



# Tracking our cultural DNA

## Researchers apply biological techniques to anthropological data

Physically, humans have not changed much in the last 200,000 years. However, the amount of cultural change over that time period is astonishing. Consider literacy as an example. Only 500 years ago, books were rare and few people could read or write. Today literacy is ubiquitous. The situation with computers is even more remarkable. The first personal computers appeared in the mid-1970s. Thirty-five years later, PCs have become so powerful that their use is now the norm in many countries. Recent surveys suggest that almost half of all Canadians have a Facebook account.

How can culture evolve so much faster than biology? Does such rapid cultural evolution affect biological evolution? How are cultural traits passed on from one generation to the next, and among peers? Surprisingly, while these questions were posed as early as the 1880s, only recently have we begun to find the answers. One of the world's leading thinkers in this area of research is Mark Collard, SFU's Canada Research Chair in Human Evolutionary Studies.

The media is fond of pitting Nature vs Nurture when reporting on human behaviour, but Collard doesn't see it that way. "We phrase it in terms of culture versus biology, but culture is part of our biology, and in fact it's the key reason we've been so successful as a species," he says. "There's a better way of thinking about culture and biology," Collard continues. "There are grounds for viewing genes as units of information rather than physical entities. And we can think about culture in similar terms. Culture is basically a set of rules for how to behave. So, humans can be regarded as having two systems of information inheritance—a genetic one that is based on reproduction, and cultural one that is based on social learning. These systems run in parallel and jointly shape our bodies and behavior."

Cultural inheritance, where individuals learn knowledge and techniques from other individuals, has the potential to be much more powerful than genetic inheritance. For instance, a father may teach a boy a particular way of harpoon-making to catch fish. But at age 16, when that same boy is out fishing on the reef and he watches someone else catching way more fish with a different harpoon design, he may copy that design and change his behaviour. Such cultural inheritance results



Mark Collard, Canada Research Chair in Human Evolutionary Studies

in a much more rapid rate of change than its genetic counterpart, which would require generations of people to have fewer children due to catching fewer fish.

Even in the early 1990s while he was an undergraduate at the University of Sheffield in England, Collard wondered about applying concepts from evolutionary biology to culture. He says, "I was a bit of an oddball in the archaeology department, writing all these wacky essays trying to apply evolutionary theory to things the faculty were surprised to see it applied to." He went on to Liverpool for a Ph.D. where he used a method called cladistics to study the evolutionary relationships of our fossil relatives. Subsequently at University College London, Collard started applying cladistics to cultural data sets to investigate anthropological and archaeological

**"Culture is part of our biology, and in fact it's the key reason we've been so successful as a species."**

questions such as the evolution of weaving patterns in Iranian tribal rugs over time. It all culminated with two consecutive £1M five-year grants from the UK's Arts and Humanities Research Council to form the Centre for Evolutionary Analysis of Cultural Behaviour. The Centre helped put the new evolutionary approach to culture on the map. "Suddenly a whole lot of faculty, postdocs and

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## Message from the Vice-President, Research Putting our Strategic Research Plan into action



Stuart Calcough, SFU

Dr. B. Mario Pinto  
V.-P., Research

The administrative offices in SFU's Strand Hall are buzzing with excitement over the start of our first academic year with new President Andrew Petter at the helm. Coincidentally, this is also the first full academic year that we'll be operating under the new five-year Strategic Research Plan (SRP), finalized this spring after a long university-wide consultation process. I recently had the pleasure of welcoming our newest faculty members to SFU, and I am looking forward to working together with all faculty, staff, and students as we implement the SRP and continue to reach for our ultimate goal of becoming the most research-intensive comprehensive university in Canada, competing effectively in defined areas with the top tier institutions in the country, and becoming internationally renowned for the excellence of our scholarship.

