missing or malfunctioning, the cellular damage affects a person’s appearance, physical abilities, and mental development, and in the most severe forms of disease, the untreated affected child will die within the first ten years of life.

Ordinary corn cells do not contain lysosomes, but they possess a similar organelle called the vacuole, where cellular materials are recycled. But corn cells are different from human cells in subtle ways—especially how they produce proteins including enzymes.

“It turns out that even after the human enzyme protein is synthesized it goes through numerous post-translational processing steps, one of which is N-glycosylation,” explains Kermode. She is referring to the addition of other simple sugar molecules that are attached to the protein, sometimes helping it to fold into a stable and functional molecule. Even after that, further processing steps trim off certain glycan (sugar) residues, and then add even more complex sugars. “It’s called N-glycan maturation,” says Kermode. The problem is that plants do this differently from animals in a part of the cell called the Golgi complex. In 2000, Kermode was awarded a Natural Sciences and Engineering Research Council grant to develop a method of bypassing the Golgi complex so that corn seeds could make usable human enzymes.

Together with her postdoctoral fellow Xu He, they tried numerous strategies to overcome every obstacle. Finally, in 2012, they succeeded.

“What we exploited in the end was a natural process,” says Kermode. They employed something called messenger RNA targeting as a means of controlling the movement and storage of human enzyme molecules inside corn cells. DNA codes for proteins via intermediate molecules known as messenger RNAs. The SFU researchers substituted non-coding regulatory sections of DNA for a corn protein onto the DNA encoding the human enzyme. This caused the corn cell to handle the human protein differently, skipping the Golgi complex where offending sugars might otherwise have been added. “We were lucky that we could use just the parts of the corn gene that coded for the subcellular zip code, without needing to alter the human enzyme itself,” says Kermode. Basically, they genetically modified the corn to produce an enzyme that could one day replace the existing treatment for children with mucopolysaccharidosis.

Kermode envisions not fields of corn, but controlled greenhouse crops, which after harvest still require a purification process. She wants to investigate other possible plants as well, since the corn method has very low yields. “We have to get higher yields before we go on to human drug trials,” she says.
Respectful Aboriginal research

MESSAGE FROM THE VICE-PRESIDENT, RESEARCH

In 2010, special provisions for ethical research involving Canada’s Aboriginal peoples were included in the 2nd edition of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2). While this chapter (Chapter 9) was the product of many years of nation-wide deliberation and consultation, it was never intended as a once-and-for-all attempt to govern Aboriginal research in Canada. Rather, it was presented as a living document to guide researchers into mutually beneficial, respectful forms of research engagement with Aboriginal peoples.

Taking this initiative a step further, SFU recently revised its research ethics policy R20.01 (Ethics Review of Research Involving Human Participants) to place the onus on its researchers to interpret and apply TCPS2 in a way that recognizes and respects the cultures, customs, languages, governance structures, and codes of Aboriginal participants.

The overriding vision of R20.01 is to provide a proportional mechanism for ethics review that effectively balances risks with benefits. At the start of the year-long consultative process to revise this policy, we asked the question, “What issues repeatedly come up for the SFU Research Ethics Board (REB) in cases involving Aboriginal research?” Working with the Director of the Office of Research Ethics, members of Aboriginal communities, and researchers with demonstrated track records of ethical research with Aboriginal individuals and communities, we identified three main ethical responsibilities.

The new Section 9 of R20.01 details the ethical conduct of research involving Canada’s First Nations, Inuit, and Métis peoples in terms of community engagement and informed consent, intellectual property and products of research, and the use and storage of data. Under 9.1, researchers will engage with the individual, community, or governing body involved, to identify research risks and benefits and determine which of these parties should provide informed consent. Section 9.2 is a particularly bold extension of TCPS2, distinguishing between intellectual property (IP) as the products of research governed by SFU’s IP Policy R30.03, and IP as the intellectual/cultural property rights and traditional knowledge brought to the project and owned by the Aboriginal individual or community. It also specifies that researchers should endeavour to accommodate participants’ ownership of research results wherever practicable, including access and usage rights, economic rights, etc. Section 9.3 is sympathetic to concerns of knowledge loss in Aboriginal communities, and seeks to preserve their IP through the use and storage of data. It offers to provide data storage on behalf of an Aboriginal individual, community, or organization without disclosure to a third party, subject to applicable law. In sum, Section 9 of the revised 20.01 attempts to deal with these three issues in a way that expedites the ethics review process while continually engaging participants as active partners in research.

