ISSUE 02/2011

SYNERGY

JOURNAL OF UBC SCIENCE

QUANTUM LEAPS FROM COMBUSTION

UBC researchers in alternative energy are working to reduce dependence on fossil fuels and combustion technology with cleaner, smarter nano-scale innovations. **06**

a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

A SUSTAINED AND LIVED FOCUS ON

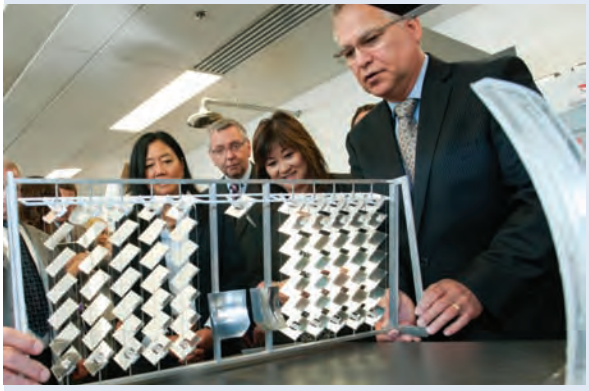
At UBC we're justifiably proud of the reputation we've earned in sustainability and in alternative energy research and technology development. Increasingly, we are using our campus as a town-scale living laboratory where we put our sustainability research and ideas into practice across building design and renewal, education and student life, and operations.

As examples of those commitments, two recently renovated wings of UBC's Biological Sciences complex now meet Leadership in Energy and Environmental Design Gold standards. The south wing provides a test bed for the novel Core Sunlighting System, invented by researchers led by Lorne Whitehead at UBC's Structured Surface Physics Laboratory (see below). Across Main Mall, heat emitted by fume hoods in UBC's Earth and Ocean Sciences main building is now being harvested by the adjacent

NEWS

Renewed Biological Sciences Wings Offer a New Window on Sustainability

Major retrofit of UBC's 50-year-old Biological Sciences complex saves $42 million in deferred maintenance costs and brings two wings to LEED Gold certification.



(L to R) BC Advanced Education Minister Naomi Yamamoto, UBC President Stephen Toope, Vancouver South MP Wai Young and federal Minister of State (Science and Technology) Gary Goodyear with a scale model of the Core Sunlighting System at UBC's newly renovated Biological Sciences complex. Photo: Martin Dee.

Botany and zoology students returning to class in UBC's newly refurbished Biological Sciences building this September were greeted by more than updated learning spaces and labs.

The west and south wings of the complex—entirely retrofitted over the past 18 months through a federal and provincial investment of $62 million—also incorporate new sustainability features that should cut the building's energy footprint by a third.

Three labs in the Biological Sciences south wing are serving as a test bed for the UBC-invented Core Sunlighting System. The elaborate system of computer-guided mirrors, prominently mounted above windows across the south side of the wing, track, collect and guide natural sunlight into the spaces, cutting down on the power needed for artificial light.

The system was invented at UBC's Structured Surface Physics Lab under the leadership of physicist and NSERC/3M chair Lorne Whitehead.

"It's wonderful to not only upgrade 50-year-old buildings used by thousands of students and hundreds of researchers, but also to incorporate made-at-UBC technology from our own Faculty to help cut the campus's environmental footprint," says dean of UBC Science Simon Peacock.

Less visible are important upgrades to the building's heating and air conditioning—including heat recovery systems for improved energy utilization. A new water management system provides irrigation for landscaped areas and is integrated into UBC's storm water flood control system to combat erosion. The changes are expected to save $200,000 a year in energy costs over a comparable reference building, and have brought the two wings to LEED Gold standards.

The Biological Sciences project is part of phase two of UBC Renew, a partnership between UBC and

ALTERNATIVE ENERGY SOLUTIONS

Centre for Interactive Research on Sustainability building—just opened this fall—and is reducing natural gas consumption in both buildings.

Our focus on sustainability extends to the classroom, with UBC Science launching a new initiative this January—a first-year Sustainability Science course (see page 15). The course will use sustainability issues as a means of integrating knowledge obtained in traditional first-year science classes. For example, a chemistry lab on acid–base combinations will be integrated with biology lectures on marine life to facilitate a small-class discussion on the impact of ocean acidification.

This issue of Synergy focuses on new and alternative energy research, highlighting work across the departments of Chemistry, Botany and Physics and Astronomy (see page 6). UBC Science researchers are looking at areas on the supply side of the energy ecosystem—new fuel cell catalysts, new photovoltaic materials and new options for biofuel sources and refining. This work not only provides a powerful base supporting UBC's core values in sustainability, but has a regional context as well, helping to cement Vancouver's and British Columbia's already strong reputation as a hub for clean energy innovation.

Sri Peacock

the BC government that has already seen seven buildings completely refurbished—including the UBC Chemistry Building. The two levels of government are contributing equally to the project—the federal infusion is part of the Knowledge Infrastructure Program.

BOTANY

Key Mechanism Calling the Shots on Plant Growth

Botany professor and Canada Research Chair in Plant Cell Biology Geoffrey Wasteneys has discovered a key mechanism that—much like a construction site foreperson—controls the direction of plant growth as well as the physical properties of the biopolymers that plants produce. The finding is a major clue in a 50-year-long quest to explain how plants coordinate the behaviour of millions of cells as they grow upward to compete for light, penetrate soil to obtain nutrients and water, and even open petals to flower.

"We've known for decades that structures in plants called microtubules act as scaffolding to define the direction of cell expansion," says Wasteneys, "but we haven't been able to determine how these tiny microtubules are organized into scaffolds in the first place."

An interdisciplinary team of plant cell biologists and mathematicians led by Wasteneys discovered that the inherent geometry of the cell itself plays an important role in the self-organization of microtubules into parallel arrays that guide cell growth and division. They also identified that a protein called CLASP plays the key role of 'foreperson,' modulating the geometric constraints of the cell.

ANALYTICAL TOOLS AND HEALTH

'Lab-on-a-Chip' a Powerful New Diagnostic Tool

A silicone chip developed by UBC researchers could make genetic analysis far more sensitive, rapid and cost-effective by allowing individual cells to fall into place, like balls in a pinball machine.

The UBC device allows scientists to simultaneously analyze 300 cells individually by routing fluid-carrying cells through microscopic tubes and valves. Once isolated in their separate chambers, the cells' RNA can be extracted and replicated for further analysis.

By enabling such "single-cell analysis," the device could accelerate genetic research and hasten the use of far more detailed tests for diagnosing cancer.

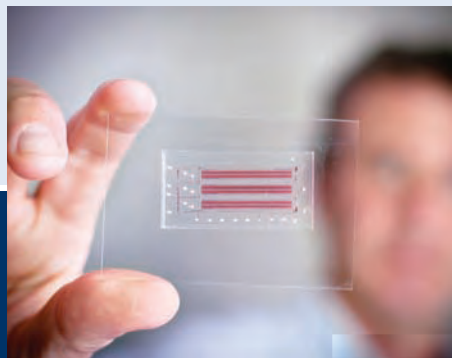
Single-cell analysis is emerging as the gold standard of genetic research because tissue samples, even those taken from a single tumour, contain a mixture of normal cells and various types of cancer cells—the most important of which may be present in only very small numbers and impossible to distinguish.

"It's like trying to understand what makes a strawberry different from a raspberry by studying a blended fruit smoothie," says Carl Hansen, who led the team that developed the device. Hansen is an assistant professor in the Department of Physics and Astronomy and the Centre for High-Throughput Biology.

Too Many Blood Vessels May Be a Culprit in Alzheimer's Disease

A team led by Wilfred Jefferies, a professor in UBC's Michael Smith Laboratories, may have uncovered a new explanation for how Alzheimer's disease destroys the brain—a profusion of blood vessels.

While the death of cells, whether they are in the walls of blood vessels or in brain tissue, has been a major focus of Alzheimer's disease research, Jefferies' team has shown that the neurodegenerative disease might in



Microfluidic 'lab-on-a-chip' could accelerate genetic research and hasten the use of far more detailed tests for diagnosing cancer. Photo: Martin Dee.

Photo: The MacArthur Foundation.

Biologist Wins MacArthur 'Genius' Grant

Sarah (Sally) Otto, a zoology professor and director of the Biodiversity Research Centre at UBC, is one of 22 people picked for this year's round of "genius" grants from the John D. and Catherine T. MacArthur Foundation.

Otto, a theoretical biologist, has focused on fundamental questions of population genetics and evolution, such as why some species reproduce sexually while others reproduce asexually, and why some species carry more than one copy of each gene. She has helped to make mathematical modelling a more accessible tool for fellow biologists, having co-authored a textbook on the power and rigour of quantitative analysis in biology.

"As an evolutionary biologist at UBC, where I'm surrounded by so many creative people, I've been able to go places intellectually that I otherwise might not have explored," Otto says.

MacArthur Fellows, as recipients of the grants are formally known, receive $500,000 payable over five years, no strings attached. Candidates are selected for their "exceptional creativity, promise for important future advances based on a track record of significant accomplishment, and potential for the fellowship to facilitate subsequent creative work."

