Branch lines

UBC Forestry
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Creating Great Graduates

OUR PREVIOUS ISSUE, profiling a few of our excellent cadre of graduate students in the Faculty of Forestry, received such positive responses that we opted to devote most of this issue to profiling another selection of our current graduate students. We hope you enjoy reading about these remarkable people and their research, and are as inspired by them as we are.

The opportunity to work with bright, talented, motivated persons, and assist them in achieving their goals, is one of the most rewarding and enjoyable aspects of a being a professor. It is also one of the most demanding – requiring one to be at various times colleague, critic, coach, mentor and (occasionally) counselor. Done well, supervision of graduate students entails training them in developing their intellectual and research skills, supporting them with adequate stipends and resources during their program, ensuring that they develop the necessary professional skills to prepare them for the next stage of their career, helping them become networked in the community of scientists and scholars in their discipline, and assisting them in becoming established in their career once they graduate. Those outside of education who might view a graduate student as "a cheap pair of hands that do the professor's research" could not be

continued on back page

Sierra Curtis-McLane and **Joe Bennett** are doctoral students committed to conservation biology and the environment. Sierra and Joe both work with rare species that have become threatened in their native environments. As members of UBC's department of Forest Sciences, their research takes them to the islands and mountains of British Columbia.

Joe Bennett

by Sierra Curtis-McLane

6am: Wake up, roll over, check weather. If good enough to satisfy weather paranoia, eat and hit the water. If not, fret uselessly about weather while entering data and looking out tent window every 5 minutes.

8am: Arrive at island #21. Throw the anchor and gingerly tug for purchase. Row to shore and spend the day surveying native wildflowers and their non-native competitors.

JOE BENNETT HAD never been to the Gulf Islands when he applied to do a PhD from his post in the jungles of Laos. After completing his master's degree at Queen's University he worked as a parks biologist in Ontario, an environmental contaminant researcher in Ontario and Nunavut and finally a natural resource manager in Laos. Through these experiences he became convinced of the power of education to bring about change, and the more research he was involved with the clearer it became that his particular calling was conservation biology. Having noticed that scientists with PhDs tend to carry the most clout in political situations, Joe found himself hitchhiking and bussing four hours to the nearest town in Laos with a decent internet connection from which he could send letters of inquiry to potential PhD supervisors.

Sometimes weeks passed before Joe could return and see what professors such as Peter Arcese had sent in response to his inquiries. Lucky for both parties, Peter sent the most thoughtful and interesting invitation to Joe and between that and the Faculty of Forestry's excellent academic reputation, Joe was pleased to choose UBC. The applied nature of much of the work that goes on in forestry was particularly enticing to Joe, who strives to balance the esoteric and practical in his work.

Joe's research isn't all Gulf-Island glamour – he has put vegetative quadrats in urban neighborhoods while followed by the eyes of elderly locals and stray cats, too. His research focuses on the biogeography of islands and non-island land patches, and the influence of surrounding landscapes on native versus invasive species. His study areas – grasslands on Vancouver Island and adjacent islands – contain many rare native species and are heavily invaded by competitive exotic plants. Upon graduating from UBC Joe hopes to work at a university where he can pursue a research and teaching career that continues to focus on conserving native flora. Within this capacity Joe will help teach a new generation to revere and protect biological diversity.

6pm: Trudge back to dingy and row to boat in evening calm. Pull the anchor (was it ever truly grounded?!) and motor to camp.

8pm: Scarf down dinner, prep for tomorrow, check weather, fall asleep before hitting the pillow. Repeat.

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Sierra Curtis-McLane

by Joe Bennett

SIERRA CURTIS-MCLANE'S PATH to graduate school was guided by her love of nature and her environmental consciousness. Her undergraduate major at Swarthmore College in Pennsylvania was biological anthropology, with unofficial minors in campus environmental advocacy and Ultimate Frisbee. After college she worked as an environmental lobbyist at the state government in New Hampshire, a job that provided a fascinating window into the creation of environmental policy. A year into this job she was lured to California by a friend who offered her a position as an environmental science teacher at a new high school program called the Woolman Semeseter (www.woolman.org) which focuses on teaching about peace, justice and sustainability.

Sierra loved that teaching was pushing her to the limits of her knowledge, but she was keen to learn more in order to give more. So she started looking into graduate schools, searching for good forest sciences programs on the west coast. After meeting with her current supervisor Dr. Sally Aitken, Sierra made her decision. She jammed everything she had into a Subaru, and moved into Green College at UBC, to a room where she could see bald eagles from her window.

Sierra's graduate work involves two extremely important environmental issues: rare species and climate change. Her focal species, whitebark pine, is considered 'threatened' in

BC, and is expected to lose 80% of its climatic range in the next 60 years. However, some new areas in the northwest of BC are expected to become potentially habitable, prompting Sierra to research the following questions: 1) Can we successfully move this species to new habitats? and 2) should we move this species, given potential ecological and ethical implications? The problems addressed by her project will become more and more common as the climate changes.

Sierra's field work starts with long drives among field areas, and then up mountains until she can drive no more. Finally, she and her field assistants hike the rest of the way up to their field sites and don rubber gloves and rain coats before shimmying up the pitch-coated whitebark pines to collect cones. Then there's more driving and hiking to new sites and countless hours on hands and knees planting seeds and assessing germination (while keeping one eye open for bears). It's tough work (especially when the field assistant's bear spray goes off in her backpack!), but it's compensated by the phenomenal beauty of the field sites.

When she finishes her PhD, Sierra would love to begin teaching again. It's in her blood: both her parents are teachers, and she feels it is a noble and rewarding vocation. First and foremost, she wants to live a full life and give back to her community. So a good guess at her future would be a position at a small college in a mountain town, where her teaching and research would inspire young people and help make the world a better place.

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Ana Xavier and **Arash Jamali** are doctoral students in UBC's department of Wood Science. Ana, a wood chemist from Portugal, is studying the potential applications of cellulose as a new value-added material. Arash, a wood scientist from Iran, is researching the properties and modification of wood surfaces using plasma.

Ana Xavier

by Arash Jamali

A TRANS-ATLANTIC EXPERIENCE had always been part of Ana Xavier's plans. Raised in Lisbon, she grew up looking at the Atlantic Ocean always wondering what it would be like to live on the other side of the Ocean. Once Ana had finished her master's degree in pulp and paper production technology at the University of Aveiro, in Portugal, she felt it was time to leave Europe. Her first stop was in the United States at North Carolina State University, where she was a research assistant in the Organic Chemistry of Wood Components Lab. Less than a year later, she felt ready to pursue a doctoral program. The University of British Columbia came as a natural choice, a research university holding a world wide reputation for excellence in advanced research and education. She quickly discovered the Faculty of Forestry's Advanced Biomaterials Chemistry Laboratory and enrolled in a PhD, under Dr. John Kadla's supervision.