Please visit our website at www.sfu.ca/vpresearch for more information about the policy revision process and a link to the final policy.

Taking a leadership role to ensure that researchers respect the diverse perspectives on research involving Aboriginal individuals, communities, or governing bodies is a natural step for SFU, which includes “Respect for Aboriginal Peoples and Cultures” as a key commitment of SFU’s strategic vision. To learn more about SFU’s Aboriginal programs, services, and research initiatives, please visit the Office for Aboriginal Peoples website at www.sfu.ca/aboriginalpeoples.

Kermode cont. from p. 1

Partners at Griffith University and Macquarie University in Australia helped analyze the enzyme from corn to determine that problematic sugar addition was effectively avoided. Kermode is now working with various collaborators with the goal of creating a therapeutic drug. “Our hurdles are in relation to yields, then there’s therapeutic efficacy, and then there’s all the drug trials, all of which take years,” says Kermode. “But what continues to motivate me is meeting families who are dealing with these devastating genetic diseases.”
Bipolar disorder in later life

SFU RESEARCHERS STUDY MENTAL ILLNESS BY GETTING MOOD DATA IN THE MOMENT

When SFU associate gerontology professor Norman O'Rourke and his students searched the bipolar disorder (BD) literature, they found only two references to older adults with BD. “So we know very little about caring for older adults with bipolar disorder,” says O’Rourke, who heads a four-year multidisciplinary national study on the subject, funded by a $722,000 Canadian Institutes of Health Research grant.

Characterized by major depressive and manic (or mixed-manic) episodes, BD affects around half a million people in Canada. Roughly 75,000 Canadians over 50 years of age have BD and according to O’Rourke this number will triple over the next decade as people with BD are living longer. Older adults with BD also have to deal with all the other issues that come with aging. “We are dealing with older adults with BD now, perhaps for the first time in history,” explains O’Rourke, pointing out that in the 1950s treatments such as lithium became available, and today’s drugs are even more effective. Although BD is primarily treated with drugs, therapy and social support, up to 80% of people with BD also self-medicate and the risk of suicide is high.

O’Rourke wants to help, using the Global Positioning System (GPS) capabilities of smartphones and tablets to find out how geospatial patterns of movement correlate with BD symptoms. His Bipolar Affective Disorder and Older Adults study distributes iPad Minis to people aged 50+ with BD. “The idea is to link mood-in-the-moment to geographic patterns,” says O’Rourke. The researchers will track place (e.g., River Rock Casino) and location (i.e., latitude and longitude) from the participants’ iPads and record their mood through a questionnaire that appears on the device. The participants can set customized warning messages to alert them, their case managers and the friends and family of people with BD, often called the “silent sufferers.”

“We want SFU to become a knowledge centre for BD research in Canada,” says O’Rourke.

As a co-author of three statistics textbooks, O’Rourke was drawn to bipolar disorder research as a statistical challenge. BD symptoms are variable and complex. Fortunately, contemporary statistical methods allow us to examine factors such as the frequency, duration and severity of mood episodes—depression and mania—over time,” says O’Rourke. The speed of mood change in BD is known as cycling, as the person oscillates from one pole to the other, and it’s a key clinical indicator.

O’Rourke’s current study is truly multidisciplinary, involving mathematician Peter Borwein and computer scientists Ted Kirkpatrick and Uwe Glässer from SFU’s Interdisciplinary Research in the Mathematical and Computational Sciences (IRMACS) Centre, Wendy Thornton in psychology, and Atiya Mahmood and Andrew Stasmith in gerontology at SFU. Other collaborators include researchers from six universities in Canada, USA, and Australia in fields of biomedical engineering, social work, mathematics, architecture, clinical neuropsychiatry, and human geography.

O’Rourke is a clinical geropsychologist. He completed his doctorate at the University of Ottawa and his residency in Rush-Presbyterian-St. Luke’s hospital in Chicago. His team will soon begin recruiting participants at UBC Vancouver, UBC Okanagan, University of Calgary, and the Rotman Research Institute in Toronto.

Norm O’Rourke

The system helps people with BD by analyzing their GPS info. Red shows movements while manic; blue while depressed.