"This is a wonderful recognition of Sally's scientific brilliance and creativity," says Simon Peacock, dean of the Faculty of Science. "Her insights into evolutionary processes have already made a huge impact on science, and she is a key reason that UBC ranks among the world's leaders in evolutionary biology and biodiversity. This award ensures that she will make even greater scientific contributions in the years to come."

fact be caused by the propagation of cells in blood vessel walls.

Examining brain tissue from mouse models of Alzheimer's disease, Jefferies' team found nearly double the density of capillaries compared to normal mice. They also found a similarly higher density of capillaries in brain samples of people who had died of the disease, compared to samples from people who didn't have it.

"When the blood vessels grow, the cells of the vessel walls propagate by dividing," Jefferies says. "In the process of splitting into two new cells, they become temporarily rounded in shape, and that undermines the integrity of the blood–brain barrier, potentially allowing harmful elements from outside the brain to seep in."

BIODIVERSITY

Tropics are 'Less Unique Than We Thought'

The temperate forests of Canada may have much more in common with the tropical rainforests of South America than commonly believed, according to a research group led by UBC ecologist Nathan J. B. Kraft.

The assertion is focused on the concept of "beta-diversity," a measure of the change in species composition between two sites, such as neighboring patches of forest. Beta-diversity usually increases as you move from the poles towards the equator, often leading ecologists to conclude that there is something inherently different about the ecology of the tropics.

But a group led by Kraft challenged this interpretation, using an extensive data set of tree inventories from around the world. Using computer modelling, the researchers demonstrated that current patterns of beta-diversity in the tropics and the temperate zone are much more similar than ecologists once thought.

"It was believed that something 'extra' must be going on in the ecology of the tropics to produce greater beta-diversity there," says Kraft. "We now see that all the patterns can be explained, not by current ecological processes unfolding over one or two generations, but by much longer-term historical and geologic events."

CLIMATE CHANGE

Gourmet Sea Snail Endangered by Increasing Ocean Acidity

Increasing levels of ocean acidity could spell doom for British Columbia's already beleaguered northern abalone, according to the first study to provide direct experimental evidence that changing sea water chemistry is negatively affecting an endangered species.

The northern abalone—prized as a gourmet delicacy—has a range that extends along the North American west coast from Baja California to Alaska. Even though British Columbia's northern abalone commercial fisheries were closed in 1990 to protect dwindling populations, the species has continued to struggle, largely due to poaching.

To better understand the impact climate change—specifically, increasing ocean acidity—has on this endangered species, UBC researchers exposed northern abalone larvae to water containing increased levels of CO_2. Increases from 400 to 1,800 parts per million killed 40 percent of larvae, decreased the size of larvae that did survive, and increased the rate of shell abnormalities.

"This is quite bad news, not only in terms of the endangered populations of abalone in the wild, but also the impact it might have on the prospects for aquaculture and coastal economics," says Christopher Harley, associate professor with the Department of Zoology and one of the authors of the study.

ZOOLOGY

Extinctions at the Top of the Food Chain Have Surprising Cascade Effects on Ecosystems

The loss of large predator animals across the globe is having unanticipated impacts on processes as diverse as human disease dynamics, wildfires and biogeochemical cycles, according to new research by an international team of scientists that includes UBC zoologists.

"Most ecosystems in the world require predators because they control the next level down—the plant eaters," says Tony Sinclair, a professor with the UBC Department of Zoology and a co-author of the team's study.

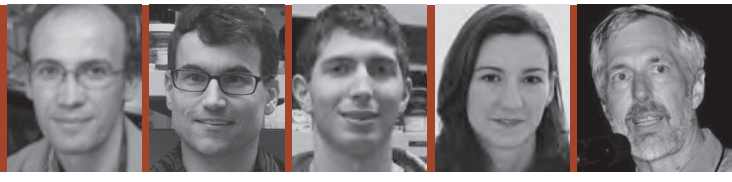
"If you take away the predators, then things start to go wrong. Too many plant eaters remove the plants, having all sorts of anticipated and unanticipated impacts. The problem is that humans are systematically removing the predators. In the ocean, they are the big fish; on land, they are the large predators like lions and leopards."

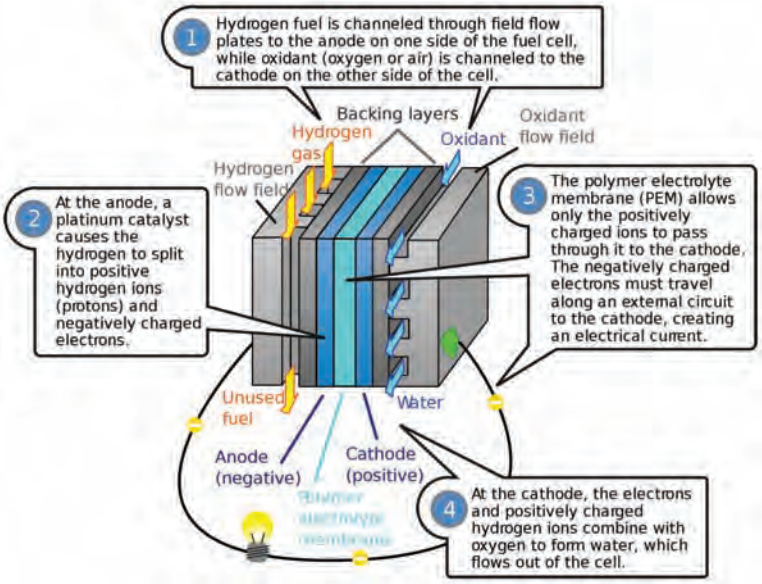
The study compiles recent research revealing the extensive cascading effects of the disappearance of large predators in marine, terrestrial and freshwater ecosystems worldwide.

This Ecuadorean lowland forest may have more in common with Canada's temperate forests than commonly believed. Photo: Nathan J. B. Kraft.

QUANTUM LEAPS FROM COMBUSTION

Developing viable alternative energy sources requires political will, team effort and completely new ways of understanding energy. UBC researchers in electrochemistry, bioenergy and photovoltaics are working to shift our reliance away from fossil fuels—one nucleotide and nano-particle at a time.





Anatomy of a Fuel Cell
Image: US Department of Energy (www.fueleconomy.gov/feg/fcv_pem.shtml).

There is no magic bullet to replace fossil fuels. Combustion technology—developed centuries ago and commercialized with oil drilling in the mid-1800s—is deeply entrenched in electrical, industrial and transportation infrastructures. Not only will we require a host of new energy sources to replace fossil fuels, but also the infrastructure to deliver them. For UBC researchers in alternative energy, the quantum leap from combustion means working at the nano-scale—from shifting d-orbitals in quantum electronics to a single nucleotide in a DNA sequence.

Improving Fuel Cells at the Nano-scale

Fuel cells, which combine hydrogen and oxygen electrochemically to produce electricity, are one alternative to the macro-technology of combustion. While silent and clean—water and heat are the only by-products—the technology is still expensive and highly complex, with some inefficiencies. Fuel cell technology requires an understanding of quantum effects at the subatomic level, where electrons oscillate between energy levels in increasingly complex interlacing three-dimensional orbitals.

Of the several types of fuel cells on the market or under development, among the most promising are polymer electrolyte membrane—also called proton exchange membrane—fuel cells (PEMFCs). Currently, dispersed platinum (Pt) nano-particles are used as a catalyst for both the oxidation of hydrogen and the oxygen reduction reaction (ORR) that provides electricity (see diagram).

"Over time, these Pt nano-particles can dissolve or detach from the membrane, decreasing reactivity, which decreases the fuel cell lifetime," explains UBC chemistry associate professor Dan Bizzotto. "To decrease the amount of platinum you alloy it with another metal that is typically less noble than platinum. This creates another problem—the added metal can dissolve and catalyze the degradation of the membrane, also decreasing fuel cell lifetime."

Platinum is extremely expensive, accounting for 30 percent of the cost of fuel cells. The noble metal is also scarce.