When asked about her research project, she said: "Before answering that question, I think it would be important to contextualize my research". We have to think about what is happening in the world concerning petroleum-based polymers, such as polystyrene used in packaging, and polyethylene used in containers and as artificial joints, and the environmental impacts caused by their production and degradation. Society is now demanding new materials based on renewable resources in advanced applications. At the same time, companies are facing challenges in the research and development of these new biologically derived polymers, also known as biopolymers. Wood, as an important component of Canada's economic development, is of particular interest in the development of high performance value-added wood derived polymer products. Cellulose, as the main constituent of wood, is one of the most abundant and low cost biopolymers available in nature. In addition to being renewable, cellulose is highly reactive, has high mechanical strength and is biocompatible, making it an interesting starting molecule for the development of new value-added materials.

In her research, Ana plans to chemically modify the microstructure of cellulose to alter its mechanical and chemical properties. To achieve this, she will graft a synthetic polymer onto cellulose poly(N-isopropylacrylamide). This synthetic polymer is known for its ability to respond to external temperature changes (thermoresponsive). Her final objective is to produce new cellulose-based thermoresponsive materials with potential applications in areas such as tissue engineering, drug delivery, membranes with controlled permeability and microporous films for cell culture.

Ana's future plans include working in research and development of biopolymers for biomedical applications in industry or a research institute. Recognizing the novelty of this area, she comments that she would particularly like to work in the improvement of governmental policies and bioethics as applied to biopolymers.

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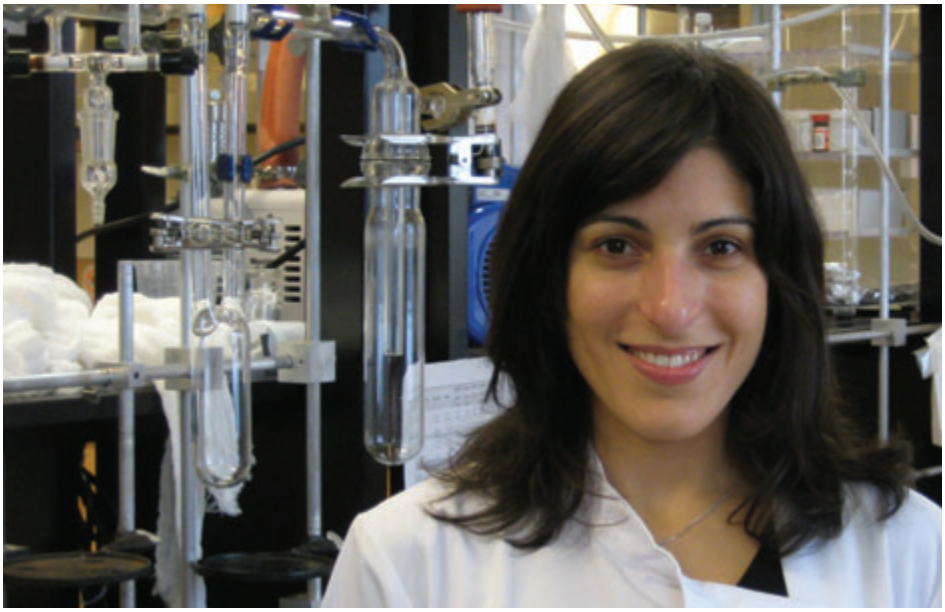

Arash Jamali

by Ana Xavier

ARASH JAMALI GREW UP by the Caspian Sea in the north of Iran. He was surrounded by the Alborz, the highest mountain range in the Middle East, and lush subtropical and temperate rain forests. As a child, he had always wanted to follow in his grandfather's footsteps and become a forester. It was his grandfather who encouraged his profound respect for forests and nature and who was the foremost influence in his choice of a lifetime career.

At the University of Tehran, Arash studied for a master's degree in wood science. It was here that he first heard about UBC from his supervisor who had been a graduate student in the Pulp and Paper Centre.

With his master's degree in hand, Arash worked as a quality control and lumber grading consultant. During two years of work experience, he had the opportunity to increase his knowledge of commercial wood species and appreciate the value of forest products. With his background in wood science, Arash saw pursuing a PhD at UBC as a way of complementing his professional and academic experience. At the same time, starting a new life in a new country, meeting people from around the world, was a challenge that he was eager to take. In British Columbia he found the mountains, the forests and, not a Sea, but an Ocean! He had again, all the elements that had been present in his life, and would continue to be.

Arash's work experience had taught him that defects on the surface of wood are one of the main causes for loss in value. This in turn made him curious to pursue a doctoral degree researching the properties and modifications of wood surfaces with Dr. Phil Evans at UBC's department of Wood Science. "I am the lucky one who had the chance to experience a problem, as a wood grading consultant, and then be given the chance to solve it, as a PhD student", he says.

When people ask Arash about his research topic, he enthusiastically starts answering the question by posing a rhetorical question: "do you know about plasma or its application on wood surfaces?"

He will then go on to explain that plasma, as a high energy gas, has been used by industry to effectively modify the surface of plastics and textiles. The novelty of Arash's research is that he will be applying plasma to the surface of wood and studying its effects on the chemical and physical properties of the wood. His research also includes testing the practical properties of plasma modified surfaces such as paints and coating adhesion and weathering performance.

Arash feels completely confident about his future. He believes that economic and environmental necessities are driving the industry of wood modification to adopt techniques such as plasma processing from other industries. By envisioning a higher value of wood and wood products and increasing their service life he sees less pressure on our valuable forests. Arash would like to contribute to this process by continuing his work either in academia or in industry.

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Aya Murakami and **Totkam Sajedi** are active members of the Forestry Graduate Student Association. Aya coordinates the many social events which bring together faculty members and their students, and Toktam organizes the Global Tea-House seminar series in which our international students talk about forests and forestry in their home countries. Aya is focusing her master's research on the impacts of climate change on the ecology of small streams. Toktam is completing her doctoral studies on plant – soil interactions in coastal forests.

Aya Murakami

by Toktam Sajedi

AYA MURAKAMI IS FROM Osaka, Japan. She completed her high school education in Australia before moving to Canada to do an undergraduate ecology and microbiology degree at Vancouver Island University in Nanaimo. She focused her undergraduate thesis on population abundance estimators of coastal BC's humpback whales using photo-identification methods. Following this, Aya became interested in Dr. John Richardson's work on aquatic ecology of forested streams and watersheds at UBC's Faculty of Forestry. Aya began a graduate program with John in September, 2007.

Working on seabream sampling.

In her current research, Aya is looking at the impacts of climate change on the ecology of small streams. Under the current climate change scenarios, precipitation patterns are expected to change. In BC these changes will mean more precipitation in winter and less in summer. These changes will have significant impacts on aquatic communities. Aya is focusing her research on the effects that summer low-flow events in small forested headwater streams will have on the community structures of benthic macroinvertebrate communities. These communities (for example, juvenile mayflies, stoneflies, dragonflies and beetles) provide important subsidies for downstream productivity by acting as a major food source for economically important fish. Aya's research involves analyzing 11 years of annual data on benthic invertebrates collected at UBC's Malcolm Knapp Research Forest. She is also building predictive and interactive population and community models based on understanding the differences between macroinvertebrate populations and their reactions to summer low-flow events. For example, a species with the ability to escape summer low flow events by quickening its aquatic stage would be more resistant to an abrupt reduction in flow than a species whose only mechanism is to go into a diapause stage. These models will allow researchers to better understand future scenarios given the current climate change predictions.