AWARD WINNERS

Congratulations to:

- **Robert Hogg**, Health Sciences, is the 2013 recipient of the Paz Buttedahl Career Achievement Award from the Confederation of University Faculty Associations of BC (CUFA BC), for “sustained contributions over the course of a career to the non-academic community through research and scholarly activity.”

- **Jeffrey Chan**, Chemistry PhD student, will receive the Boehringer Ingelheim Doctoral Award from the Canadian Society for Chemistry for organic chemistry or biochemistry.

- **Mario Pinto**, Chemistry (and Vice-President, Research), is the 2013 recipient of the Canadian Society for Chemistry for organic chemistry or biochemistry.

- **David Vodak**, Chemistry, was presented with the Boehringer Ingelheim Research Excellence Award of the Canadian Society for Chemistry for his medicinally relevant research.
A helping hand
SFU PROFESSOR OFFERS HOPE TO STROKE PATIENTS THROUGH BIOMIMETICS

Ever since word got out that SFU Engineering Science researcher Carlo Menon had developed a therapeutic robot, he has been fielding calls from desperate stroke patients anxious to be the first to try it. “I get calls from people all the time. They’ve been trying everything and don’t know what to do; can I ship my device to them?” says Menon. Often callers have tried every other treatment available, and he is their last hope. For the former professional violinist turned engineer, this validates his decision to switch to a career where he feels that he can make a greater contribution to society.

Menon’s device is a type of exoskeleton that helps stroke patients to perform repetitive physiotherapy exercises after they leave acute care. It fits on a patient’s arm, where it amplifies weakened arm muscles, flexing and bending the elbow over and over again in response to the user’s initial frail movement. Studies show that more movement repetitions speed the rate of recovery.

Menon is the principal investigator for a Collaborative Health Research Project grant, a joint initiative between the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Canadian Institutes of Health Research (CIHR). His SFU Menrva research group is developing the exoskeleton technology in preparation for patient trials with project collaborators Lara Boyd and Jayne Garland at UBC’s Department of Physical Therapy.

Stroke victims suffer acute central nervous system damage, which often results in weakness or partial paralysis affecting one side of the body. As the patient recovers, healthy brain tissue takes over. Rehabilitation therapy can speed up the process by coaxing dormant neural pathways back to life and restoring muscle function. “You don’t need a physiotherapist to move the elbow a hundred times. A robot can do it,” says Menon, emphasizing that a robot is relatively affordable compared to daily sessions with a hospital physiotherapist.

Menon, originally from Rovigo, Italy, came to SFU in 2007 from the European Space Agency where he worked on robotic systems as a member of the Advanced Concepts Team in the Netherlands. “I wanted to combine my expertise with robotics, and find a niche in health sciences,” says Menon. “Our work is not limited to stroke victims, but to any individuals with neurological disorders.” Menon’s inspiration comes from the world around him, from animals, insects and plants. “It’s called biomimetics,” he explains, “taking ideas from nature to develop new technologies, and then taking them back to help nature.”

His devices can also help those with spinal cord injuries, but he is currently focusing on the elderly. “If they lose strength in their upper extremities, they cannot perform movements they used to do, like opening a window,” says Menon. “It requires amplification in force when needed so seniors can wear an exoskeleton device to help nature.”

“Biomimetics: taking ideas from nature to develop new technologies and then taking them back to help nature.”

Menon’s vision is that one day, people can wear an exoskeleton device to help with everyday life, keeping them active and improving their quality of life. If they stop doing these tasks, they lose their muscle tone, and they become even weaker. With the support of a CIHR grant, Menon has already studied seniors in a local care home, using adhesive detectors to record how they move their wrists and the electrical muscle signals involved. This knowledge is informing his current work on an assistive device that will detect electrical signals from the muscles or brain, providing a small amplification in force when needed so seniors could still use their arms and hands. “It requires the person to use their muscles to get the robotic assist, so it has a motivational factor,” says Menon. In this case, the device is not used for physiotherapy but for assistance.

Menon considers upper extremity functions the most important. “You can’t feed yourself or dress yourself. If you lose the mobility of your hands, you are lost.” As a former professional violinist, Menon is not one to take hand dexterity for granted. He hopes that through his assistive biomimetic devices, he will be able to help millions of people to do previously, like take the lid off a jar;” says Menon. “By helping the patient make meaningful movements we can get them to continue using their arms which helps rehabilitation and gives purpose to their life.” However, more work is needed to refine the bulky prototype into something more comfortable for the user.