An essential factor in ensuring our success is the investment that SFU receives annually from the Indirect Costs of Research Program (IDC), introduced by the Government of Canada in 2003 to help offset the "hidden" costs of research funded by the Tri-Council (CIHR, NSERC, and SSHRC). These are the costs that cannot be easily attributed to a specific research project, but which the institution incurs in the support of research-related activities, from the light, heating, and maintenance of research space to the salaries for staff and students who facilitate research and commercialization. In the same way that actors would not be able to put on a successful play

without lights, sound, a theatre and stage, and stagehands, so too our researchers would not be able to optimize their time and talents without such "behind the scenes" support.

IDC grants in Canada are awarded annually and cover only about 25% of the direct costs of research incurred during that year. The amount of the grant is based on the funding received by researchers from the Tri-Council in the previous three years for which data is available. This translated into about \$6.4 million for SFU in FY 2009-10.

### SFU will be implementing a new model for the allocation of Indirect Costs of Research funds.

Beginning in FY 2011/2012, SFU will be implementing a new model for the internal allocation of the IDC funds that we receive annually from the Canadian government. In response to concerns that have been expressed to me by our faculty members and Deans, the annual IDC grant will be divided equally between the University and the initiating Faculty, as is already the case with overheads realized from research funded through contracts. The initiating Faculties must report to me each year on the use of these funds, so that I can in turn fulfill our reporting requirements to the IDC Secretariat. This includes an explanation of how the funds improved SFU's research capacity, why the funds helped researchers and research administration, what would have happened if these investments had not been made, and how the funds helped sustain the existing research infrastructure and how they generated improvements, efficiencies, and innovations thereof. ■

## Who's new

After many years in the Department of Molecular Biology and Biochemistry and Student Services, Ash Lalani joins the Office of Research Services as a continuing part-time Research Grants Coordinator. Originally from North Vancouver, Lalani spent three years teaching English in Japan after graduating from Trent University with a B.Sc. in Computer Science and Philosophy in 2002.

Lalani reviews grant applications for eligibility, adherence to university and granting agency policies, and need for compliance review. She authorizes the set up of research grant accounts by Research Accounting and coordinates the inter-institutional Tri-Council research grant transfer arrangements with co-investigators at other Canadian institutions. Lastly, she publicizes available funding opportunities.

Lalani is currently working on a Graduate Diploma in Business Administration at SFU and hopes to enter the Masters in Technology program in Fall 2011.

Ash Lalani, Research  
Grants Coordinator in  
the Office of Research  
Services

## Award winners

Congratulations to recent research award winners:

- Rekha Krishnan, Business - *Canadian Journal of Administration Sciences*' 2009 Verity Award for excellence in management research
- Daniel Leznoff, Chemistry, Canadian Society for Chemistry's 2010 Strem Chemicals Award for Pure or Applied Inorganic Chemistry

And to these successful SFU entrepreneurs:

- Bozena Kaminska, Engineering Science - BC Innovation Council's Entrepreneurship Fellow (\$25K) for her leadership in technology innovation and commercialization
- Crowdsource Networks Hiretheworld.com, founded by SFU alumni Arash Afrooze and Terry Beech won BCIC-New Ventures Competition 1st place prize (\$123K).
- Ben Brown-Bentley, Engineering Science, Founder of Adrenaline Productions won Surrey Board of Trade's 2010 Student Entrepreneur of the Year

# SFU Venture Connection expands

## Supporting student entrepreneurs

**D**iscovery Foundation, through its agent SFU, has helped provide an expansion of SFU's Venture Connection student business mentorship program with the addition of three Mentors-in-Residence.

Vancouver entrepreneurs Jack Gin, Stewart Marshall and Dave Thomas join founding mentor Jim Derbyshire to offer their entrepreneurial expertise to promising student entrepreneurs. Mentors-in-residence set milestones and monitor business start-up individuals and teams in Venture Connection's programs. They provide advice on market research, business planning, business models, sales and organizational development.

Gin, a business consultant and advisor, is the founder, president and CEO of Extreme CCTV Inc (1997 – 2008). A professional engineer, marketer and business writer, he received an Ernst & Young Entrepreneur of the Year award in 2007.

Marshall helps organizations tell their stories through numbers and has worked in businesses of all sizes. A certified management accountant (CMA), he is currently chair of the CMA Vancouver Chapter.