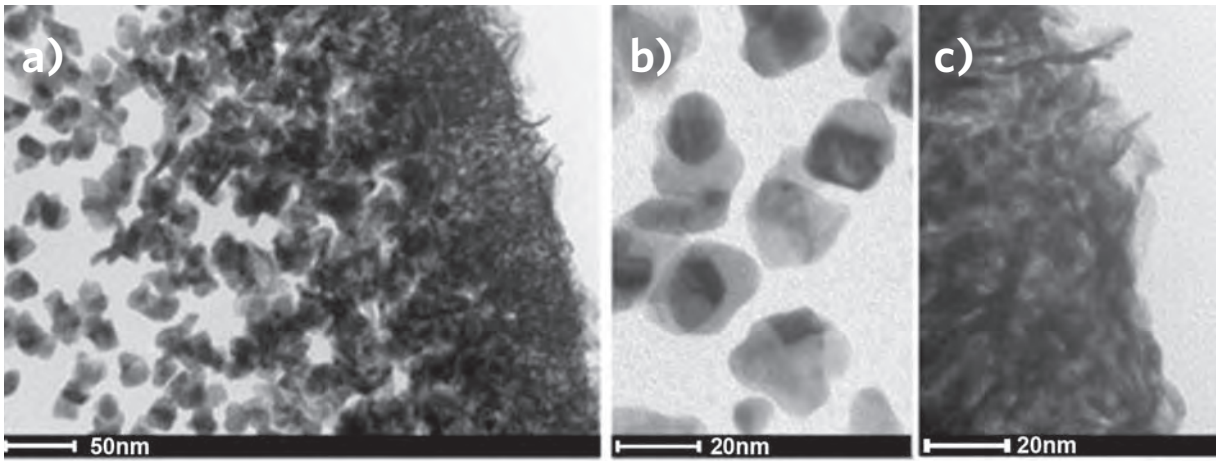
"When this becomes a large commercial area, we also need to know that there will be enough platinum in the world to supply all of the requirements," says research colleague David Wilkinson, director of UBC's Clean Energy Research Centre (CERC). Wilkinson, Bizzotto and CERC colleagues are working to increase fuel cell stability, improve efficiency and decrease costs.

Bizzotto's work on fuel cells began with a chance finding—and with funding from Western Economic Diversification. In unrelated research, former graduate student Ed Guerra, now a professor at Laurentian in Sudbury, rediscovered that platinum and zinc (Zn) formed a very stable alloy for ORR electrocatalysis. (Originally discovered by Despic in 1982, the PtZn alloy was not widely known.) Usually, Pt-alloy research uses metals that are on the left-hand side of Pt in the periodic table, while Zn is on the right-hand side (see Synergy 1|2008). "In thermodynamic terms, if you put Zn on Pt it will spontaneously combine to form PtZn," says Bizzotto. The serendipitous discovery has led to ongoing research into why Pt alloys so well with a metal from the 'wrong side of the tracks,' and how this basic knowledge can be applied to improving fuel cells.

Scratching the Surface of PtZn

Bizzotto and colleagues used electrochemical deposition to create PtZn nano-particles, then atomic force microscopy (AFM) to measure the strength of particle adhesion to glassy carbon. The alloy was put into fuel-cell-like acid conditions, and electric potentials were applied over certain periods of time. By doing scratch tests on the nano-particles,

Dan Bizzotto, Associate Professor, Chemistry • Mark MacLachlan, Professor, Chemistry • Kevin Shopsowitz, PhD student, Chemistry • Sarah Burke, Canada Research Chair in Nanoscience and Assistant Professor, Physics and Astronomy, and Chemistry • Carl Douglas, Professor, Botany.



Imaging the nano-structures of Nafion fuelcell membranes: A variety of Pt nano-structures deposited in Nafion and observed in a series of high-resolution TEM images of (a) the region near the surface of the Nafion membrane, (b) the non-regular polyhedral particles observed further into the bulk of the Nafion membrane, (c) Pt nanowires at the surface of the Nafion membrane. Image credit: Nik Ingle.

they found that at higher potentials more PtZn than Pt particles were left on the carbon surface. "This is important, Bizzotto explains, "because Pt is such a good catalyst that it will actually chew up the carbon it is deposited on, and you lose electrical connectivity."

They also showed that Pt nano-particles are smooth, while PtZn nano-particles are rough. "This roughness increases the surface area, which in turn increases the rate of reaction because there are more places where oxygen can be reduced," notes CERC colleague and chemical engineering professor Elod Gyenge.

One of the biggest challenges is determining the atomic structure of the alloy, which comes back to quantum mechanics and electron orbitals. PtZn is an interesting alloy because zinc is d-electron rich and usually Pt is alloyed with d-electron-poor metals from the left-hand side of the periodic table.

"Once you get into higher orbitals, where collections of atoms and bands of electron energies are interacting, the problem is not straightforward at all," says Bizzotto. "Structure is really the key. If we can figure out how the Pt and Zn atoms are spatially located, then we can better understand their chemical interactions."

Boosting Fuel Cells With Pt on Nafion

Nafion is a synthetic polymer developed in the 1960s by DuPont. Today, the Teflon relative has made a comeback in fuel cell research due to its dual hydrophilic and hydrophobic properties and its active charge separation. Because Nafion allows positively charged ions to pass through a membrane while restricting negatively charged particles, it shows great potential as a proton conductor in fuel cell membrane electrode assemblies (MEAs).

"Nafion's hydrophilic capacity is very important as well," says Gyenge. "The more hydrated the Nafion, the more mobile the protons are." In an extension of their Pt research, Wilkinson, Gyenge and Bizzotto used electroless deposition—where electrons are provided by another chemical rather than an electrode—to "paint" an extremely thin Pt catalyst layer on the surface of the Nafion membrane. Using Nafion's interlinked hydrophilic pathway, they were able to generate a network of electrically connected nano-particles constrained to a shallow band near the surface. The group were the first to deposit a nano-layer of Pt onto a Nafion membrane with such precision—using the hydrophilic property as the primary control parameter.

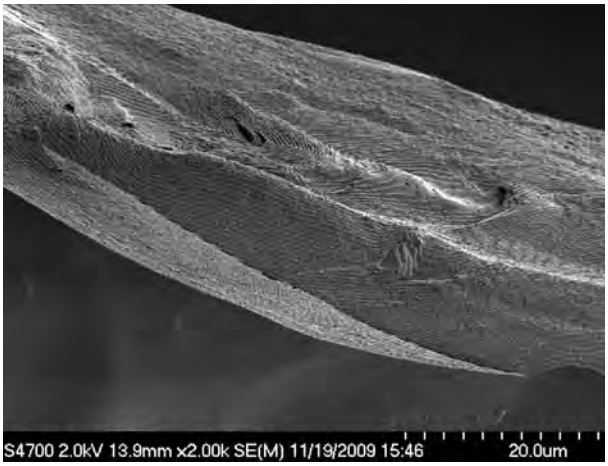
"Being able to control nano-structures on the surface of Nafion could increase performance and durability," says Wilkinson. It can also decrease the amount of Pt needed, thereby reducing costs.

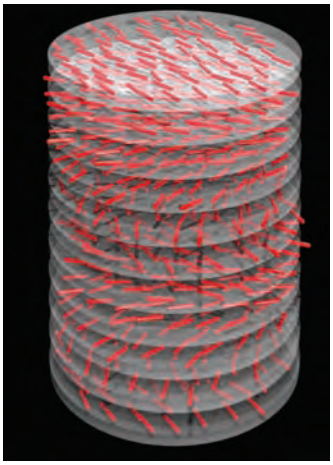
"A hot issue in the electro-catalysis field is the relationship between catalytic activity and particle shape and surface morphology," notes Gyenge. "There has been a lot of competition to find the best alloys, but now there are research groups synthesizing nano-particles of different shapes to improve activity."

Bizzotto notes that PtZn particles are approximately 50 nanometres in size—larger by a factor of five than the nano-textured Pt particles on Nafion. "In 2009, we needed to look at larger particles in order to see them and do something with them," he says, underscoring the challenges researchers have in keeping up with the latest technology, and the need for scientists, engineers and industry to work in tandem.

Serendipity in a Handshake—Sand + Cellulose = New Smart Material

In the search for a hydrogen storage solution, another fuel cell conundrum, UBC chemistry professor Mark MacLachlan, PhD student Kevin Shopsowitz and



Left: A scanning electron micrograph of a thin film of the glass shows the fine structure that makes the films iridescent.
Centre: A photograph of three different porous glass films on a dark surface, with a dime added for size. Photo credits: Kevin Shopsowitz.
Right: Graphical representation of the chiral organization of nano-crystalline cellulose (NCC). Graphic credit: Mark MacLachlan.

post-doc Hao Qi stumbled upon the amazing chiral properties of nano-crystalline cellulose (NCC). Chiral molecules exhibit right-handed or left-handed orientations and are non-superimposable mirror images. This "handedness" can dramatically change molecular properties. The rod-shaped crystals of NCC self-assemble into a structure where the rods are all oriented in the same direction and spiral up into a left-handed three-dimensional helical "staircase" (see diagram above).

"Chemists are pretty good at introducing chirality in single molecules, which is a huge area of research for developing new drugs and industrial products," says MacLachlan. "In NCC, chirality extends over hundreds of nanometres, whereas a single molecule is around a nanometre in diameter."

With support from FPInnovations, who developed NCC from acid treatment of pulp, MacLachlan's team was investigating the use of the material to make highly porous glass for hydrogen storage. The walls of the porous glass would help to pack the hydrogen molecules more densely. "The idea was to make silica films with NCC fibres randomly situated inside, and then to burn away the cellulose leaving a porous glass," he says.

Surprisingly, they found that burning away the NCC left holes inside the glass with the same helical structure as the template. Although the material proved too heavy for hydrogen storage, it is the first material to combine mesoporosity with long-range chiral ordering—and unique photonic properties. The helical structure selectively reflects wavelengths of light, ranging from infrared to ultraviolet. And tuning the material is as simple as changing the ratio of silica to NCC.