Enter biomimetics. Menon is experimenting with dielectric Electro-Active Polymers (EAP), thin plastic membranes which flex and contort to move a load when an electric current is applied, similar to the way that muscles work. This year Menon received a Career Investigator Award from the Michael Smith Foundation for Health Research, which provides up to eight years of support so that he can develop wearable assistive devices for patients with neuromuscular disorders. He hopes to ultimately create a thin biomechanical sleeve that would fit on a person’s arm like a wetsuit.

While other research groups are focusing on getting stroke patients up and walking again, Menon considers upper extremity functions equally important. “If you can’t use your hands, life becomes much harder. It’s what distinguishes us from animals,” he says. “You can’t feed yourself or dress yourself. If you lose the mobility of your hands, you are lost.” As a former professional violinist, Menon is not one to take hand dexterity for granted. He hopes that through his assistive biomimetic devices, he will be able to help millions of people to improve their quality of life.
Studying history means reading countless documents before gaining insight. Similarly, lawyers in the discovery phase of court cases need to scrutinize reams of printed material. Many other jobs are the same. But according to SFU computing science associate professor Anoop Sarkar, “Now you can have the computer do a first read for you to find relationships.” His natural language processing software is smart enough to understand basic concepts in text documents and then display the information visually, making it far easier for people to draw correlations and see patterns. He has just been awarded a Discovery Accelerator Supplement from the Natural Sciences and Engineering Research Council of Canada for “high-risk, novel or potentially transformative” research.

“The computer brings the right things to your attention graphically,” says Fred Popowich, a professor of computing science and Director of the Vancouver Institute for Visual Analytics (VIVA), one of the many research institutes under the VP Research umbrella.

Sarkar is one of VIVA’s principal investigators. His software processes every history article in Wikipedia and presents world history visually. A user might see coloured locations on a map showing how countries have interacted with each other over time and space. “By clicking on the map, you get to see what documents support that,” says Popowich. “The computer has been the research assistant for you. It’s done the preliminary reading and drawn to your attention what articles and what text is relevant.”

SFU’s research centres and institutes are established to facilitate multi-disciplinary collaborations among faculties on campus, as well as multi-university initiatives that provide research-related services to the community. VIVA, initially funded by a research gift from The Boeing Company in 2010, includes researchers from UBC, BCIT and UVic as well as companies such as Boeing and SAP.

Visual analytics (VA) arose as a way to help US intelligence experts make sense of the mass of security-related data following the terrorist attacks of September 11, 2001 on the World Trade Center. Analysts were lost in a sea of data, much of it dynamic, ambiguous, and often conflicting. The discipline draws upon research from a number of areas including visualization, human computer interaction, machine learning, data mining, statistics, and cognitive science.

For academics it can be problematic doing research with corporations because many of their results cannot be published as they may be proprietary. “So we turned to the web and Wikipedia,” says Sarkar. “People always complain that there’s too much information out there: ‘I need to get to it more quickly.’” His visualization software can handle unstructured data such as web pages, automatically processing their content. But human intelligence is still required to make sense of what is displayed.

Managing Director of VIVA Jean-Sébastien Coté says, “VA allows you to use your sense with the biggest bandwidth—vision—to identify specific things, like points of failure in faulty components.” He tells how five Boeing engineers tried conventional methods on such a problem for seven months with no success, whereas a pair of visual analytics workers figured it out within a couple of weeks. “It’s the interactive nature of the visual analysis that makes the difference,” says Coté, emphasizing that the two investigators always consist of a subject matter expert, typically an engineer or a manager with a particular problem, and a technical expert familiar with visual analytics software.

“The machine cannot solve novel problems on its own. Nor can people. We get people to work together with machines to obtain insights,” says David Darvill, Research Director of VIVA. Darvill is a psychologist specializing in human computer interaction. “It’s a psychological problem to understand how people think about problems and their solutions and to get people to accept new tools to help them visualize their data,” he says.

Darvill tells of another success the group had with Boeing involving bird strikes on airplanes during landings and takeoffs. An SFU graduate student worked with a Boeing safety engineer, using visual analytics tools and methods to examine available data on bird strikes. They were able to see the kind of damage, where it happened and when it occurred. Their discoveries resulted in four engineering design changes to Boeing aircraft as well as a major change in the standard procedure for pilots landing passenger aircraft. “It used to be up to the pilot whether to land the plane or not if there was a flock of birds in the way. Now pilots are told to land, because the visual analysis demonstrated that there is greater risk when a bird strike occurs if the pilot adds power to go around and try landing again,” says Darvill.