Thomas is a business consultant and advisor for several technology companies. He manages the *Rocket Builders Market Readiness Program* and is general manager of the Canadian Financial Forum. A skilled sailor, he's also a member of the coaching staff for Canada's Olympic sailing team.

SFU Venture Connection provides resources and opportunities to help young entrepreneurs succeed. More than 1,000 students have taken advantage of Venture Connection since its launch in the fall of 2008, with 20 student teams currently receiving additional support through the early-stage business incubator, SFU VentureLabs.

Dr. Bernie Bressler, Chairman of the Board of the Discovery Foundation, says, "Discovery Foundation is pleased to collaborate with industry through education programs

and to contribute to commercialization from the British Columbia technology sectors. Programs that reach students and entrepreneurs

will assist them in moving their inventions from the bench to the marketplace." Discovery Foundation was established by the provincial government in 1979, and was created to promote and support the province's high technology research and development industry. The Foundation's mandate is to utilize its assets for the benefit of the people of British Columbia, particularly BC's post-secondary institutions. SFU will receive a total of \$47,000 through the Foundation's Technology Education Program. ■



Greg Ehlers, TLC

## BCIC program support

BCIC develops entrepreneurial talent and commercializes technology through startup companies and partnerships between industry and academia. BCIC focuses on competitively positioning British Columbia in today's global knowledge economy in order to provide significant employment opportunities and a high standard of living for British Columbians. BCIC first supported SFU Venture Connection in 2008 when the program started. In 2010, BCIC made another investment in Venture Connection to help expand programs supporting SFU's science and technology students, such as Mentor Meet, an informal session where students with business ideas meet with a Mentor-in-Residence for initial advice and feedback. It will be offered in more locations. New awards were created for the Business Concept competition and the SFU Student Entrepreneur of the Year competition. "BCIC is proud to support this worthy program as part of our commitment to developing entrepreneurial talent in the province," said Dean Rockwell, who was CEO of BCIC at the time.

"By continuing to team up with BC's educational institutions to create programs that support our entrepreneurship ecosystem, we are well on our way

**"We are well on our way to rapidly developing early-stage companies that will help grow the provincial economy."**

to rapidly developing early-stage companies that will help grow the provincial economy," said Rockwell. BCIC has contributed a total of \$85,000 to SFU Venture Connection.

SFU is also able to leverage other BCIC initiatives, such as the annual CONNECT event which took place October 12, 2010, to benefit SFU startup companies. This event, attended by over 1100 people, provided exceptional opportunities for SFU entrepreneurs to meet potential partners and investors, to gain feedback on their business ideas from experienced industry leaders, learn valuable lessons in the case study and keynote sessions, and to showcase their technologies. ■

Jim Derbyshire (L) with Jack Gin, Dave Thomas and Stewart Marshall, SFU Venture Connection's new student business Mentors-in-Residence.



DISCOVERY FOUNDATION



Irene Barr (R) owner of Business Centre Solutions, understands that having an office and business address is an important step for any new business. That's why she partnered with SFU's Venture Connection to provide office space and amenities to one SFU student-run business per year over the next five years, an in-kind gift valued at \$200K. Business Centre Solutions' newest location in Lake City provides modern executive offices and customized business solutions. Venture Connection clients Ross St. George and Matias Marquez, cofounders of Buyatab.com are the first recipients of the award. SFU V.-P., Research Mario Pinto (L) is proud to welcome Business Centre Solutions as a neighbouring partner in supporting entrepreneurial talent for the economic development of our region.



SFU Executive MBA student Howie Wu (R) and Vancouver technical guru Trevor Orsztynowicz are on cloud nine after securing a San Francisco-based company's investment in their cloud computing technology.

## Layerboom acquired

Joyent, Inc. of San Francisco has purchased Layerboom Systems, a high-tech company started under the Venture Connection umbrella by SFU executive MBA student Howie Wu. It's the first protégé firm from SFU Venture Connection to score such a success. Wu founded the company in May 2009 with a vision to create a software company that powers private and public cloud computing, the practice of using a remote Internet hosting service to eliminate the need for companies or individuals to manage complex computing hardware and software in-house.