"It is unbelievably easy to do. Our apparatus for making the material is a Petri dish on a bench top," says MacLachlan. "In a day we can easily make a series of samples in the lab that reflect all different colours of light." His group's findings were published in Nature (Vol. 468, Nov. 2010).

From an alternative energy standpoint, the films can be used in window coatings to reflect infrared light that leads to heating, thereby reducing air-conditioning costs. Another smart glass application is a thin film coating to replace window blinds. When the pores are empty the material reflects light, and when they are filled it becomes completely transparent.

MacLachlan notes that several architects have expressed interest in the aesthetic and energy-saving properties of these films. The colour of the material is also angle-dependent, like that of a beetle shell. "Imagine walking past a glass building that changes colour as you passed by, or cars coated with thin films that change colour when it rains."

Other potential applications include light-based sensors and non-chemical chromatography for separating chiral molecules.

Not only is the material simple to make, the components—silica and cellulose from pulp and paper by-products—are cheap and abundant. MacLachlan's team has already filed three patents with FPInnovations and has received interest from other industry partners, underscoring how innovation occurs when basic and applied research shake hands.

Shedding Light on Organic Thin-Film Electronics

Charges in many organic carbon-based nano-materials act like longing lovers not wanting to part. An excited electron is still attracted to the positive hole it left behind. "You always need a bit of energy to rip these charges apart, and this all happens at the atomic-scale interface," explains Sarah Burke, newly appointed Canada Research Chair in Nanoscience, and assistant professor jointly appointed in the departments of Physics and Astronomy and of Chemistry. She

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Research cited in this article is funded in part by the Natural Sciences and Engineering Research Council of Canada, Genome Canada, Genome BC, the Canada Foundation for Innovation, Western Economic Diversification and FPInnovations.

is investigating optoelectronics at the nano-scale, including organic photovoltaics—solar cells that use conductive organic polymers for light absorption and charge transport.

The potential to create very lightweight, cheaply manufactured solar cells from abundant organic material is one motivation behind Burke's research. Major infrastructure funding from the Canada Foundation for Innovation is providing the tools for her lab—scanning tunnelling microscopy (STM) and atomic force microscopy (ATM) in ultra-high vacuum and at low temperatures.

"At this scale, everything must be very clean and well controlled so that we know what we have on our surfaces. Then we use STM or AFM to probe single molecules and move them closer to other molecules in order to investigate their electrostatic or chemical characteristics," explains Burke, whose research on scanning probe microscopy has already been cited over 300 times.

"I think the combination of people at UBC who can make novel materials and devices, and who can characterize on a fundamental level what is happening is very powerful," she says. Light may progress in a vacuum, but research discoveries do not.

Clean Energy Research Centre a Catalyst to Change

UBC's Clean Energy Research Centre (CERC) is dedicated to developing knowledge and solutions that reduce the environmental impact of energy use and provide sustainable energy alternatives. The CERC includes members from the faculties of Applied Science, Science, Forestry, the School of Architecture and other areas active in energy research from both UBC Vancouver and UBC Okanagan. CERC provides state-of-the-art research facilities in a recently completed building, as well as other facilities across both campuses. Currently, over 60 faculty members and 200 graduate students are participating in CERC activities.

"With faculty from several disciplines, including sociologists and policy makers who are studying why people don't turn off their lights to save energy, or why new technologies are difficult to implement, CERC really helps us look at the big picture," says David Wilkinson, CERC director.

From Forest to Fuel Pump—Poplar as Second-Generation Biofuel

Biofuels are another important alternative energy source—in part because they do not require a complete change in infrastructure to implement in the marketplace. The Canadian government's mandate of five percent renewable fuel content in gasoline currently requires almost 2 billion litres of biofuel annually for small vehicles alone, and an overall estimated biomass of 6.25 million dry tons per year.

Today, most ethanol in gasoline is produced with starch from food crops such as wheat and corn. The consequent "food versus fuel" debate has triggered a research surge in second-generation biofuels produced from waste materials and non-food crops. "It takes a lot of biomass to make ethanol. Every geographical area will have a biomass crop that is best suited to the landscape," says UBC botany professor Carl Douglas, who is studying the black cottonwood, or poplar, as biomass for producing ethanol.

Widely distributed across Canada, Populus trichocarpa and the closely related species P. balsamifera grow readily on marginal land and have abundant lignin and cellulose in their wood. (Ethanol in biofuels is refined from sugars such as cellulose.) A major obstacle in using poplar wood for biomass is separating the cellulose from the lignin—the complex polymer that gives wood its rigidity.

"There is a wide variation in wood chemistry traits in poplar, particularly in relative amounts of lignin and cellulose, so we are working to identify the genetic nature of those variations to develop wood that is easier to break down," says Douglas. In a Genome Canada-funded project in 2006, Douglas was part of a team that determined the complete deoxyribonucleic acid (DNA) sequence of the poplar genome, the first tree genome sequence to be established.

Genomic Markers Select Trees for Biofuel

In 2008, with funding from Genome BC, Douglas and UBC collaborators from the Department of Botany and Faculty of Forestry began a study of the genetic variation in 500 individual poplar trees from wild populations across BC and the northwest US. These trees were collected over 10 years ago by the BC Ministry of Forests and Range to aid in poplar breeding. The project, led by Douglas, established a replicated trial of this collection at UBC's Totem Field research site.

Using advanced sequencing tools at Vancouver's Michael Smith Genome Sciences Centre, Douglas and collaborators have been working to identify the nucleotide variation in the DNA of the 500 trees grown at Totem Field.

Simply stated, DNA is a string of four nucleotides (A, T, G or C) that are found in all organisms. In genes, the sequence of the string of nucleotides contains a code that specifies the kind and abundance of proteins produced, which determines how organisms grow and develop. However, the string is not identical from one individual of a species to the next. Much of the difference is caused by

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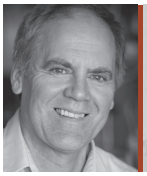



David Wilkinson, Professor, Chemical and Biological Engineering and Director of UBC's Clean Energy Research Centre • Elod Gyenge, Professor, Chemical Engineering, CERC associate.

Photo: iStockphoto

Could a New Type of Honour Code Bring Balance to Fisheries?

Corrective actions with negative reputational impacts—like publicly outing tax dodgers or identifying Stanley Cup rioters via online social networks—are increasingly being used to affect policy and social change. But new work by UBC scientists indicates that honour or praise might be just as effective in spurring co-operation.

Could the rewards of positive reinforcement extend beyond good parenting? According to new work by mathematicians and fisheries experts at UBC, and colleagues at Germany's Max Planck Institute for Evolutionary Biology, honour and shame work equally well in encouraging social co-operation.

The research—published in Biology Letters this July and based on experiments with 180 first-year UBC students—shows that the threat of shame and promise of honour each increased co-operation by as much as 50 percent. The work could provide insights into strategies for tackling global issues such as overfishing and climate change.

"Shame and honour might evoke images of The Scarlet Letter or The Three Musketeers, but as tactics to drive social co-operation, they are increasingly important in the digital age of YouTube, Facebook and Twitter, where acts of shame and honour are being shared and propagated with unprecedented speed," says lead author Jennifer Jacquet, a post-doctoral researcher with UBC Mathematics and the Fisheries Centre.

"The study confirms that a shame tactic can be effective, but rather surprisingly, we've also found that honour could have an equally strong effect on encouraging people to co-operate for the common good," says co-author Christoph Hauert, an associate professor with UBC Mathematics. Hauert is an expert in game theory, and his research interests include the study of evolutionary dynamics in structured populations, co-operation, reward and punishment.

Jacquet says shame and honour are increasingly used to affect policy and cultural change. For example, to deter tax evasion, many United States jurisdictions recently implemented policies to post names of tax delinquents online. Large-scale conservation programs use honour to encourage corporate and public involvement, such as labels that signal to consumers that products are sustainable, including Vancouver's Ocean Wise seafood program.

The new study is part of a series to establish a scientific foundation for future strategies to encourage co-operation on global issues. It builds on previous experiments showing that co-operation can also be achieved if participants can establish and maintain a good reputation, says co-author Manfred Milinski, an evolutionary biologist from the Max Planck Institute.

"In contrast to previous studies, the real-life reputation of our participants was at stake," says co-author Arne Traulsen, also from the Max Planck Institute. "This could be a prerequisite for shame and honour to work in other contexts."

How the Shame Game Was Played

In groups of six, the student participants were each given $12. Over 12 rounds of the game, participants were asked to decide privately whether to contribute $1 to a public pool—the total of which would be doubled and equally distributed among all players regardless of whether they contributed or not.