Aya comments that she likes being a graduate student in the Faculty of Forestry because she is not restricted to studying forests and resource management. Through her research she is able to also follow her interests in areas such as geography, fisheries and zoology. She would like to continue her studies to a PhD level.

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Toktam Sajedi

by Aya Murakami

TOKTAM SAJEDI'S INTEREST in applied forest ecology stems from her research experiences in Mediterranean, subtropical and temperate deciduous forest ecosystems during her undergraduate studies in forestry at Gorgan Agricultural Sciences and Natural Resources University in her home country of Iran. Toktam went on to do a master's degree at Tehran University researching nutrient cycling in beech forests. It was this work, using a humus classification system developed in British Columbia, that stimulated her interest in British Columbia's forested ecosystems. Looking more closely at the UBC Faculty of Forestry's research projects in this area left her in no doubt that she wanted to come here next to pursue her doctoral studies.

Toktam is part of the Below Ground Ecology Group (BEG) at UBC, working under the supervision of Dr. Cindy Prescott. She is researching the causes of poor soil nutrient supply in western redcedar/western hemlock stands – a phenomenon that occurs in extensive areas of productive forests on northern Vancouver Island. The causes of this condition have remained unclear despite many researchers examining different theories over the past 15 years. Toktam is focusing on the effects of excessive soil moisture and low oxygen availability on carbon and nitrogen mineralization, plant species development and forest productivity. She is looking at a variety of soil physio-chemical characteristics, decomposition rates, organic and inorganic forms of N, microbial respiration, biomass and enzyme activity at different soil moisture levels in an attempt to understand the causes of low soil nutrient availability in her study sites. So far, Toktam has been able to show that slightly, but significantly, wetter conditions and shallower aerated zones with higher frequencies of anoxic conditions are accompanied by lower emissions of CO_2 and lower net N mineralization rates. In her laboratory studies, she found a threshold in soil moisture above which decomposition and C and N mineralization declined.

In another part of her research, Toktam has assessed drainage as a potential solution for forest management in poor soil nutrient supply conditions. She has tested the effects of drainage on above and belowground C stored in a cedar-swamp forest. As the final stage of her research, Toktam is trying to incorporate her findings from field and laboratory studies into the ecosystem-based models, ForWaDy and FORECAST, to predict the long-term responses of the ecosystems to differences in soil moisture conditions and water fluctuations. Findings from her research will help us to understand how much control soil moisture has over mineralization of N and C. These results will also be important for sustainable forest management in wetland forests where she believes clear-cutting may accelerate waterlogged conditions and therefore may not be a suitable harvesting system in these ecosystems.

Toktam is at the final stages of her PhD and for her future research she would like to work on plant-microbe interaction dynamics under extreme conditions. She is particularly interested in studying microbial communities' function and structure at different scales from micro to macro environments and linking that into ecosystem resilience and plant community dynamics.

Toktam admits to being fascinated by the diversity of research that the more than 30 BEG group members are involved with. She describes her overall experience at UBC as an extremely rewarding opportunity that has allowed her to develop a rich professional and friendship network at an international level.

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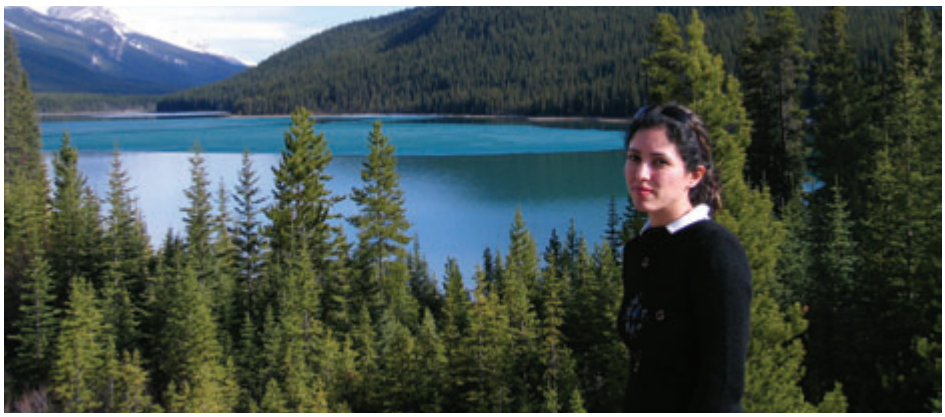

Kate Kirby and **Trevor Lantz** are passionate about the interactions of people and the ecosystems they inhabit. In Kate's case, this has taken her to the remote villages of Panama. Trevor has spent five summers in the bug-infested regions of northern Yukon and the Northwest Territories. Both are members of Dr. Sarah Gergel's Landscape Ecology Lab at UBC.

Kate Kirby

by Trevor Lantz

I THINK IT IS FAIR TO SAY that Kate Kirby is hooked on the tropics. On her first visit to Brazil in 2002 she lived with the Kayapó people in the remote village of A'ukre. During her time in this village Kate became fascinated by the complex relationship between the Kayapó and their environment. According to Kate this experience also highlighted "the importance of considering local perspectives in conservation."

Evidently it has also had a lasting impact on her academic career. Following this trip, Kate spent a large part of the next two years living in Panama where she worked with a rural community as a part of her MSc research on land-use based carbon offsets. In 2004 when Kate finished her degree, she moved to Vancouver to start a PhD with a temperate focus, but was ultimately drawn back to the tropics. Following a successful field season on Vancouver Island in 2005, Kate chose to follow her passions back to the forests of Panama.

At UBC Kate is a student in Dr. Sarah Gergel's Landscape Ecology Lab in the Faculty of Forestry. She is continuing her work in Panama by focusing on systems of traditional agriculture. During her MSc work, Kate was impressed by the diverse agroforestry systems maintained by many of the families she worked with. Households throughout the tropics have traditionally tended and harvested plants in a variety of agroforestry contexts, including homegardens, fruit orchards, and fuelwood plantations. In contrast to many modern agricultural systems, these agroforests provide a range of ecological goods and services ranging from habitat for pollinators and seed dispersers, to sources of medicinal plants and improved food security in times of drought or pest outbreak. While agricultural diversity declines around the world, small-scale agroforestry systems remain important "hotspots" for agrobiodiversity.

A dugout canoe carries Kate and a load of plantains down-river to a nearby town.

Unfortunately, traditional agricultural systems are not immune to global change, but are stressed by a number of biophysical, socio-economic and cultural factors. In her PhD work Kate is exploring the drivers of agricultural change in the Darien region of Panama. She is working with farmers in a number of villages to try to understand how their decisions surrounding both land use and the planting of particular crop varieties are influenced by factors as diverse as soil type, formal education, government extension activities, and belief systems. Kate is also working at a broader scale, using meta-analyses and GIS, to try to understand how the distribution of crop and fruit tree diversity across Central America is related to factors such as population density, road networks, and ecosystem type.

Kate's research in Panama takes her to remote villages that are often

two days travel from Panama City by bus, boat, dugout canoe and foot. According to Kate, the time spent traveling is small in comparison to the time she spent at the outset, contacting communities and developing research agreements with them. Kate says that the time invested in these agreements is essential because it builds the collaborative relationships that are vital to her work in each community.