## VentureLabs in Burnaby

SFU's incubator program has supported 36 young entrepreneurs with 20 new ventures, using facilities located at SFU Surrey. In June, the program expanded the number of participants by offering space to selected teams at the Burnaby campus, in the Multi-Tenant Facility at 8900 Nelson Way (Discovery Parks). The three new ventures now receiving mentoring support are Crowdsouse Networks (Hiretheworld.com), Hexart, and Shift 7 Interactive. SFU VentureLabs is supported by grants from the federal and provincial government as well as Coast Capital Savings, Discovery Foundation and the Dobson Foundation.

Hiretheworld.com uses the power of crowdsourcing to help businesses connect with the world's best designers for their projects. Currently running in its beta stage, the site has already attracted significant interest, resulting in revenue for the young company.

Five graduates of the Masters in Digital Media program at the Great Northern Way Campus founded Hexart, a casual game developer for social networking websites. The company has developed an immersive virtual world for Facebook centred on real-life fashion trends. Players can chat, socialize, play games, and collaborate in competitions.

Shift-7 is developing interactive, evidence-based training simulation tools for staff in global health care facilities. The customizable modules use a 3D gaming engine that supports engagement. Dr. Debra Bakerjian is the founder and CEO of the company, bringing over 30 years of knowledge and experience dealing with the US health care system, focusing on long-term care. The team includes several graduates of the Masters of Digital Media Program, who worked on a prototype module while completing their degrees. ■

Layerboom was acquired by Joyent in June, having completed one of the fastest tech exits in Canadian history in just 14 months.

An active participant in the SFU Venture Connection program, Wu was convinced that cloud computing would offer great prospects. He teamed up with Vancouver technical guru Trevor Orsztynowicz to form the business and won entry into Boot Up Labs, a Vancouver seed accelerator.

Throughout Layerboom's growth, SFU Venture Connection has provided Wu with support and guidance via its first Mentor-in-Residence Jim Derbyshire. Wu also received advice and coaching from Danny Shapiro, Dean of SFU Business. "They've both been influential in helping guide the growth and positioning of Layerboom," says Wu. "Jim brought the practical experience of managing and selling high tech companies and was the key supporter of the strategy change that led to the venture's success. Danny brought a strategic view and sounding board that helped shape the venture." ■

# A new treatment for Alzheimer's?

## SFU spinoff Alectos makes deal with Merck & Co.

**D**avid Vocadlo believes that taking some risk is an important part of life. He loves rock climbing and is familiar with mountains throughout the United States and Canada. When not letting it all hang out high on the rocks above the earth, professor Vocadlo can be found in his chemistry lab at SFU or at his startup company, Alectos Therapeutics, enjoying the thrill of designing new drugs that may offer a lifeline for Alzheimer's patients.

In August 2010 one of the largest pharmaceutical companies in the world, Merck & Co. Inc., announced a research collaboration with the SFU startup that could reach a total of almost \$300M assuming the project is a complete success. Alectos may also receive royalty payments on sales of any products arising from the research. It's the biggest deal ever for an SFU spinoff company. But Alectos' CEO Ernest McEachern cautions, "It can take quite a while for a drug to get to market from such early stages." Another risk, but early indications are promising.

"Everyone knows someone who suffers from Alzheimer's, and the emotional impact is profound, not just for the patient, but for the caregivers. It's a serious societal concern," says Vocadlo, who first approached SFU's University Industry Liaison Office (UILO) for help in 2005, when he and his research team had discovered molecules that selectively block an important biological regulatory system for sugars found inside cells.

"At the time they had not pinpointed Alzheimer's, but we knew there could be a wide variety of possible applications including cardiovascular, diabetic, arthritic and neurological uses," says Ziba Afshar, the UILO Technology Manager who led the commercialization of the Alectos technology.

The UILO filed a total of three patents applications. "We had a patenting strategy that took into account the needs of big pharma, so when Merck came along they were happy," says Afshar. She had worked for 10 years in the pharmaceutical industry and brought her drug development experience to the table. UILO Associate Director Ian Hand adds, "New drug discovery and commercialization require years of dedication and creativity. Ziba and the Alectos team excelled in this regard and put Alectos on a promising trajectory."