At VIVA the focus is getting people working together with technology to make better sense of data. “We’re not replacing human jobs. We’re solving problems by putting humans at the centre to see what’s in the data,” says Popowich. “And it’s going to become more and more important in the future, as we try to deal with way too much information.” People need to see information so they can use it to make better decisions.
SFU is gaining a reputation for its innovative HIV/AIDS research. Now its researchers have a brand new lab that will enhance fast-track efforts to find a vaccine for this deadly disease that newly infects several million more people every year. The new Containment Level 3 (CL3) lab in Blusson Hall took 10 years to create from its first conception. It will allow researchers to study contagious diseases such as AIDS, influenza, and hanta virus in a thoroughly safe environment.

The virus that causes AIDS, Human Immunodeficiency Virus (HIV) can mutate very quickly. It can easily alter a molecule here and there on its outer surface, making it difficult for the human immune system to recognize and destroy it. However, this chameleon-like power comes at a cost. “I’m interested in finding out what is that cost to the virus to make these mutations,” says Zabrina Brumme, professor of Health Sciences at SFU. In some cases, the virus mutates without a problem. But in other cases the virus itself suffers from the mutation, i.e., it loses fitness. “The idea is to find out what mutations are rather costly, because this may help in the development of vaccines,” says Brumme.

Brumme and partner Mark Brockman, a Canada Research Chair in Viral Pathogenesis and Immunity, were attracted to SFU in 2009 in part because of the CL3 lab, but their work started at least a year before while they were postdoctoral fellows at Harvard Medical School. “We used to have these long conference calls with the CL3 team during which we had to come up with plans and procedures for every eventuality in the lab. What if someone has a heart attack? What if a spider gets in? How often do we Swiffer the floor?” says Brumme. It took three years to write the Standard Operating Procedures manual for the lab, a requirement of the Public Health Agency of Canada (PHAC). The process uncovered some issues.

The lab is under constant negative pressure. Air is always being drawn into the lab, and the only way it can get out is through a series of elaborate filters that keep potential pathogens from escaping. If the power fails, an emergency generator maintains negative pressure. During the lab commissioning process, this system was tested using smoke. “There were a couple of seconds after the power failure before the backup generators came on,” says Brockman. “We could see smoke puff back into the lab. Additional damper valves had to be installed and the smoke test was redone until puff back was reduced to zero.”

Everything was tested. For instance, water pressure can be a problem at SFU because the campus is on top of a mountain. A dedicated autoclave in the lab sterilizes all waste materials that leave the room. “You put dirty material in on the inside and it comes out sterile on the outside of the lab,” says Brumme. But water pressure issues made the autoclave abort, so a special $42,000 water pump was installed to solve the problem.

Andrew Barton, SFU’s director of radiation safety and biocontainment facilities, says, “We have a commissioning agent who advises on design and testing to ensure that the lab is fail safe.” All aspects of the design, construction, and use of the lab are tightly regulated by PHAC.

The CL3 lab was part of the Health Sciences Building business plan, which started around 2004. Housed in Blusson Hall, funding for the lab was provided by a generous donation from the Djavad Mowafaghian Foundation, and most of its equipment was purchased using Canada Foundation for Innovation/BC Knowledge Development Fund grants. VP Research Mario Pinto says, “This facility signals a coming of age for SFU in the biomedical and health fields, and will permit internationally competitive research.” Up to now, SFU investigators have had to travel to outside labs, such as the BC Centre for Disease Control (BCCDC), to conduct CL3 level experiments. Besides Brumme and Brockman, Masa Niikura and Ralph Pantophlet from Health Sciences will be the first SFU researchers to use the lab to study simian HIV and hanta virus respectively. Julian Guttman in Biology plans to study pathogenic bacteria in the lab.

“In our case, if you are working with blood from an HIV positive person, doing routine handling, then an ordinary biology lab is OK, but in Canada if you are actively wanting to grow the virus in cell culture, it’s considered level 3,” says Brumme. She creates infectious HIV strains with certain mutations, and grows them in the lab to compare their replication capacity against wild type strains. “These are the experiments that I’ve really wanted to do since coming here in 2009, so it’s great to be able to do this at SFU instead of the BCCDC,” says Brumme. Meanwhile Brockman will use the lab to study killer T-cells from the human immune system, which can cause the virus to mutate. He also uses infectious virus and HIV patient cells. “The CL3 lab is absolutely required for our work. In addition to its convenience, it provides an order of magnitude better safety than any other laboratory on campus,” he says.