Ultimately Kate hopes that her work will be relevant both to small farmers as well as to global efforts to conserve agrobiodiversity. Farmers and conservation biologists typically have very different motivations for maintaining agroforestry systems and for conserving traditional varieties of fruit trees and crop plants. In Kate's view, understanding these differences is the most critical aspect of encouraging and empowering farmers to maintain diversity.

When she finishes her PhD, Kate plans to continue her research exploring the human dimensions of global change. She continues to be fascinated by the links between cultural diversity and biological diversity, and in how changing modes of subsistence affect the relationship between people and the environments they live in. When she is not traveling up rivers to reach

Kate discussing field surveys with colleague Domingo Diaz.

isolated villages, Kate enjoys running, skiing, exploring, paddling and camping. On occasion you can also catch her in a hammock with a book and a cold beer.

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A local farmer guides Kate through his taro and maize field.

Trevor Lantz

by Kate Kirby

FROM GROWING HIS OWN tobacco to experimenting with homemade pemmican recipes, learning about the uses and beliefs surrounding plants had long been a pastime for Trevor Lantz when in 1995 he discovered there was an entire discipline dedicated to the subject. "For me, understanding the ways that people use plants makes botany totally come alive. I was pretty excited to learn about the discipline of ethnobotany in the second year of my undergrad." Since taking his first ethnobotany course a year later, Trevor hasn't looked back.

Today, Trevor describes himself as an ethnoecologist, which he defines broadly as someone who studies the interactions between people and the ecosystems they inhabit. The broad scope of the field of ethnoecology is reflected in the research Trevor has carried out over the past ten years, which has ranged from his master's research on the population biology and ethnobotany of devil's club, a culturally important shrub common to much of coastal BC, to his postdoctoral research with the community of Old Crow in the Western Arctic. In Old Crow, researchers and the Vuntut Gwich'in First Nation are working to understand the long-term effects of climate change on the traditionally important wetland area known as Crow Flats.

I first met Trevor in 2004 when he was planning the first field season of his dissertation research in the Mackenzie Delta Region of the Western Arctic. The research he was undertaking was inspired primarily by observations made by elders in the region. They described a changing landscape, one with more shrubs, increased permafrost thaw, and fewer lakes. Trevor became interested in exploring the causes of these changes. Certainly, climate change was a good contender: temperature increases in the Western Arctic over the past decades have been twice as rapid as other parts of the world. However, these temperature increases have coincided with an increase in reports of fires and disturbances that result when permafrost thaws. Which of these factors was driving the changes local peoples were observing? And perhaps more important: was climate change interacting with some of these other disturbances to accelerate landscape change?

I remember being astonished by the logistics involved in the sampling Trevor planned to carry out. Trevor would study the dynamics of shrub populations in disturbed and undisturbed sites along a 300 km temperature gradient in the Mackenzie Delta Region. He and his field crew would travel by float plane, helicopter, canoe, sea kayak, snowmobile, snowshoe, and on foot. But after five summers in the north, it wasn't the logistics that Trevor recalls as his greatest challenge, but the bugs: "some people say caribou migrations meander much more than necessary because the caribou

are trying to escape the bugs. Imagine trying to keep yourself and a field crew sane and happy when working and living out of doors. We learned a lot about cooking, eating and bathing in ways that minimize skin exposure."

The experience of living on the land is also what Trevor claims has been the most enjoyable aspect of his dissertation work. "Travelling through this landscape over the past five years has been incredible. It has also been very rewarding to get to know the people who live in these places. I've also been lucky to collaborate with a number of northern scientists who know the region very well."

Trevor didn't only tackle his research questions using ground sampling. As part of the Faculty of Forestry's Landscape Ecology Lab, he had access to top-of-the-line remote sensing tools that allowed him to complement his ground work with analyses of landscape change using aerial photos and satellite images. "I wanted to come away from my PhD with a good working knowledge of a range of remote sensing and GIS techniques."

Those techniques proved to be critical to his findings. From his analyses of air photos, Trevor was able to show that higher temperatures were correlated with greater abundance of shrubs across the tundra. The air photo analyses also provided evidence of a recent increase in permafrost-related disturbance. Trevor's ground sampling confirmed that sites of disturbance are often the first places to be colonized by shrubs such as alder. Taken together, Trevor's results indicate that the effects of climate change on vegetation are likely being magnified by shifts in the frequency of disturbance, with significant implications for both global climate (through feedbacks such as reduced albedo) as well as for local peoples. Overall, Trevor says his results really emphasize the value of studying the effects of disturbance across long temporal scales and broad spatial scales. So does this mean more seasons of field work? "I hope so," he says.

Those seasons will be limited by other obligations, however. This fall, Trevor will begin as a new professor in the School of Environmental Studies at the University of Victoria. He is excited to begin his new job, and is enthusiastic about future research opportunities. When not on the tundra Trevor enjoys playing a variety of string instruments, including guitar, dobro, banjo and fiddle. He also enjoys gardening, skiing, paddling, and is well known by his friends for his delicious pies.

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Traveling between sites along the Old Crow River in Vuntut National Park (Yukon) using a packable canoe.

Trevor Jones and **Nicholas Soverel**, both from the US, are graduate students in the Integrated Remote Sensing Studio (IRSS) run by Dr. Nicholas Coops in the department of Forest Resources Management. The two are using remotely sensed data to map forest structure and species distribution on the Gulf Islands and burn severity in Western Canadian National Parks.

Trevor Jones

by Nicholas Soverel

AFTER WORKING WITH Trevor Gareth Jones (TGJ) in Kootenay National Park during the summer of 2008, I have come to realize that he and his work cannot be easily summed up in a 500-750 word document. Ask him a few questions about his hometown, his various degrees, or his personal interests and you will quickly discover the scope of his numerous research and recreational passions. For instance, did you know that at present TGJ may be the youngest PhD candidate in the Faculty of Forestry?

In June 2006, at the ripe age of 22, TGJ arrived at UBC's Faculty of Forestry with a Bachelor of Arts (BA) in Geography, a BA in Studio Art and a Master of Arts (MA) in Geographic Information Sciences (GIS) from Clark University (CU) in Worcester, Massachusetts. His MA research at CU investigated the long-term spatial and temporal dynamics of forested land cover types in New York State's Adirondack Park. Working with Landsat TM and ETM+ imagery, TGJ's MA work built upon the geotechnological skills he had acquired as an undergraduate. With completion of his MA approaching, TGJ's advisor Dr. John Rogan recommended UBC Forestry as an excellent next step. With various offers on the table, TGJ accepted a once in a life time opportunity to study with Dr. Nicholas Coops in the Integrated Remote Sensing Studio (IRSS) in the Faculty's Forest Resources Management department.

Trevor Jones taking a vegetation inventory on Darcy Island, a former leper colony.

TGJ's PhD research is a logical step forward from his MA research. While his research at CU utilized only one type of remotely sensed data (*i.e.*, Landsat data), his current research employs four. These four datasets include: Landsat multispectral, airborne hyperspectral, airborne LiDAR (Light Detection and Ranging), and ground based spectroscopy. The research study area encompasses the entire Gulf Islands National Park Reserve (GINPR), located in the southern Gulf Islands in south-western British Columbia. The main objectives of his work include mapping forest structure and species composition using a synthesis of these four disparate remote sensing technologies.