Vocadlo had only arrived at SFU a year before, in 2004, coming from a post-doctoral fellowship at UC Berkeley with Carolyn Bertozzi, a MacArthur Genius Award laureate. "While I was there, Carolyn had started a company so I had some familiarity with that process," says Vocadlo. He was excited by the risk-taking culture in California and wanted to try it himself. "I came to appreciate that in business you have to assume risk in order to accomplish things that are significant," he says.

Vocadlo is a sugar chemist and enzymologist. "Special



sugar units decorate proteins throughout biological systems," he explains, giving as an example the sugars attached to proteins on the surface of red blood cells. These tiny sugar units interact with the immune system to define one's blood type as A, B, or O.

At the molecular scale a protein is a giant compared to a single sugar unit. Proteins are tangles of strands and spirals of connected molecular subunits tens of thousands of atoms in size. In comparison, sugar units are wee little things consisting of only 10 or 20 atoms, though they too can form bigger more complicated chains. For a long time it was thought that no sugars were associated with proteins in the cytosol, the liquid inside cells, but in the 1980s scientists made a breakthrough. "They discovered that one sugar unit does in fact decorate proteins there. But the form is relatively simple compared to the complex sugar structures on cell surfaces," says Vocadlo.

His team works with the enzymes that attach and remove this particular sugar. It's called O-linked N-acetylglucosamine (O-GlcNAc). Vocadlo's detailed mechanistic studies enabled them to synthesize small molecules that block the action of one of the enzymes. These inhibitors are so potent they work in minute concentrations below parts per billion. At first, Vocadlo worried that his drug candidate might cause diabetes because of the way it disrupted sugar chemistry within cells. But experiments in cells and animals showed that it did not increase insulin resistance. "It was a big surprise for us, and went against a number of observations in the scientific literature. In fact we had a fair amount of difficulty gaining acceptance of these findings, and it is only very recently that the papers have been published," says Vocadlo.

Once he realized that diabetes would not be an issue, Vocadlo turned his efforts to potential therapeutic applications. "Basic research is so important because it's the key for opening the door to understanding. Once you figure out how things work, then you have the potential to address real world problems," he says. Researchers in the USA had

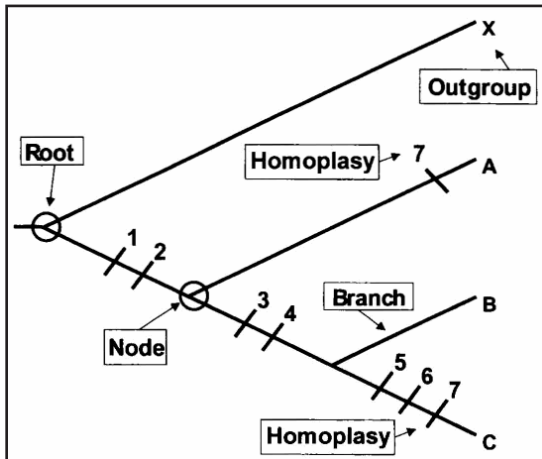
After a long effort building their spinoff company and negotiating the Merck collaboration, SFU Chemistry professor David Vocadlo and CEO of Alectos Ernest McEachern are smiling as they study new molecules.



Ziba Afshar, UILO Technology Manager, managed the intellectual property and commercialization strategy for the Alectos technology.

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## Evolution of culture continued from p. 1



Mark Collard uses trees of evolutionary relationships called cladograms to investigate cultural evolution.

evidence. “My main goal has been to take some of these theories and bring data to bear on them,” he says.

One of the main findings of Collard’s work concerns the importance of vertical transmission in cultural evolution. Vertical transmission refers to the transfer of information from a parent to their child, or from an ancestral population to a descendant population. Since the early part of the 20th century, anthropologists have assumed that vertical transmission is a much less important factor in cultural evolution than horizontal transmission—the transfer of information among peers or contemporaneous populations. However, Collard has demonstrated that the empirical evidence does not support this assumption. His work suggests that vertical transmission often plays an important role in cultural evolution.

