortage of dentists in California and around the world. Researchers noted key challenges such as the anticipated retirement of many experienced practitioners and the reluctance of new dentists to practice in remote and under-served areas—where they are needed most. Researchers from the University of California San Francisco and the Universities of British Columbia, Saskatchewan and Alberta are pooling their expertise to address these issues. With support from CCSIP, the bilateral team aims to develop an innovative model of continuing education that leverages online technologies and social networking tools, and enhances the professional development of dentists. The researchers will host a Canada-California Digital Learning Symposium that brings together students, practitioners, educators, technology development companies, and the Canadian, BC and California Dental Associations. Participants will explore online and in-person activities that improve collaboration, knowledge and skills development, online training and practice sharing in the dental profession. The outcomes of this event will support the development of new continuing education tools, approaches and research networks that improve the quality and reduce the cost of dental training. For example: oral cancer screening techniques that are taught via a virtual classroom to practicing dentists in any location. Longer-term, this bilateral collaboration could accelerate the development of highly skilled dentists required by Canada and California; increase the use of new technologies in the dental profession; and enhance quality of patient care.

## **CCSIP Collaborative Event: Developing Next-Generation of Virtual Reality Technology with Potential Application in Canadian and Californian Markets**

Imagine technology that allows you to be at home, the office or another location, and creates the overwhelming sensory experience of being in a completely different environment....innovation that builds on the visual, audio and tactile sensations created by current video games and other computer-simulated environments, and enables you to see, hear, and interact with people, and real or imaginary objects in more authentic ways. With support from CCSIP, a multidisciplinary team led by the University of California San Diego and McGill University aims to launch a new R&D consortium that leverages expertise and resources in California and Canada to develop next-generation virtual reality hardware and software. These technologies have potential applications in life sciences, transportation, environment, communications, entertainment, and education, and could significantly enhance research collaboration in the arts and sciences. The team will host a bilateral workshop in 2010 that brings together researchers from five UC campuses and seven Canadian universities, plus industry and innovation agencies, to define the objectives, priorities, cooperative models and potential investment for the consortium. Long-term, this bilateral cooperation promises to create cost-effective technologies for high value markets in Canada and California, and create a pool of highly qualified people for companies in both jurisdictions.

## **Overview of Selected Projects: Canada-California R&D Business Plans**

### **CCSIP R&D Business Plan: Leveraging Canadian and Californian Research Leadership to Create a Bilateral R&D Center for Energy-Efficient Carbon Capture**

With the recent United Nations Climate Change Conference in Copenhagen, there is increasing international attention on the rising amounts of carbon dioxide (CO<sub>2</sub>) in our atmosphere and the acceleration of global warming. Electrical power utilities that depend on fossil fuel production generate extensive CO<sub>2</sub> emissions. They often use dated industrial processes to capture CO<sub>2</sub> and store it away from atmosphere. Inefficient and costly, these processes sometimes require as much as 25 per cent of the energy produced by the electrical utility. New technologies that reduce the cost and energy requirements for carbon capture and storage (CCS) are not only essential for large-scale applications of this technology—they are required to capitalize on the emerging global CCS market. To seize this opportunity, researchers at the University of California Berkeley, the University of Waterloo and the Alberta Research Council are establishing a California-Canada Research Center for carbon capture. With support from CCSIP, the team will develop a business plan that defines research priorities, cooperative R&D models, and long-term funding requirements. Once established, the bilateral center will form a hub complementary science, engineering and economic forecasting expertise, enable participating researchers to collaborate on novel CCS projects, and pursue related market opportunities. The application of jointly developed technologies promises to deliver economic and social benefits to citizens in both Canada and California.

### **CCSIP R&D Business Plan: Creating a Bilateral Bioinformatics Network to Develop Novel Carbon Measurement Strategies and Support the Growth of Environmental Monitoring Companies in Canada and California**

The impact of climate change is readily apparent in Canada and California, as it is threatening the sustainability of key industries such as fisheries, forestry and agriculture. Although there is increasing consensus that net carbon emissions must be reduced, there is little agreement on the best way to achieve this. Current carbon measurement and management strategies fail to account for natural ecological disturbances that can readily alter carbon levels in the environment and put them into a state of flux. For example, a fire or pest infestation can readily turn a forest from a carbon sink (a reservoir that gathers and stores carbon) into a carbon source. These changes are difficult to track. Ecological informatics, the development and application of computer technologies that enable the analysis and management of ecological data, may offer an important part of the solution. Recognizing this opportunity, researchers from the University of Alberta and the University of California Davis will establish a bilateral Ecoinformatics Network to develop novel ways to monitor, measure and report on biospheric carbon (the natural movement or exchange of carbon between different parts of the ecosystem, such as the atmosphere, oceans and earth's crust). With support from CCSIP, the Network will bring together key stakeholders from industry, academia, government, and non-governmental organizations (NGOs), and aim to create a world-first Biospheric Carbon Index. The group will also develop a business plan that identifies potential markets and investment required to fully implement and sustain the network. Long-term, this collaboration could stimulate the growth of environmental monitoring companies in Canada and California, and enable the development of the skilled people they require.