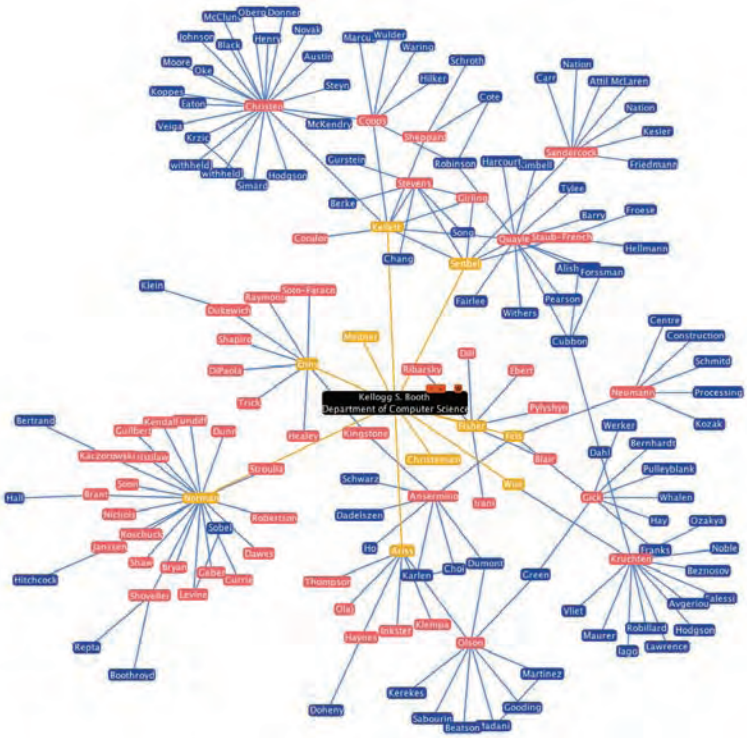
According to the rules of the game, participants got to keep the remainder of their $12 plus their share of the public pool at the end of the experiment. This condition potentially generates a temptation to withhold contributions and "free-ride" on the contributions of others.

To test the impact of shame and honour, players were also told that at the end of 10 rounds the identities of the two least—or most—generous players would be revealed in front of the other participants, while the other four players would remain anonymous. Participants were recruited from the same class at the beginning of the term to ensure they would meet again.

The team found that reputational effects induced by shame and honour each led to 50 percent more co-operation (approximately $33 in total contributions) compared to control experiments where all participants remained anonymous (approximately $22 in total contributions).

The study was supported by the Natural Sciences and Engineering Research Council of Canada. The research team is now looking at the policy implications for shaming policies in the digital era, as well as how the timing of choices affects co-operation.

(L-R) Jennifer Jacquet, Post-Doctoral Fellow, Fisheries Centre • Christoph Hauert, Associate Professor, Mathematics.



Map between individuals centered on Kellogg S. Booth.

Mapping UBC's Research World

A social network analysis site launched this fall could help UBC—and the rest of the world—visualize the strengths of the university's research enterprise and identify new opportunities for collaboration.

"UBC is by far the largest institution I have ever been a part of," says Jinhua Zhao, an assistant professor from Qingdao, China, who came to UBC last year after earning his PhD in urban planning at the Massachusetts Institute of Technology in Boston and working at Transport for London in the UK.

Zhao asked his new colleagues to explain the difference between a department and a school when he first arrived at UBC. To help, they drew a tree-like diagram to articulate reporting structures. But that only told part of the story.

"In reality, people interact with each other much more fluidly across departmental boundaries," says Zhao. "In addition to research, scholars are also connected with one another through brainstorming, co-teaching a course, or co-supervising students—they are active agents who explore and broker connections among faculties. These relationships are rarely reflected on an organization chart, but they speak directly to how knowledge is created and sustained."

While most recently popularized by Facebook and Twitter, the method of social network analysis has been around for decades and is widely applied in sociology, management, public health, geography and social psychology, says Zhao, who is jointly appointed between Civil Engineering and the School of Community and Regional Planning (SCARP). "For example, scholars once redrew the regional map of Great Britain based on its telecommunications records. And while the resulting map coincided with some regional boundaries, it also revealed strong cross-regional connections between areas currently divided by administrative borders."

SCARP director Penny Gurstein says, "Since knowledge creation is often at the intersections between disciplines, redrawing UBC along the lines of knowledge creation could help us better understand the core strengths of UBC: established clusters of researchers who are highly connected and 'glue' the community together, emerging clusters of researchers who originate and spread new ideas across campus, and the community's collective local, national and international connections."

To illustrate those connections, Zhao, Gurstein and fellow UBC researcher Tony Dorcey came up with a survey that, in 10 questions and roughly five minutes, aims to elucidate both research and teaching collaborations of UBC faculty members—how they are initiated, the length and depth of the interactions, their geographic vicinity, and respective expertise.

After a small-scale pilot, the project was formally launched this July, and approximately 800 UBC faculty members, staff and students have added profiles. Zhao and a team of Computer Science and SCARP students are working to create and improve interactive maps to visualize these relationships—some of the maps are now available to the public and serve as a tool

Jinhua Zhao, Assistant Professor, Civil Engineering, School of Community and Regional Planning.

"A university builds upon its scholars, but sparkles with the interactions among them. And while the stars shine in their own right, the constellations tell us even more compelling stories."

– Jinhua Zhao

for everyone to explore UBC and its scholars.

"People change, and so do their networks," says Zhao. "With these interactive maps, we can zoom in and trace the evolution of individual networks, project our scholarship onto the globe, or search by expertise or geographic area.

"A university builds upon its scholars, but sparkles with the interactions among them," says Zhao. "And while the stars shine in their own right, the constellations tell us even more compelling stories."

John Hepburn, UBC vice-president, Research and International, says: "We already know from various independent indicators that our research is of the highest calibre, and one of the reasons for this research excellence is interdisciplinary collaborations. This project will provide us with a clear and dynamic road map for prioritizing and supporting excellence while pointing toward new directions and opportunities."

Quantum Leaps from Combustion: New Developments in Alternative Energy *continued*

a single nucleotide polymorphism (SNP), where one individual might have an A nucleotide in a certain position and another might have a T in the same position. "A lot of times that variation is neutral and doesn't affect the protein being made, but sometimes it changes the kind or abundance of a protein and causes a difference in a trait, or phenotype," Douglas explains.

Douglas and colleagues resequenced the entire genomes of the 20 individual poplars from the Totem Field collection. Out of the 45,000 genes in the poplar genome, they found half a million SNPs in the18,000 genes that are expressed, or active, at significant levels in developing wood. They then used the information on active genes to determine important SNP variants in all 500 trees. By correlating the information on SNP variation with information collected by UBC Forestry collaborators, the team has been able to identify the gene variants underlying traits important for biofuel production.

"We initially chose only 20 trees, because when the poplar genome was sequenced in the early 2000s, it was inconceivable that we would be able to readily resequence the genomes of individual trees for which there is already a reference sequence," he says.

Technological advances—and nearly $10 million in new funding from Genome Canada, and collaborators from the US and South Africa—have allowed Douglas and colleagues to expand their scope. Their goal is to resequence and catalogue the entire genome of hundreds of individual poplar trees to better determine the connection between nucleotide variation and phenotypic traits, such as growth rates and the ratio of lignin to cellulose.

Douglas' team includes co-leader Shawn Mansfield from the UBC Faculty of Forestry and colleagues from the Department of Botany, UBC Faculty of Forestry, University of Victoria, University of Alberta and the University of Toronto. The group is working with poplar breeders in Canada and the US to use their research in marker-assisted breeding programs—a non-GMO approach to enhance desired traits for biomass and bioenergy production.

Developing bioenergy also needs biorefining expertise. Douglas is a member of the BC Bio-Energy and Refining Initiative (BERI) to establish a BC-focused network of researchers working at different levels, from conversion technologies to biomass optimization. Fast-growing trees with improved traits grown in plantations on marginal land across Canada could be crucial in the transition from fossil fuels to more sustainable forms of energy. BERI will help translate basic research on poplar genomics into second-generation biofuel.

Background: Complex chemical structure of lignin, a compound derived from wood.

Interactive maps of UBC's research enterprise can be viewed online.
www.knowledgenetwork.ubc.ca

Jen Hinze. Photo: Martin Dee.

Bumping the Life Sciences Up a Notch

UBC Science graduate Jen Hinze has netted four national volleyball championships and some of UBC's highest academic honours. Up next? Volunteer work and medical school.

It must be hard to imagine topping your undergraduate experience when you've won four national volleyball championships, received top awards in academics and athletics and competed in the world championships.

But for Jen Hinze, a new UBC Science graduate and a member of the university women's volleyball team, there is still much to look forward to. Over the next year, she plans to return to Canada's national volleyball team, write medical school entrance exams, volunteer and travel. If all goes as planned, Hinze's busy life will not slow down at all.

"I've learned a lot about myself and how much I can really handle at once," says Hinze, a Vancouver native. "It's a great feeling of accomplishment."

"Volleyball has been a big part of my life, but academics is a really important part of my life," says Hinze, who counts the Wesbrook Scholar Award as one of her proudest accomplishments in the last five years.