To map forest species distribution, the first step was to collect vegetative samples from all dominant overstory forest species in the GINPR. To do this, TGJ and other field assistants from IRSS established over fifty field plots on North and South Pender, Saturna, D'Arcy, Sidney, and Tumbo islands in the summers of 2006 and 2007. The main focus of the field work was to capture the variability present in targeted sunlit dominant forest species.

From the vegetative samples, a ground based spectrometer was used to measure the spectral signature of each tree sample with the final output being a hyperspectral library representing all species of interest. Statistical procedures were then utilized to identify wavelengths that best differentiate each tree species. To produce maps depicting forest species distribution, wavelengths identified as optimal for species differentiation were targeted in hyperspectral imagery and used for classification.

To map forest structure, LiDAR data was used. LiDAR is active, and therefore sends and receives near infrared (NIR) energy which can then be processed to provide a 3D representation of the forest and its surface topography. Each pulse of NIR energy detects the various layers of objects that it interacts with, and in this case elucidates the many components of forest structure.

From left to right, Nicholas Coops, TGJ, and Chris Bater being dropped off on Tumbo Island by a Parks Canada warden.

Once species and structural information have been collected, the next step is to scale up from the spatial resolution represented by airborne data to the landscape level as represented by Landsat imagery, thus allowing for detailed and accurate species and structural information to be provided for the extent of the GINPR.

Measuring vegetative spectral response curve of hemlock needles.

Once completed, the final products will have many applications for natural resource managers, some of which include: wildlife habitat studies, invasive plant control, fire management, and long-term climate change monitoring. For instance, Dr. Peter Arcese from UBC's department of Forest Sciences realizes the great possibilities this data provides for avian studies being conducted by his lab in the Gulf Islands.

So what does someone like TGJ do after they complete such a lofty PhD project? TGJ says that post-graduation he would like to continue pursuing research-related endeavours. A longer term goal would be to teach geography or remote sensing at the post-secondary education level. When or where that takes place, only the future will tell.

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Nicholas Soverel

by Trevor Jones

Nicholas Soverel en route to Kootenay National Park field work sites.

NICHOLAS OSBORNE SOVEREL emigrated to Vancouver to attend UBC in September, 2007. Originally hailing from Acton, Maine, USA, Nick attended boarding schools in Connecticut (Rumsey Hall) and Maine (Hebron Academy) before attending the University of Vermont (UVM) in Burlington. While at UVM, Nick worked towards a BS in Natural Resource Ecology (and a minor in Spanish), graduating in spring 2004.

Upon graduation, Nick's first job involved driving and simultaneously vending frozen treats from a truck. Although bringing smiles and joy to dozens of neighbourhood children and equally enthusiastic adults was a hard position to move on from, after a few months of dessert distribution, Nick joined an Exotic Plant Management Team (EPMT) in Big Thicket National Preserve in Beaumont, Texas. While working with the EPMT, Nick took part in the eradication of invasive trees relying upon the use of chainsaws and herbicide. It was through the EPMT that Nick gained his first practical hands on experience with geotechnologies, specifically using Geographic Information Science (GIS) and the Global Positioning System (GPS).

Following his time in Texas, Nick worked at both Bryce Canyon National Park in Utah and the National Interagency Fire Center (NIFC) in Boise, Idaho. In Utah, Nick developed skills as an on-the-ground firefighter, while simultaneously strengthening his field and office experience with GIS and GPS. While working in Idaho at NIFC, which those in the know refer to as the Pentagon of wildland fire, Nick was engaged in national wildland fire support and continued to bolster his ever increasing knowledge of geotechnologies as they relate to wildland fire.

After leaving NIFC, Nick went on to work at Olympic National Park in Washington state. Relying upon skills acquired in Utah, Nick was again employed as a firefighter, this time on a larger wildland fire engine, in contrast to the smaller one he had worked on at Bryce Canyon.

Having gained numerous years of practical hands-on skills and experience relating to wildland fires and geotechnologies, Nick felt that it was time to continue with his formal education. Under the impression that going international was a really good move, and due to the grand reputation that UBC had, Nick contacted Dr. Nicholas Coops in the Integrated Remote Sensing Studio (IRSS) and visited Vancouver. Feeling seduced by all that the IRSS lab had to offer, Nick was thrilled at the opportunity to pursue a MSc at UBC.

Since arriving at and enrolling in UBC, Nick has been working on creating and assessing the accuracy of burn severity maps for various Canadian National Parks. Specifically, Nick has been generating burn severity maps using Landsat remotely sensed data. A burn severity map is created via the differenced normalized burn ratio (dNBR),

which uses multidate Landsat imagery (pre burn and post burn) to assess the level of burn severity in a particular area. Severity can range from high, to moderate, to low, and to areas that have remained unburned.

Although this approach to mapping burn severity has been used extensively in the US, it has not been utilized and subsequently had its accuracy assessed in Canada. While this process is applicable to anywhere affected by fire, Nick is working in partnership with Parks Canada with a focus on western Canadian parks.

GPSing in Wood Buffalo National Park.

In the summer of 2008, Nick assessed the validity of the dNBR algorithm in Kootenay and Wood Buffalo National Parks. I had the pleasure of accompanying Nick on his field campaign to Kootenay. Map accuracy was assessed based on numerous criteria, however, the overall goal was to determine if burn severity maps based on dNBR were able to reliably detect overall changes in forested ecosystems due to wildland fire. This summer, Nick will conduct field work in Kootenay, Wood Buffalo and Glacier National Parks, with the potential for work in other Parks as well. I cross my fingers that I will be able to join Nick in the field once more…

Burn severity assessment on a high burn severity site in Kootenay National Park.

Nick's research will lead to confidence statements related to burn severity products for National Parks in western Canada. Having confidence in these products is critical for Park Managers, as it will allow for the development and implementation of a federally standardized protocol for mapping wildland fire effects. Furthermore, Nick's work allows for a comparison between the effects of natural wildfires vs. prescribed burns.

After receiving his MSc from UBC, Nick hopes to gain employment within a Canadian or US government agency working in the realm of fire management.

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Antje Wahl and Olaf Schwab are both in the Collaborative for Business and Operations Management (Cbom). Antje is studying how voluntary standards for social and environmental responsibility are being implemented by forest companies. Olaf recently completed his doctoral degree for which he developed a model for predicting the economic effects of disturbances such as the mountain pine beetle outbreak.

Antje Wahl

by Olaf Schwab

ANTJE WAHL WAS STUDYING for her Bachelor's degree in Wood Science and Business Administration at the University of Hamburg in Germany when she was presented with an opportunity to work with the international forest products company Weyerhaeuser for her thesis. In this work Antje looked at the cost implications of using new silvicultural systems such as individual tree selection and group selection harvesting for protecting mountain caribou habitat in British Columbia's interior region. After finishing her undergraduate degree, Antje spent a year honing her language abilities in Japan – a skill which she then put to good use in her graduate studies!

Antje chose UBC's Faculty of Forestry for her master's degree, working with Drs. Dave Cohen and Rob Kozak on markets for value-added forest products in Japan.