## **CCSIP R&D Business Plan: Canada and California Join Forces to Develop Bioimaging Technologies to Improve the Detection and Treatment of Disease**

The World Health Organization estimates that cancer will cause more than 12 million deaths worldwide by 2030. These and other startling statistics emphasize the importance of early detection, diagnosis and treatment of cancer and other life-threatening diseases for global health. With an aging population, increasing threat of pandemics and rising health care costs, there is growing demand for novel and cost-effective medical imaging and treatment systems. With leadership from world-class scientists at McMaster University and the University of California Los Angeles (UCLA), an interdisciplinary team of scientists, clinicians and students are combining their expertise and resources and launching a bilateral research consortium to develop low-cost and minimally-invasive diagnostic and therapeutic devices for improved cancer detection. With support from CCSIP and participation from three UC campuses (including UC Santa Barbara, San Diego) and four Canadian universities (including McGill University, and the Universities of Toronto and Waterloo), the team will draft a business plan that defines research priorities, identifies market opportunities, and aims to secure long-term funding for the consortium. If successful, the emerging joint R&D promises to bring new biomedical technologies from the lab to start-up and established companies, build and broaden the biomedical talent base in both Canada and California, and ultimately improve the quality of healthcare delivery in both regions.

## **CCSIP R&D Business Plan: Combining Canadian and Californian Know-how to Create Ultra Energy Efficient High Performance Computing Facilities**

The world of research and discovery has evolved significantly since the development of supercomputing facilities—powerhouses that aim to provide compute capabilities that enable scientists to process very large volumes of data, identify patterns, extract key information and apply it to their research. But this computing power comes at a cost—a large carbon footprint that accelerates global warming. These facilities consume substantial amounts of energy; US consumption has more than doubled since 2000 and it is expected to double again by 2011. To address this challenge, researchers from McGill University's CLUMEQ (Consortium Laval, Université du Québec, McGill and Eastern Quebec) and the San Diego Supercomputer Center (SDSC) based at the University of California San Diego aim to create a bilateral, 'ultra energy efficient' data center for high performance computing (HPC). With support from CCSIP and participation from Hydro Quebec, Rumsey Engineering (San Francisco) and ClimateCHECK (Ottawa, Canada), the bilateral team will develop a business plan to design a world-first HPC facility that requires less electricity than existing facilities, helping to reduce greenhouse gas emission reductions. The plan will propose technical specifications, a cost/benefit analysis, carbon audit and collaborative management model that will benefit both jurisdictions. If implemented, the centre could serve as a model for HPC facilities around the world; create new expertise and high-paying jobs in Canada and California; and attract a wide range of professionals who are eager to use these facilities.

## **CCSIP R&D Business Plan: Harnessing the Power of Canada-California R&D Cooperation to Develop Novel Biofuels for Green and Sustainable Energy**

Around the world, the availability of natural resources such as food, fuel, and water is steadily declining. Scientists predict that the price of food staples such as wheat, maize and rice will continue to rise due to increased demand caused by population growth; the demand for world energy will increase by 50 percent by 2030; and climate change will begin to exhaust food supplies as rainfall decreases in many areas, prompting crop failures. This complex global challenge requires the development of sustainable energy alternatives such as biofuels that can produce fuel, electricity, heat, and other sources of power. With support from CCSIP and leadership from McGill University and the University of California (UC) Davis, scientists from eight Canadian universities (including the Universities of Alberta, Saskatchewan,

Manitoba, Toronto, British Columbia, Sherbrooke and Ecole Polytechnique de Montreal) and five UC campuses (including Los Angeles, Irvine, Berkeley and San Diego) are pooling their expertise to create a bilateral 'green energy' research consortia in biofuels. Over the coming year, the multidisciplinary team will create a business plan that defines key strategies, collaborative R&D models and funding requirements for the Canada-California network. Once established, participants will harness their collective knowledge to develop innovative biofuels, bioproducts and biorefining practices for a growing global market that is expected to grow at a CAGR of more than 12 percent from 2007 to 2017<sup>1</sup>. They will also participate in training programs and propose policy recommendations that strengthen the biofuels sector in both jurisdictions.

### **CCSIP R&D Business Plan: Leveraging Canada-California R&D Expertise in Green ICT to Reduce Carbon Emissions and Slow Global Warming**

Climate change is a key global challenge and priority. Information and communications technologies or ICT (including microelectronics, photonics, wireless technologies, telecommunications networks and services, software and multimedia applications) currently generate global carbon emissions equivalent to the aviation industry. However, in an interesting duality, the novel application of these technologies creates the potential to reduce worldwide greenhouse gas emissions by up to 30 percent<sup>2</sup>. McGill University, the California Institute for Telecommunications and Information Technology (CALIT2) at University of California (UC) San Diego and Irvine, and Prompt (Quebec, Canada) aim to seize this opportunity. With support from CCSIP, they are bringing together 10 Canadian universities (including the Universities of British Columbia, New Brunswick, Ottawa, Toronto, Waterloo, École Polytechnique de Montreal, École de technologie supérieure, Concordia University and Université du Québec à Montréal), two UC campuses and CANARIE, Canada's Advanced Research and Innovation Network, to establish a bilateral R&D consortium for the development of green ICT that will help reduce carbon emissions. The multidisciplinary team will develop an R&D business plan that defines the objectives, strategies and investment required to launch to consortium. As the global market for green ICT is expected to exceed US\$600 billion by 2013, the potential economic benefits of this bilateral R&D collaboration are significant. For example, energy-efficiency efforts over the last 30 years in California created 1.5 million new jobs and payrolls of \$45 billion. Longer-term, the consortium promises to enable the creation of new expertise and the development of novel technologies that deliver health and environmental benefits to both jurisdictions.

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<sup>1</sup> Global Markets Direct; December 2008; <http://www.globalmarketsdirect.com/>

<sup>2</sup> Insight Research Corporation:  
[http://promptinc.org/template/ngi\\_pdf/ICT\\_Carbon\\_Credit\\_Ecosystem\\_Bauer\\_Insight\\_Research\\_Corporation.pdf](http://promptinc.org/template/ngi_pdf/ICT_Carbon_Credit_Ecosystem_Bauer_Insight_Research_Corporation.pdf)