Masa Niikura is working on new and better anti-influenza drugs. He needs to test drug candidates on viable cultures of many influenza virus strains. “The new fail-safe lab is essential for such drug development efforts,” says Niikura.
Research and Innovation News

COAST CAPITAL SAVINGS VENTURE PRIZE
Three young startup companies shared $5,000 in prize money as winners of the second annual SFU Venture Connection Coast Capital Savings Venture Prize competition. The award recognizes excellence in business development among early-stage companies that are clients of SFU Venture Connection’s student incubator program, offered in partnership with Coast Capital Savings. First place winner, WittyCookie founder Michael Cheng says, “Since we joined the program last year, we have seen massive growth in our [web design] company, been featured in a dozen newspapers, and have won nearly $10,000 in prize money from business competitions.” Second place winner, CKM Sports Management, provides high-level development and recruiting services for junior and professional hockey players. SFU Psychology graduate and founder Cliff Mander says, “Over the last 16 months the company has gone from one to 26 clients and gained a strong reputation in the hockey industry.” Third place winner MLT Media is a mobile marketing firm that delivers innovative performance-based advertising. The competition was held at SFU’s Segal Graduate School of Business in February.

DISCOVERY FOUNDATION FUNDING
Two of the Innovation Office’s programs have received renewed funding through SFU’s partnership with the Discovery Foundation Technology Education Program. The funding will support the SFU GreenTech Exchange’s Discovery Foundation Executive Speaker and monthly networking sessions for the green tech and renewable energy sectors. It will also enable SFU Venture Connection to continue delivery of the Discovery Foundation Entrepreneur Mentoring Program, which provides one-on-one entrepreneurial mentoring for students and alumni.

NEW MENTOR APPOINTED
Hugh MacNaught has become the newest member of SFU Venture Connection’s Mentor-in-Residence (MIR) team, joining Jim Derbyshire, Stewart Marshall, Dave Thomas, and Jack Gin. These experienced entrepreneurs help students and alumni achieve their business goals. MacNaught is a senior executive with over 25 years of experience in product development, manufacturing, finance, business development and executive management. He has worked with companies ranging in size from raw start-ups to blue-chip corporations. His experience includes several years as a venture capitalist to guiding university spin-outs at Oxford and Stanford. He directed the Technology Commercialization Committee for the Alberta Heritage Foundation for Medical Research, and was the Audit Chair of Genome Prairie.

VENTURE CONNECTION INCUBATOR UPDATE
SFU Venture Connection incubator client Leaping Coyote Interactive, a company co-created by three Masters of Digital Media graduates, has been making media headlines with its mobile gaming apps. Vancity Dash (no relation to the credit union) is a location-based app using GPS technology that rewards joggers with power-ups and virtual coins as they pass local landmarks. Leaping Coyote’s newest release, Run with Me, allows joggers to create a virtual “running buddy”. Learn more at leapingcoyote.com. Meanwhile, former Venture Connection client Buyatab.com recently presented to an audience of venture investors as one of the “hottest early stage companies” at the 2013 Canadian Financing Forum, Western Canada’s premiere event for high growth technology companies.

CAR-POOLING SMARTPHONE APP
This spring, SFU Venture Connection client go2gether launched a pilot car-pooling service with SFU Parking Services. Beedie School of Business graduate Alice Park first developed the concept as part of a course on social entrepreneurship. The goal of go2gether team is to facilitate ridesharing by matching drivers with passengers through its free smartphone app. Learn more at go2gether.ca.

Smithsonian adopts SFU tech

WORLD’S LARGEST MUSEUM NOW USES SFU OPEN MONOGRAPH PRESS
The Smithsonian Institution, based in Washington, D.C., released its first publication, Smithsonian Contributions to Knowledge, in 1848. Today, the Smithsonian Institution Scholarly Press (SISP) publishes academic research in fields ranging from science to art and art history, and history and material culture. Soon, all of SISP’s publications produced with federal funds will be publicly accessible at a new website, thanks to open source technology developed by the Public Knowledge Project (PKP) based at the SFU Library.