On top of going to classes, two hours of daily volleyball practice and gym workouts, Hinze found time to pursue a research project on how myelin, the material surrounding portions of a nerve cell, regenerates after spinal cord injury.

Hinze is also one of UBC's top athletes. During her five years at the university, Hinze and her teammates won four Canadian Interuniversity Sport (CIS) championships, making the Thunderbirds the most decorated team in the league. She's also won a number of prestigious awards for Canadian student athletes: CIS Tournament All-Star, CIS First-Team All-Star, Canada West First-Team All-Star, Thérèse Quigley Student-Athlete Award, Academic All-Canadian and Desjardins Top-Eight Academic All-Canadian.

"Being on the volleyball team has been a really unique and incredible way to experience university," she says. "It makes you feel like you are part of something bigger."

But it isn't the big wins that Hinze will remember from her undergraduate days—it's her teammates.

"We're very close, and I've made some lifelong friends," says Hinze, who credits her teammates for making her university experience so valuable. "We are a bunch of caring, hard-working girls, and I think that's one of the reasons we've been so successful."

UBC volleyball might be over for Hinze but she's not done with the sport. The graduate will spend the summer playing with Team Canada's volleyball program and in December will compete in the Olympic qualifiers. Making the 2012 Summer Olympics would be a great accomplishment for Canada—only 12 countries make it and Canada's women's team is currently ranked 20th.

Hinze is also deciding when to pursue the next stage of her education. She wants to be a doctor, but first wants to travel and volunteer. She'd like to get involved with the organization Right to Play, which aims to improve the lives of children living in disadvantaged areas of the world through sport and play.

"I've had so many good things come out of sports, I'd like to do something that promotes children playing and athletics," she says.

Despite the big role volleyball and sports have played in Hinze's life, she stresses how important school and her biology major have been.

Although sport medicine is something Hinze has considered, she really enjoyed the medical research. Hinze has always had an interest in learning how cells and the body work.

"I never expected my time at UBC to turn out this way—to get to play volleyball on a successful team but also to pursue my interest in the life sciences."

"I've learned a lot about myself and how much I can really handle at once." – Jen Hinze

UBC Vancouver Campus. Photo: Russ Heinl.

New Class Views Science Through the Lens of Sustainability

First-year seminar course will offer UBC Science students a broader look at the scientific and societal issues behind sustainability.

A new course being offered this spring will challenge UBC Science students to connect what they are learning in their lectures to big-picture issues in sustainability.

Sustainability Science is the latest in a series of science curriculum updates that focus on smaller, more interactive classes for first-year science students—a rarity in lower-level undergraduate studies.

The one-hour, weekly seminar will focus on four key elements of sustainability—water, energy, food and air—and the impact that society's day-to-day choices have on these areas.

Starting in January, students will have the option of taking Sustainability Science as a one-credit elective. Classes of 20 to 25 students will work collaboratively on real-world sustainability issues, framed by topics covered in their other courses.

"Students might be learning about acid–base reactions in chemistry while studying living organisms in biology," says Gary Bradfield, biology professor and course instructor. "Our aim is to get them thinking about the connections between what they're learning in their labs and lectures and how those concepts translate to real-world issues in sustainability, like ocean acidification and its effect on marine organisms."

The course will concentrate on two or three key topics. Students will explore the concepts in groups, and will be evaluated through short written assignments and presentations shared with the rest of the class.

"We want students to think about the broader implications of what they're studying," says Bradfield. "Students are incredibly attuned to sustainability issues. This course is the first step in offering them a broader understanding of the science behind the subject."

Campaign Brings New Energy to UBC Alumni Engagement

I hope this fall issue of Synergy finds all UBC Science alumni well. The past year has been a busy and productive one at UBC, with the university's launch of a five-year campaign and comprehensive alumni engagement strategy. That strategy will enable you to connect more easily with your alma mater, make you more familiar with our mission, and support you in acting as advocates for UBC Science within the local and global community.

Since arriving in my current

MENTORING

Become a UBC Science Mentor for a Day

We know the schedules of UBC Science alumni are jam-packed. With that in mind, we're highlighting one-day career mentoring opportunities that allow you to get involved and share your expertise without a long-term commitment.

More specifically, you'll find three examples where you can participate and share career tips, personal anecdotes and strategies for success with Science students. Students will get a better idea of the roles they can play in their respected communities and careers as they take on new responsibilities after university.

These events have a major impact on both students and mentors. Most events occur in the early evenings between January and March. If you would like to participate in one of these three events—WISE, Beyond the BSc and/or Crash Course on Careers—or any other career nights on campus, please email alumni@science.ubc.ca, or call 604-822-1864.

VOLUNTEER!

Women in Science and Engineering (WISE)

Save the Date: March 8, 2012

The UBC Women in Science and Engineering initiative is looking for female mentors for their 2012 networking reception—a friendly, small-group setting that allows you to offer practical advice to UBC students as they navigate challenges and explore potential careers.

WISE is a collaborative initiative between UBC's Science Team (SCI Team), Engineering Team (E-Team), and Women in Engineering (WIE), which are student development organizations promoting leadership, networking and academic-related events for science and engineering students at UBC.

"The best part about WISE wasn't the ego boost from being asked to participate, though that certainly didn't hurt," jokes Eagranie Yuh, a UBC Science alumni mentor at last year's event. "The best part is that I learned something from each young woman at my table. Their questions showed far more maturity than I had at their age, and it was an enriching and rewarding experience to spend time with them."

Jennifer Gardy, who also participated in the 2011 event, agrees. "There was so much energy and enthusiasm in the room, and it was really inspiring to see how engaged the trainees were with all the mentors. I ended up staying until the tables were being put away, chatting with the attendees! I get inspired and energized by mentoring, and ultimately, I think I'm benefiting from the event as much as the trainees are."

position as alumni relations manager, I've been impressed by the exciting research and student developments emerging across our departments and find the chronicles from our alumni community invigorating and inspiring. I'm delighted to be part of the UBC Science team and am committed to providing you with diverse and unique engagement opportunities.

Our programming will strive to enhance your individual experiences through respect for established traditions, memorable events, networking and community outreach initiatives, discovery workshops, museum tours, and various mentorship and volunteer opportunities.

I invite you to provide me with your comments and observations as I'd like these initiatives to be not only of personal interest but also of value to you in your professional endeavours. It's vital to our success that the overall UBC Science community be aware of and supportive of our activities.

We know our alumni are busy. With that in mind, we invite you to follow UBC Science online via UBC Science Connect, the UBC Science alumni home page, and via Twitter and Facebook.

I appreciate your support and I'm looking forward to 2012 and staying connected with you as UBC Science continues to grow and thrive.

Kim Duffell, BA, MA
Alumni Relations Manager, Faculty of Science

VOLUNTEER!

Beyond the BSc

Save the Date: March 2012
Do you remember being stressed about your career direction as you wrapped up your science degree? Did it take a while to find your niche after graduation? Then we want you to volunteer and share your career journey at Beyond the BSc—UBC Science's largest career mentoring event.

Beyond the BSc invites alumni and industry professionals who took a variety of paths to find fulfilling careers in diverse fields. The evening is about the journey and the decision-making process following graduation.

The gathering is organized by a dedicated team of student volunteers. In 2011, over 375 students and 35 alumni took part. Each alumnus shared their personal experiences with students to provide career guidance and explain the variety of possibilities and directions available.

VOLUNTEER!

Crash Course in Career Planning

Save the Date: March 2012
Prior to spring graduation, many UBC Science graduates are uncertain about their career path and even more concerned about their immediate employment prospects. UBC's Crash Course on Careers is a one-day intensive series of panels and workshops that provide our soon-to-be alumni with advice and effective job-search tools. Every May, alumni volunteers share stories of success and challenge with graduates in the hopes of alleviating anxiety, busting myths and inspiring career exploration that many students may have never considered before.

What do students have to say about Beyond the BSc?

"The greatest thing I got from the event was not to be stressed over not knowing what I wanted to do, and to realize that our career paths are really a journey. It may not be easy or predictable, but full of surprises and opportunities, which makes our life more exciting, and more valuable."

Top 10 Reasons to Become a UBC Science Alumni Mentor

1. Share your knowledge and wisdom with students.
2. Meet motivated UBC Science students.
3. Scout energetic, young talent for your organization.
4. Support the next generation of scientific leaders and entrepreneurs.
5. Build on UBC's tradition of alumni–student mentorship.
6. Provide guidance to students who are questioning potential career paths.
7. Network with people from different contexts and backgrounds.
8. Develop skills and capabilities in training and coaching.
9. Motivate and empower future community leaders.
10. A great excuse to grab some of UBC's famous cinnamon buns.

Force of Nature Receives UBC Honorary Degree

David Suzuki—geneticist, broadcaster, environmentalist and UBC professor emeritus of zoology—received an honorary degree from UBC this fall.

"At UBC I had the freedom to explore ideas that intrigued me," recalls Suzuki, whose academic career at UBC spanned more than 30 years as a full professor until his retirement in 2001. "Students were a joy to work with, and the little gang I attracted to my lab were like family to me."