For the next two years Antje worked with Jaakko Pöyry Consulting in London, England, where she focused on market studies and competitiveness assessments in Eastern Europe and North America. She returned to Canada in 2003, joining the Markets and Economics Group at FPInnovations. When Antje decided to pursue a PhD, the close working relationships between researchers at FPInnovations and the Faculty of Forestry made UBC a logical choice.

Wood pellets – bioenergy made in BC.

For her PhD with Dr. Gary Bull, Antje is studying how voluntary standards are being implemented. These types of standards are becoming increasingly important in shaping how companies interact with their environment. For example, voluntary forest certification schemes have been very effective in convincing forest companies to adopt social and environmental performance standards that by far exceed their current legal requirements. Voluntary standards have not only changed the way that existing industries do business – they are also having a profound effect on how new business sectors are developing. In the bioenergy sector, companies are encountering heavy criticism for competing with food production for suitable land, or for converting natural forests rich in biodiversity into farmland and plantations. Using wood as the main feedstock would help to resolve some of these conflicts, but companies still face the ongoing challenge of convincing both business partners and customers that they are acting socially and environmentally responsibly.

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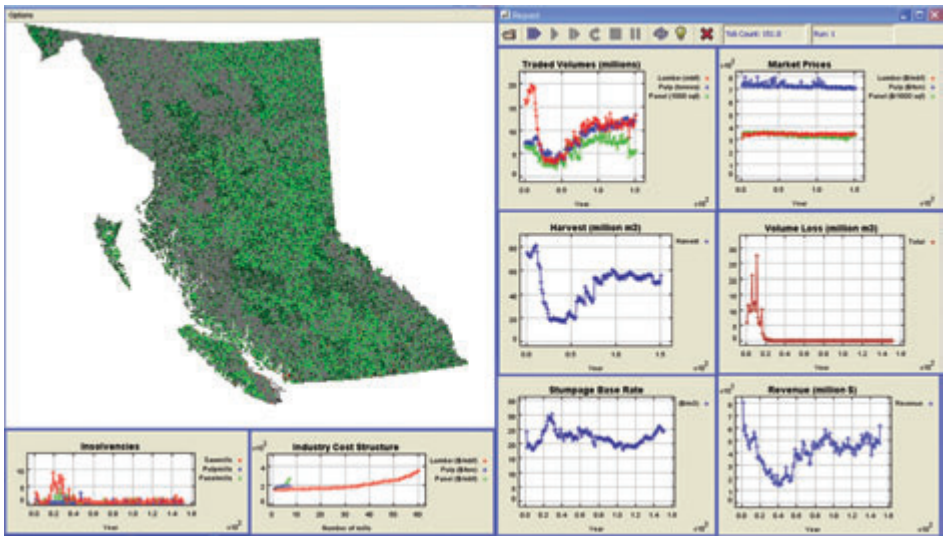
Olaf Schwab

by Antje Wahl

OLAF SCHWAB FIRST CAME to UBC as an undergraduate exchange student from Germany. Before returning to the University of Gottingen to finish his forestry degree he stopped off in Scandinavia to gain work experience as an industry and government intern in the forestry sector.



Screenshot of model developed as a decision support tool.

While on exchange at UBC Olaf met Dr. Gary Bull from the department of Forest Resources Management. His positive interactions with Gary encouraged him to return to UBC to complete a Master of Science degree. Olaf cooperated with UPM-Kymmene, Europe's second-largest forest company, for his research on econometrics and timber demand modeling for Finland. After completing his MSc, Olaf immediately started working on his doctorate degree with Drs. Thomas Maness and Gary Bull.

Olaf's very recent PhD research focused on a forest sector modeling approach to analyze the economic effects of natural disturbances. The model is a decision support tool for assessing the effects of changes in forest product demand and forest resource inventories on the structure and economic viability of the forest industry. Governments and forest companies will find the model a useful decision support tool for large-scale strategic analysis. Olaf named the model CAMBIUM after the layer of cells that contribute to the growth of the wood and the innermost bark of a tree. Similarly, forest sector agents (companies) play a critical role between forest resources and product markets.

To test the model and its relevance, Olaf calibrated CAMBIUM to current conditions in the forest sector in British Columbia. Taking into account the mountain pine beetle epidemic and a downturn in forest product markets, the model predicts a decline in roundwood harvest by more than 40 million m^3/year between 2030 and 2060. This is the result of a very large proportion of immature stands in the province's forest inventory after salvage and regular harvesting.

According to the model, the effects of the downturn in the US housing market on industry structure is limited to the short term, while the timber shortage from the mountain pine beetle epidemic leads to a large number of insolvencies in the primary wood processing sector (lumber, panels and pulp). Olaf stresses that his model does simulation, not optimization, *i.e.* the model does not produce the optimal result, but the most likely outcome.

Olaf successfully defended his dissertation in December 2008, and is currently working as a Research Associate in UBC's Conservation, Economics and Policy Analysis Group. His current focus is to adapt the CAMBIUM model for the Coastal Forest Action Plan to help formulate a new forest sector strategy for the BC Coast.

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Babita Bains and **David Jack** share a passion for life outdoors and for the world of insects. Both are Dr. John McLean's graduate students in the department of Forest Sciences. Babita is fascinated by the habits of adelgids and David is consumed by mountain pine beetle response to nitrogen fertilization in lodgepole pine stands.

Babita Bains

by David Jack

IT WAS IN A KAMLOOPS school yard, on a sunny day long ago, that Babita Bains, armed with a magnifying glass, first discovered her love of insect management. It would be many years later, during her biology undergraduate degree at the University of Victoria, that she would rediscover this love for insects through entomology courses and working for her mentor Dr. Richard Ring. As an undergraduate student, Babita spent her summers planting trees in the Southern Interior. This experience, together with her enthusiasm for nature, stirred her interest in becoming a forester. Armed with her biology degree, she enrolled in UBC's Faculty of Forestry to take the courses needed for her to become a professional forester. Soon after this, Babita decided to pursue her love for entomology again and began a forest entomology master's program with Dr. John McLean.

Babita is looking at the basic biology and management of adelgids. Adelgids are a prominent Western Canadian seed orchard pest. They have a complicated life cycle and are most recognized for inducing galls on the reproductive and vegetative shoots of spruce trees. Babita's contagious passion has resulted in collaborations with other researchers at the University of British Columbia, the Ministry of Forests and Range, the Forest Genetics Council of BC, and Laurentian University.

Her research contributions can be divided into four major areas. First, Babita is looking at host genotype variability. The Kalamalka Seed Orchard in Vernon BC provided spruce trees of known genetic make up. Here Babita was able to study different tree genotype responses to adelgid induced galling. Results from this work have established that galling on interior spruce trees is under genetic control. Second, she is clarifying the role of two adelgid life stages in the galling process using manipulative laboratory experiments. Results of this work have shown that both life stages are required to induce a complete gall; a unique situation among galling insects. Third, she is investigating the morphological development of gall structure. Working in laboratories at both the University of British Columbia and Laurentian University, Babita has used botanical histological techniques to study these

Collecting winged adelgids at the Skimikin Seed Orchard in southern, BC.

morphological stages. The results of this work should help further our understanding of the processes involved in gall development. Fourth, Babita is contributing to a field guide for seed and cone pests. Currently there is no simple way to identify adelgids to the species level and Babita is trying to characterize the unique gall structures induced by different adelgid species. Her hope is to provide seed orchard managers with simple field techniques for pest management.