The SFU Library’s newest PKP software module, the Open Monograph Press (OMP) 1.0, was released in September 2012 and is attracting numerous early adopters worldwide. OMP is the modern way to publish scholarly books. The free open source software publishing system takes care of the entire publishing process, from manuscript submission through review, approval, editorial, production and publication in all formats from print to web and ebook.

Other early adopters include the State University of New York, Buffalo who use OMP for their Open Textbooks publishing initiative, Athabasca University Press in Alberta, Temple University Press in Philadelphia, Open Humanities Press, as well as the philosophy department at the University of Windsor. The ONIX standard specification for descriptive book data is included in OMP, which means university presses can interact with the larger commercial publishing world.

While OMP software is free, SFU Library supports its development by charging for hosting and related services. The Smithsonian may become SFU’s first hosted OMP site. Visit smithsonianrex.si.edu for more on how PKP software is being adopted there.

The Public Knowledge Project is a partnership among Simon Fraser University, the School of Education at Stanford University, the University of British Columbia, the University of Pittsburgh, the Ontario Council of University Libraries and the California Digital Library. It is supported by numerous university libraries across North America. Visit pkp.sfu.ca for more information.
The birth of a new sector: bio-nano

BUSINESS PROF TAPS PATENTS TO STUDY BIOTECH AND NANOTECH INDUSTRIES

What do you get when you combine nanotechnology, the building of useful objects at an atomic or molecular level, with biotechnology—the manipulation of living organisms and biological systems, to develop new products?

You get one of the world’s hottest new business sectors, according to a new study led by associate professor Elicia Maine, academic director of the Management of Technology MBA program at SFU’s Beedie School of Business.

The study, Global Bio-Nano Firms: Exploiting the Confluence of Technologies, classified and analyzed virtually every firm in the world that is utilizing technological capabilities in both biotechnology and nanotechnology to create a host of new products and services.

Maine and her co-authors from SFU, the Massachusetts Institute of Technology and the University of New South Wales presented their results in February at the annual American Association for the Advancement of Science (AAAS) meeting in Boston. The study was funded in part by the Social Sciences and Humanities Research Council of Canada.

“We have watched the ecosystem emerge in terms of the number and type of firms entering,” says Maine, whose research helps R&D managers evaluate risks and uncertainties to pursue the most viable innovations.

The global bio-nano industry includes sub-sectors such as biopharma, drug delivery, diagnostics, bioinformatics and medical devices.

“Some of the things we’re talking about are targeted drug delivery, tissue engineering, enhanced medical diagnostics and new therapeutics,” says Maine. “This confluence of technology silos in the emerging bio-nano sector is enabling radical innovation, new products and connections that didn’t exist before.”

The study details “how many players are coming in, how they merge, industry dynamics over time, what types of firms are coming in, what the overall entries and exits look like regionally, as well as by classification,” says Maine.

The researchers found that “de novo” firms—technology start-ups typically borne of research labs and tightly integrated with universities—have driven the integration of knowledge from the biotech and nanotech spheres.

The radical innovation at the heart of this emerging space, which the authors describe as “the birth of a new sector,” is rapidly creating opportunities for new companies at the intersection of these two fields.

Their data show that bio-nano companies are emerging not just in technology hotbeds like the Silicon Valley and the U.S. Northeast, but also across North America and Europe.

Germany, the United Kingdom, Japan, Australia and Canada all have a significant bio-nanotechnology presence with 10 or more such firms, but the U.S. still dominates the sector. Maine attributes much of its strength to the National Nanotechnology Initiative (NNI), a federal R&D program established in 2000 to coordinate multiagency efforts and support the nanotech industry.

“Canadians could draw some policy implications from this,” she says, suggesting that governments focus on funding their research universities to stimulate new firm formation in this emerging sector. Also, that the potential exists to create clusters in bio-nanotechnology.

She points to the highly innovative and highly integrative firm C Sixty, out of the University of Toronto, which was sold to a Texas company (Arrowhead Research Corp.) around 2005, possibly because it just couldn’t grow in Canada.

“I see other Canadian companies in our sample that have had a very difficult time raising venture capital financing, whereas it is significantly easier in the U.S.,” says Maine.

The NNI dwarfs Canadian public funding for nanotech, and it also funds science-based ventures directly through the U.S. Small Business Innovation Research Program, versus Canada’s largely indirect funding of innovation.