Photo: The David Suzuki Foundation.

CLASS NOTES

1960s

Retirement from University Life a Fiction

John Chrysochoos (PhD Physical Chemistry, 1964) owns a well-stamped passport reflecting a life in academia that included stints with Harvard, the University of Toledo and Bowling Green State in Ohio, the University of Western Ontario, and the universities of Crete and Patras. But don't let rumours of his retirement fool you. Chrysochoos has merely switched from writing chemistry equations to writing non-fiction, with four books to his name: Beyond the Blue Ikarian Sea (2008), Elusive Dreams (2009), In Reason We Trust (2009) and Ikaria—Paradise in Peril (2010).

Alumnus Gets Back to His Roots

While a 100-acre family farm may have pulled this alumnus back to his roots, a degree in science and a legal career in the late 1970s laid the foundation for the growth of a distinguished community representative. Robert Dawson's (BSc General Science, 1967 | LLB 1970) career in agriculture in the Okanagan has flourished: he is a lifetime member of the BC Fruit Growers' Association, and has served on numerous boards, including the Okanagan Similkameen Co-operative Growers Association, BC Tree Fruits Limited and Sun Rype. Dawson now represents the tree fruit and grape sectors with the Investment Agriculture Foundation of BC, an industry-led not-for-profit that invests federal and provincial funds in agriculture and agri-food.

1970s

Sweet on UBC for Several Reasons

Not only has Tom Balabanov (BSc Biology, 1974) maintained a lifelong appreciation for UBC's famous cinnamon buns, but also for his wife, whom he met on campus. The couple just celebrated their 30th wedding anniversary, have four children (the youngest also a UBC alumna) and host UBC home-stay students from other countries. A programmer with Central 1 Credit Union, Balabanov relishes lifelong learning (including continuing studies at UBC) and looks for the same trait when hiring colleagues.

Suzuki, who turned 75 this March, has attained iconic stature as an environmentalist and has enjoyed an award-winning career in scientific broadcasting. His first professional love, however, was genetics research. At UBC he held an E.W.R. Steacie Memorial Fellowship for three years and co-authored one of the world's most widely used genetics textbooks.

"It was a heady time, as the field of genetics was expanding. And because we were in the scientific 'boondocks,' we could try things like searching for temperature-sensitive paralytic flies, an idea that seemed crazy!"

"But when Tom Grigliatti, now a professor of genetics at UBC, isolated the first such mutant, it turned out to be a sensational discovery that opened up a whole new area of research."

Suzuki studied biology at prestigious Amherst College in Massachusetts before declining acceptance to medical school in order to study zoology at the University of Chicago.

The honorary degree isn't the first time UBC has recognized Suzuki, who has never been shy in encouraging the scientific community to keep sight of the broader social and environmental contexts of research advances. In 2000, he was recognized with a Lifetime Achievement Award from UBC's Alumni Association. In 2008, Suzuki delivered the keynote address at UBC Science Week.

Singing Emeritus

William Hsieh (BSc Mathematics and Physics, 1976 | MSc Physics, 1978 | PhD Physics and Oceanography, 1981) became a professor emeritus at UBC soon after turning 55. His relationship with UBC, aside from post-doctoral work in England and Australia, has been uninterrupted since his freshman days in 1972. Hsieh has taught in Earth and Ocean Sciences and in Physics and Astronomy, and has chaired the Atmospheric Science Program. Author of Machine Learning Methods in the Environmental Sciences (2009), an advanced graduate text that brings together his research efforts of the last two decades, Hsieh plans to expand the applications of machine learning methods from the field of artificial intelligence to oceans, the atmosphere and land surface processes. On another note, singing has been a lifelong passion, and Hsieh is working toward producing a CD of tenor songs and arias (including at least one duet with his wife Jean, a graduate of the UBC School of Music). Two years ago, he began practising Tai Chi for its health benefits, and found himself increasingly attracted to Chinese martial arts and Qigong. Hsieh also enjoys spending time with his daughters, ages 14 and 11.

1980s

Modification in Mangroves

Since graduation, Mei Sun (PhD Botany, 1986) has continued her research career at the University of California-Davis and the University of Hong Kong. She recently spent a few months as a visiting professor at Harvard and published findings (together with Eugenia Lo, currently a post-doctoral researcher at Yale) on natural hybridization in mangrove forests. Their research—published in the Public Library of Science—examines the biodiversity of mangrove ecosystems, the dynamic evolutionary consequences of hybridization and the genomic structure of hybrids and parental species.

Animal Lover Recognized

Romany Runnalls (BSc Zoology, 1987) has been recognized by the BC SPCA as the non-profit's 2011 Philanthropist of the Year. "Romany is an outstanding example of philanthropic leadership," says BC SPCA chief development officer Rosemary Conder. "Everything she gives, whether time or money, comes from her heart, and she inspires others to help abused and abandoned animals." Runnalls joined the BC SPCA Kelowna Community Council last year and was recently elected to the society's board of directors. The BC SPCA awards program honours people and animals who have made outstanding contributions to animal welfare.

1990s

New Role at Yellowhead

Charlene Higgins (MSc Zoology, 1991 | PhD Zoology, 1996) has been named Vice-President Environment, Community and First Nations Relations for Yellowhead Mining.

Ahead in the Clouds

Moe Kermani (BSc Physics, 1991 | MSc Physics, 1994 | PhD Physics, 1998) has been named Person of the Year by the BC Technology Industry Association. Kermani, former CEO of Bycast, received the award for his leadership in establishing the company's presence in storage virtualization software for the large-scale cloud computing industry. In 2010, Bycast was acquired by NetApp, where Kermani is currently a vice-president. NetApp develops storage systems and software that help customers store and manage corporate data.

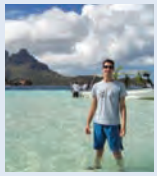
Michele Ng Receives UBC President's Service Award

Congratulations to Computer Science's Michele Ng for receiving the UBC President's Service Award for Excellence. Ng has been a long-time driving force in industry and alumni relations for the department. She helped create the largest tri-mentoring program at UBC, and has spent countless hours offering support and advice to students.

CLASS NOTES

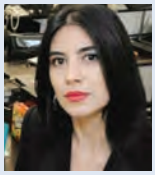
cont.

2000s



Discoveries Inside and Outside the Lab
Anthony Fejes's (MSc Microbiology and Immunology, 2004) PhD thesis is investigating the use of computer algorithms to interpret how breast cancer operates through a cell's DNA and RNA. "It's absolutely incredible to gain an insight into what a cancer cell is trying to do and why it wants to do it. The next piece of the puzzle is how to use that information to help people with breast cancer." But Fejes doesn't just limit his discoveries to the lab. He keeps a keen eye on industry as a mentor for the Student Biotechnology Network and as a co-founder of the cross-disciplinary biotechnology company Zymeworks. Fejes blogs about bioinformatics, coding, graduate studies and a host of other topics. When he's not working, he can be found hanging out with his family.

From Science to Sake
Adam Levine (MSc Resource Management and Environmental Studies, 2005) and his business partner have opened Electric Owl, an "izakaya-themed social club" offering Japanese tapas, live music and spectacle, cold beer and wine, sake and other treats for Vancouver's young, creative crowd.



Sailing the Modern Seas of Piracy
Named one of the Most Creative People in Business 2011 by Fast Company, Shahrzad Rafadi (BSc Computer Science, 2007) has leveraged state-of-the-art search technologies to launch the media delivery company BroadbandTV. Her technology identifies user-uploaded copyrighted content (including YouTube videos), sells and serves ads with the content, and shares the ad revenue with the copyright owner.

2010s

Joining the Global Debate
Bryan Tsuyuki Tomlinson (BSc Psychology, 2010) is pursuing a master's degree in international relations at the London School of Economics. Tomlinson will study alongside students from across the world, a perfect fit for a UBC Science graduate keen on investigating international life in an exciting, vibrant city.

CS Tri-Mentoring Celebrates 10 Years, 30 Veteran Mentors

Almost 200 alumni and friends joined together on UBC's Vancouver campus in May to celebrate the 10th anniversary of Computer Science's tri-mentoring program. The program matches trios of junior students, senior students, and alumni, community or industry mentors to share expertise and experiences and to build communication and leadership skills. The CS program is the largest on campus, with over 300 participants and incredible alumni involvement. At the get-together, 30 mentors were honoured with 10-Year Milestone Awards (Meghan Allen, Sonja Norman) or Five-Year Milestone Awards (Don Acton, Victoria Chan, Elaine Chang, Renee Cheung, Simon Choy, Carole Clem, Terry Coatta, Anne Condon, David Dai, Moyra Ditchfield, Ben Forsyth, Laszlo Hollander, Alan Hu, Gregory Johnson, Ed Knorr, Deepak Kumar, Helen Li, Juanita Lohmeyer, Tom Magliery, Tamara Munzner, Gail Murphy, Raymond Ng, Rachel Pottinger, Roland Santos, Andrea Schiel, Peter Smith, Calvin Wang, Arthur Yung).