Ph.D. students were producing papers in which evolutionary methods were applied to cultural datasets, giving talks at conferences, and so on,” says Collard. They changed the field from almost entirely theoretical to one that has a strong empirical component.

Collard got interested in this approach due to a frustration with the hand-waving that characterized work on cultural evolution at the time. There were plenty of theories but little empirical

Other members of the SFU Centre for Evolutionary Analysis of Cultural Behaviour have discovered that population size plays an important role in cultural evolution. Borrowing from population genetics, they have found a relation between innovation in a culture and population size. It turns out that larger populations are better at maintaining advantageous innovations and cultural information. “When populations shrink there are fewer experts, and as they die, the pool of knowledge and innovations shrinks too, so demographics is a powerful force in cultural evolution,” Collard says. And it’s not linear. Going from 100 to 1000 individuals actually results in more than ten times the innovation. It’s an exponential effect.

The approach that Collard and his colleagues have developed is not without its critics. According to Collard, investigators in the arts and social sciences gravitate toward either a scientific or a humanistic approach in their work. That split is most salient in anthropology where scientists and humanists are often found in same department. “They tend to fight like cats and dogs about how you pursue research and how you evaluate research,” says Collard. “A typical outcome is the total rejection of evolutionary thinking when it comes to human behavior, which is ironic given that anthropology began as the natural history of humankind.” One of Collard’s goals is to put anthropology back together again. “Hopefully, one day we’ll stop treating the cultural and biological aspects of human life differently, and be able to analyze them within a single theoretical framework,” he says. ■

## RESEARCH MATTERS

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## Alzheimer’s continued from p. 5

found lower O-GlcNAc levels in the post-mortem brains of Alzheimer’s sufferers. Such brains also contain neurofibrillary tangles (NFTs) that appear to have no O-GlcNAc. The more NFTs, the worse the severity of the disease. Perhaps molecules like Vocadlo’s blocking agent could slow the formation of NFTs by increasing O-GlcNAc, and so delay or halt the progress of Alzheimer’s disease.

But again, Vocadlo was taking a chance. Drug discovery is a risky enterprise. Other potential Alzheimer’s therapeutics targeting pathological plaques in afflicted brains have failed to benefit patients. It remains to be seen if Alectos and Merck will succeed where others have failed. One huge problem is that nobody knows for sure what causes Alzheimer’s. But this does not deter Vocadlo and his team. “In order to strike gold you can’t be digging in a sandbox, you need to explore new areas,” he says. He loves searching in places where few others go.

In some ways it’s a lot like rock climbing. Climbing a new route requires good judgment, finding the right path,

persistence, taking calculated risks, and a good partner. Unlike rock climbing though, Vocadlo points out that

## Alectos Timeline

- 2004 Vocadlo arrives at SFU, starts research
- 2006 Discovers diabetes is not a risk, which inspires formation of company with McEachern to be CEO
- 2007 Alectos Therapeutics spinoff founded by Vocadlo and McEachern
- 2007-08 Funding from private sources & grants
- 2009 Confidential Merck collaboration starts
- 2010 Merck deal announced

drug discovery requires a dedicated and driven team of people. For Vocadlo, that has been part of the fun, collaborating with talented students, postdoctoral fellows, and researchers at SFU, Alectos, and now Merck. “SFU also played a critical role by providing a fertile research environment and also through the services of the UILO,” says Vocadlo. The UILO provided the following services: assessing the potential for commercialization; protecting intellectual property such as patents and other formal legal agreements; helping to recruit Ernest McEachern as CEO; creating the spinoff company; researching comparable licensing transactions; and advising on deal structure, negotiations and contractual agreements.

Vocadlo is Chief Scientific Officer and Chair of the Scientific Advisory Board of Alectos. He is currently on sabbatical at the Institute for Human Genetics in Montpellier, France studying epigenetics. He’s probably hanging off a few rock faces there as well. ■