The excellence of this work is evidenced by her recent award from the Entomological Society of BC (ESBC) for best MSc presentation. The ESBC also awarded her a travel scholarship to present her work in Ottawa at the Annual General Meeting of the Entomological Society of Canada.

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David Jack

by Babita Bains

DAVID IS AN ONTARIO native and moved out west to complete his undergraduate degree in Natural Resource Management at UNBC. Prior to completing his undergrad, David completed college diplomas in Recreation Leadership and Outdoor Recreation. British Columbia was naturally appealing to David considering he loves spending his spare time hiking, skiing, cycling and exploring. David's interest in the outdoors and natural systems logically brought him to pursue a graduate degree in Forest Entomology at UBC, under the supervision of Dr. John McLean. His motivation for attending graduate school was to improve his research abilities and to enhance his forest entomology and ecology knowledge; considering his long-term career goals include being an active part of sound scientific research that contributes to positive changes in the field of natural resource management. David's experience goes beyond academia. David has worked for the BC Ministry of Forest and Range in Williams Lake and Victoria, and he worked to develop a silviculture model for Canfor.

David's research explores the responses of the mountain pine beetle (MPB), its fungal associates, and a mature mixed stand to nitrogen fertilization through an epidemic MPB attack. The application of this research is to assess whether nitrogen fertilization can be used to increase mature lodgepole pine trees' natural defences against the mountain pine beetle, and thereby reduce the impact of the infestation in these stands. Over three summers David has monitored close to 8000 trees at the Pennask Summit in the Southern Interior Forest Region (elevation ~1400m), and David will return to the field this summer (2009) to complete a final research season. To date, David's research has demonstrated that:

David used his mechanical abilities to design and build a field truck that would conquer the rugged terrain of the Pennask, and allow him to live on-site and in comfort. Living on site reduced his travel mileage from 12,000km to 3,000km.

1. The nitrogen fertilizer applied in September 2006 resulted in an increase in nitrogen concentrations in the lodgepole pine phloem and needles.
2. No significant differences were observed in lesion length related to nitrogen treatment levels (Control, 200 kg N/ha, 400 kg N/ha) among different fungal isolates.
3. Measurements from 2008 and '09 will clarify whether the MPB attack success varies among the different nitrogen treatments.

David's success as a graduate student, and other personal endeavors, are a reflection of his dedication to his work and interpersonal relationships. He has received various awards, worked as a teaching assistant, and collaborated with a variety of individuals within the Faculty and beyond. Some of his partnerships include Gorman Brothers, the Ministry of Forests and Range, and the Forest Pathology Laboratory at UBC. His collaborations have contributed to his research and to the projects of the collaborators. In addition, he has built strong working and personal relationships with his lab group and peers within our faculty.

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Psychology of the environment

Pavlos Alexiadis

AN INITIAL INTEREST in nature's processes led me to complete a BSc degree in Forestry and the Natural Environment in my home country of Greece. However, as I had always found the business world quite stimulating, I decided to follow this with an international MBA graduate program at the University of Glamorgan in Wales. As a next step, after working at a multinational company for a while, I decided to acquire a more international background by moving to North America for continued graduate studies.

I chose the UBC Faculty of Forestry because of its worldwide reputation. Furthermore, it was one of the few universities offering an MSc in Forest Products Marketing and Management. With this degree I essentially combined the knowledge from my two previous degrees and looked at how businesses can profit from sustainable environmental activities. While studying for my MSc, the high level of interaction between students and professors helped me understand other people's perspectives. At this point, I decided to continue with PhD studies.

I examined human behaviour in relation to environmental activities inside the home. Human impact on the environment is massive and implementing relevant solutions to minimise it depends on how people behave. This is an interdisciplinary subject in which I merge elements of environmental psychology, marketing, and architecture together. I identified factors that affect people's actions within an environmental context, which can be grouped into three major categories:

a) Internal factors consisting of psychological constructs such as personal values and specific attitudes toward green activities or situations.

b) External factors which are mainly uncontrollable by the individual. (*e.g.* building regulations or existence of media campaigns.)

c) Demographics.

I developed a model to combine all of these factors. There were two primary paths in the model that could result in behaviour adoption and which were roughly equivalent with 1) one's will and 2) one's ability to perform a given behaviour. Depending on the behaviour examined, the importance of each path was expected to vary substantially.

Data from households throughout Canada were collected to test the model which so far has been supported.

I am privileged to have worked under the careful supervision of Drs. David Cohen and Rob Kozak and with the valuable guidance of Professors Ray Cole and Michael Meitner for this project. The interdisciplinary approach I used and the knowledge of consumer behaviour and sustainability I acquired can be applied to a variety of social science and/or business settings. Upon graduation, I would like to pursue an academic career and continue to investigate areas where human behaviour plays a major role in running a profitable business without overlooking environmental impacts.

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Evaluating community forest tenure

Lisa Ambus

PRIOR TO BEGINNING graduate studies at UBC, I served as the coordinator of a global network that promoted community forestry. Though the work was interesting, introducing me to innovative community initiatives and inspiring leaders from around the world, I wanted to develop a deeper understanding of the theoretical rationale for and practical implications of devolving forest management authority to communities.

In Forestry at UBC, I found a flexible and interdisciplinary program, compatible research interests, and a wide range of knowledge among both faculty and graduate students. My interests in community forestry fit as a case study within a national study of forest tenure reform, funded by the Sustainable Forest Management Network, a project in which my supervisor Dr. George Hoberg was involved. To support my research I was also fortunate to receive generous scholarships from the Social Sciences and Humanities Research Council and the Macaree Family Foundation.

My study consisted of a qualitative analysis of community forest tenure in BC. I addressed the question of whether the community forest program has met government's stated intention to provide "local control over forests for local benefits". I examined the structure and function of the community tenure, and identified the actual degree of authority transferred from the provincial government to community tenure holders. Analysis revealed that the degree of devolution is quite modest. The community tenure is a smaller and only slightly modified version of the industrial Tree Farm Licence. As such, 'local control' is largely restricted to operational decisions, affecting on-the-ground aspects of timber harvesting rather than enabling a more holistic approach to community forest management.

For eleven community tenures included in the study, I also evaluated whether the program was fulfilling expected outcomes. Did community tenure holders use their rights to commercially harvest and manage for botanical non-timber forest products? Did they employ more environmentally-sensitive silvicultural treatments than industrial licensees? Did they pursue opportunities for value-added wood processing, and generate local employment? My study found that outcomes of the community tenure generally did not meet these expectations, and raised further questions about local capacity, scale, and economic viability of these community-based ventures.

Since defending my thesis, I relocated to Smithers, BC. I have been working as a research and extension consultant, focusing on the 'people part' of natural resource management. Just recently I accepted a position with the Integrated Land Management Bureau as a Land and Resource Coordinator. In the future, I would like to be involved in applied research that addresses questions related to community-based natural resource management, particularly as more opportunities are created for First Nations and community authority over land and resources in BC.