Alumnus of Distinction Seeks Spicy Thai Food

Lifelong foodie Alia Dharamsi (BSc Integrated Sciences, 2010) has received a 2011 Young Woman of Distinction Award from the YWCA Metro Vancouver for her work as president and founder of the UBC Meal Exchange. The program raised over $56,000 worth of food and resources for the Strathcona Healthy Eating Program, Sheway, the Greater Vancouver Food Bank and the UBC Food Bank. "I met other passionate leaders who inspired me with their motivation and energy toward making Vancouver a more livable city," says Dharamsi. "Looking back at my undergrad, I have to say that Meal Exchange was one of the driving factors that kept me yearning for knowledge and provided me with an opportunity to give back to the community that raised me." Dharamsi just completed her first year of UBC medical school, and in the next few months she'll be off to Southeast Asia and Japan to explore the cultures, experiences, history and foods that Thailand, Cambodia, Vietnam and Japan have to offer.

From Ballet to Bacteria

Four years ago Rebecca Gordon (BSc Microbiology and Immunology, 2011) had set her sights on a career in contemporary ballet. Little did she know that four years later she would have a very different passion—international public health. As part of her degree, Gordon worked with a small, student-run non-profit, Global Initiative for Village Empowerment in Kenya, on their HIV/AIDS education and prevention project. Gordon taught life skills workshops to children in grades six through eight on topics such as condom use, HIV and voluntary counselling and testing, with the goal of increasing awareness, demolishing misconceptions and eliminating stigma. Now back from Kenya, Gordon is working as a research assistant with UBC PRE-EMPT, an international maternal health research project. The work allows her to learn the logistics involved in planning, coordinating and executing an international public health research project. She plans to continue her education with a master's degree in international public health as well as medical school.

Research on Ice

Sabine Lague (BSc Animal Biology, 2011) is no stranger to grand adventures. Prior to graduation, she was selected as one of 50 participants in a multidisciplinary expedition to Antarctica led by the Canadian non-profit Students on Ice. The team conducted research—glaciology, geology, palaeontology, oceanography and marine ecology—in the unparalleled beauty and purity of the Antarctic ecosystem. As the team's only Canadian biologist, Lague collaborated with marine mammal ecologists from Scotland to conduct population and behavioural surveys of penguins and seabirds. She now applies her Antarctic experience to graduate studies at UBC exploring the cardiovascular adaptations of bar-headed geese during their biannual migration over the Himalayas. Lague is also helping to establish the UBC Polar Club for researchers and enthusiasts who wish to study and help preserve the polar regions.

EVENTS & REUNIONS

Science Undergrad Society 51st Anniversary Reunion

Save the Date:
Wednesday, January 25, 2012

Since 1961, the Science Undergraduate Society has been the heart of social life for science students at UBC. This January, SUS will celebrate more than 51 years of school spirit, student pride and hard work. If you've ever volunteered with SUS—on the executive, on a committee, in fundraising, during Science Week, or on The 432—we want to see you at this event!

If you have not already received your exclusive invitation, please email alumni@science.ubc.ca with your SUS title, the year of your participation and whether you can attend. Watch www.sus.ubc.ca for news.

RSVP Deadline: Wednesday, January 11, 2012

UBC Geological Sciences/Engineering Alumni Reception at Roundup 2012

Save the Date:
Tuesday, January 24, 2012

Join us at Roundup 2012 for a UBC Science Alumni & Friends Appreciation Reception for a drink and some appetizers prior to your evening engagements. Reconnect, mingle and meet with fellow delegates from the Earth Sciences Program at UBC.

Currents Restaurant
Westin Bayshore
1601 Bayshore Drive
Vancouver, BC
Tuesday, January 24, 2012
5:30 pm – 8:00 pm

Remarks: 6:00 pm, Greg Dipple, Professor and Head of Earth and Ocean Sciences (EOS)

RSVP Deadline: January 13, 2012
If you have not already received your exclusive email invitation, please email alumni@science.ubc.ca as space is limited.

Inaugural Chemistry Alumni Reunion!

Save the Date:
Saturday, May 12, 2012

Are you a UBC Chemistry grad? Then it is our pleasure to invite you and a guest to attend the first Science Chemistry Alumni Reunion in May 2012. Join us as we renew old friendships, reminisce about the great times you had back on campus, and perhaps even hear from a few senior professors on how amazing a student you were back in the day. More details will be distributed in early 2012. Be sure to keep your email address up-to-date: alumni@science.ubc.ca

UBC Geological Sciences/ Engineering Alumni Reception at PDAC 2012

Save the Date:
Monday, March 5, 2012

Alumni in geological sciences and engineering are gearing up for the Prospectors and Developers Association of Canada (PDAC) conference in Toronto. UBC Science will be on hand to represent and will also be hosting its second annual UBC Alumni Reception. We welcome you to join us! Registration details will be distributed via email in early 2012.

Be sure to check out the UBC Faculty of Science–Earth and Ocean Sciences booth on the trade show floor.

Calling Computer Science Grads from 2002 or 1987

2012: Date to Be Determined

Do some in-person networking and renew old friendships in 2012. If you're a Computer Science alumnus and your 10th or 25th anniversaries are upon you, it's time to celebrate. Contact Michele Ng at mng@cs.ubc.ca for details or to volunteer, and watch www.cs.ubc.ca for details.

Vintage Science Undergraduate Society

UBC Alumni Wine

For the Educated Palate…
For all you Bacchus laureates out there, the UBC Alumni Association has launched a uniquely packaged and delicious wine to help celebrate graduation, a reunion or any other special occasion. The UBC-inspired labels will bring back fond memories while you create some new ones with your friends and fellow alumni.

Our partner in wine is Bounty Cellars in Kelowna, BC. This winery selects the best grapes, juice and wine from throughout the Pacific Northwest to produce a top quality product. In fact, Bounty Cellars 2007 Pinot Blanc has just been awarded a Lieutenant Governor's Award for Excellence for BC wines.

Choose from Pinot Blanc and Merlot—or save yourself a difficult decision and buy them both. Raise a glass, and raise some funds at the same time. Proceeds will support UBC alumni programming and events.

"A great idea for any occasion." David Murney, BC Wine Trails Magazine

Order yours online today!
www.alumni.ubc.ca/services/wine

Fall Graduates Take Centre Stage

Fall Congregation 2011
In November, we welcomed our newest class of graduates into the UBC Science alumni community. Family, friends, faculty and staff gathered at the UBC Chan Centre to mark the occasion and celebrate the determination and commitment each graduate displayed in pursuing their degree. Congratulations all and *Tuum est*!

MDRU at Roundup 2012

The Mineral Deposit Research Unit (MDRU) welcomes alumni and industry members to an exclusive gathering on Sunday, January 22, 2012, during the Roundup conference. E-invitations will be sent out in December. Connect with us to ensure you're on the list: mdru@eos.ubc.ca

American Association for the Advancement of Science (AAAS)

Will you be attending the (AAAS) Annual Meeting in 2012? The Annual Meeting is one of the most widely recognized pan-science events, with hundreds of networking opportunities and broad global media coverage.

An exceptional array of speakers will gather at the 2012 AAAS Annual Meeting from February 16 to 20, 2012, in Vancouver, B.C. (www.aaas.org/meetings/).

If you're a UBC Science grad who plans on attending and might like to have an opportunity to mingle with other Science grads and faculty members, please be sure to let us know. If we receive a sufficient amount of interest, we'll plan an exclusive UBC Science gathering and share additional details as they develop.

Email us with your level of interest at alumni@science.ubc.ca

Alumni Weekend 2012 Party at the Point

Save the Date: May 2012
Thinking of visiting your alma mater? Try scheduling your next visit during the month of May for the 2012 UBC Alumni Weekend. Join over 2,500 alumni on the UBC campus for academic discussions, circus acts and cookery, tours, reunions and more… Stay tuned for more exciting details.

Photos and video recaps of the 2011 Alumni Weekend can be viewed here: www.alumni.ubc.ca/events/alumniweekend/

New Custom UBC Science Gear for Sale: Look Cool, Support Students

Show your pride by gearing up with UBC Science merchandise. Proceeds support student initiatives. Visit the UBC Bookstore to check out our custom line of men's and ladies' T-shirts, water bottles and lanyards.

UBC Alumni ACard

The Alumni ACard, which is free for all UBC alumni, gives you access to discounts from several partners, as well as a host of UBC services and venues. Pick up yours today at either UBC Alumni Affairs at Cecil Green Park House, UBC-Brock Hall Welcome Centre, Robson Square or the UBC Okanagan Library. For a list of discounts available see: www.alumni.ubc.ca/services/acard

Update Your Coordinates or Go Green for a Chance to Win an iPod Shuffle

We're celebrating the launch of UBC's alumni engagement campaign by giving away free stuff! Update your contact details or opt to receive Synergy online before December 31, 2011, for a chance to win an Apple iPod Shuffle.
alumni@science.ubc.ca

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