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Estimating tensile stresses during wood drying

Ciprian Lazarescu

AFTER COMPLETING a master's degree in wood science at the Transilvania University of Braşov in my home country of Romania I worked as a project coordinator for a construction company and also taught courses as an assistant professor in wood science at my home town university. Feeling that I could do and learn more I applied to doctoral programs at UBC and the University of Melbourne, both prestigious universities in the wood science community. The first answer came from UBC; you could say that UBC chose me and I have never regretted this decision.

I arrived at UBC in 2005 and embarked on research with Dr. Stavros Avramidis in the department of Wood Science. My research focused on the tensile stresses of wood drying that are often responsible for lowering the quality of the final end product. By measuring the influence of restraints to free shrinkage, I hope to provide a better understanding of how the wood shell behaves during drying. I studied the effect of tensile stresses on artificially restrained small wood strips and correlated these experiments with drying tests made on short pieces of lumber. My results allowed me to correlate the amount and rate of moisture loss depending on the partial vapour pressure of the surrounding environment, determine the fiber saturation point, and study the elastic and visco-elastic components of the restrained shrinkage process. My research provided information on how interconnected variables such as temperature and moisture content can have a significant impact on the desorption process. My final model yielded high coefficients of determination (R^2=0.83-0.85, $p<0.05$) for both tangential and radial structural directions, respectively. The cutting patterns of the short lumber also proved to have a great influence over the tensile stresses.

Understanding the fundamentals of defect formation, and further optimization of the drying schedules will allow us to waste less fibre and produce a more valuable final product with a longer service life. A reduction in drying defects also means that fewer trees need to be cut down. This new knowledge can also encourage our British Columbia forest industry to do more drying at home.

I have now completed my experimental work and have written a draft of my thesis. After I graduate I would like to continue my work in research and continue to work on designing better drying schedules for wood.

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Wood Products Processing Co-op presentation evening

EVERY YEAR IN OCTOBER and January, the UBC Wood Products Processing Program hosts its Co-op Presentation Evening at the Centre for Advanced Wood Processing. The event gives co-op students an opportunity to showcase the accomplishments of their most recent work terms. This past January, the event drew quite an audience, among them twenty-two industry employers from as far away as Ontario and Washington state. Attendance at the event remains strong, reflecting the continued support and interest employers have in hiring our co-op students and graduates.

Bob Smith, an alumnus who is now a Branch Manager with Sauder Moulding and Millwork, has been attending almost every Co-op Presentation Evening over the past few years. "My expectations for the evening were to see what kind of new talent is coming out of the Wood Products Processing Program," he said. "The event is an opportunity to network with prospective employees, talk to industry contacts, and also discuss issues that we have in our businesses with some of the professors."

January's Co-op Presentation Evening consisted of ten presentations delivered by students in their final year who have just completed their senior work terms and are scheduled to graduate in the spring. The presentations were a direct reflection of their experiences in the industry during the previous year and topics included everything from implementing new marketing tactics and cost-savings plans to dealing with cutbacks.

As Stephen Toope and other BC university presidents have suggested, universities will play an essential role in the economic recovery process over the next few years. They have predicted that university graduates will create and staff some of BC's leading companies, something that resonates with the aim of the Wood Products Processing Co-op Program which complements students' cutting-edge education and advanced technical training with direct, hands-on, industry experience that will prepare them for management roles in the wood products sector.

Rob Stewart, Canfor's Vice President of Human Resources, agrees that the Co-op Program is paramount in preparing students for work in the industry after graduation. "The co-op students that we've hired and brought into the company have been very strong and certainly delivered some of the skill sets that we believe we will need in the future," he says. "That's why we have been using the program – to bring some of the future managers into our company."

This year's presentations made it clear that there continue to be great opportunities for students enrolled in the Program. Our senior co-op students dispersed across three continents for the course of their eight month work terms. Of the students, 60% completed co-op terms within Canada, working for companies such as Canfor, Interfor and Goodfellow. The other 40% worked in Australia, Japan and the United States; their presentations were based on work completed for Forest Enterprises Australia, the University of Tasmania, Key-Tec Co., and Pöyry Forest Industry Consulting.

"I thought this year's event was one of the best that I've been to..." remarked Bob Smith. "There were students focused on marketing and sales, there were presentations focused on the technical side of things, and there were some presentations focused more on leadership or supervisory roles. It's clear that students who pick their co-ops well are getting a well-rounded set of skills and experiences."

Based on the quality of the students' presentations and the response from industry professionals, the Program is continuing to live up to its mandate to prepare graduates to take up the mantle and lead tomorrow's wood products sector.

For more information about the co-op program, email wood.co-op@ubc.ca or call 604-822-4793.

Chris Mihalcheon during his 2008 work term in Australia.

continued from front page

more mistaken about the nature of graduate student education.

A committed and effective supervisor is critical to a graduate student's success, but much more is needed. The student and supervisor must be supported by other faculty members willing to contribute to the student's success by serving on their supervisory committees and offering courses, seminars and workshops for graduate students. Students and professors must be supported by a graduate program which is adequately resourced to provide efficient administrative support and unfailingly focused on timely and successful completion of every student. The program and the university as a whole are increasingly encouraged to ensure that our graduates have also developed the professional skills that will allow a smooth transition into their working careers. All those involved in graduate education have the additional responsibility of making sure that our students feel valued and respected, are engaged in the intellectual and social life of the department or faculty, and are just as motivated (or hopefully more so) when they graduate as they were when they began their graduate program.

Graduate students are often referred to as "the research engine of the university", but this analogy is problematic in that it promotes the "cheap pair of hands" thinking which undervalues both graduate students and graduate education. Truth is, if one were designing an engine to efficiently do research and produce new knowledge, it is unlikely that graduate students would be included in the parts list. In reality, the central place of students in university research makes the research enterprise of a university fundamentally different from any other type of research institute. Consider the resulting business model; at first glance it seems curious and inefficient:

- we only take on people who are not trained to do the job (*i.e.* research)
- we support them while they develop the skills needed to do the job (and we also pay the people who train them)
- as soon as they are able to do the job, we send them away and take on someone else who is not trained
- we usually take on young people who do not have a proven track record of success
- we like to take in people from other countries and cultures, who will need some time to adapt.

Obviously, this is not how one would run a research institution, which emphasizes the point that a university is not simply a research institution. The primary mandate of a university is education and our primary product is graduates. Research and knowledge creation are additional benefits that arise from successful training of new researchers.

Why should public and private money be invested in this enterprise? Quick perusal of any newspaper on any day provides countless challenges we face today both locally and globally, and unseen challenges will certainly arise in the future. Simply put, we will need smart, educated and motivated people solving problems and creating opportunities. The recognized importance of graduate education in preparing for the future is apparent in recent bolstering of graduate scholarship programs by both provincial and national governments, in the face of other laudable options. I am sure that after reading these profiles, you will agree that graduate research and education is a wise investment in people who will soon be making a positive difference in the world.

In this issue we also highlight our successful Wood Products Processing Co-op Program, in which students receive direct, hands-on industry experience in addition to advanced education and technical training that prepares them for management positions in the wood products sector.

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