Earth, Ocean and Atmospheric Sciences

ALUMNI NEWSLETTER

Number 15 (2012)

Message from the Head

Dear Alumni and Friends

This has been another year of incredible change for the Department. The pace of construction for the Earth Sciences Building is frenetic. By the time you receive this newsletter we will be moving into the new building and renovations to reconfigure EOS Main building will have begun. By this time next year, the Department will be housed within a single complex, and our teaching and research activities physically integrated for the first time in the history of the Department.

Members of the former departments of Geological Sciences, Geophysics and Astronomy, and Oceanography formed the Department in April 1996. At that time, “earth and oceans” encompassed the scholarship of the department. In 1999, three Atmospheric Science faculty joined Earth and Ocean Sciences from the Department of Geography. Since that time there have been numerous formal and informal attempts to identify a moniker that captures the breadth and interdisciplinary nature of our research and teaching. At our annual retreat last year, the Department voted overwhelmingly to change our name to the Department of Earth, Ocean and Atmospheric Sciences. That change became effective on the 16th anniversary of the formation of the department this past April. In choosing the new department name, we have intentionally focused on the domains in which we operate rather than on the disciplinary foundations of our work. By listing the three “spheres” (geo-, ocean-, atmosphere), we assert the interconnectedness of these domains and the interdisciplinary nature of teaching and research in the department.

We continue to excel in our teaching and research mission, both in quality and quantity. Student enrolments are larger than they have ever been: 9,000 registered in undergraduate courses, 425 in honours and majors programs, and more than 200 seeking Masters and PhD degrees. Within this newsletter you will find updates from undergraduate clubs, a summary of graduate theses awarded, and faculty awards and publications highlights of the past year. The QS World Rankings, the only university ranking system that includes evaluations at the disciplinary level, continue to recognize UBC as tops in Canada (and 18th in the world) in the earth and marine sciences.

The opening of the Earth Sciences Building this fall will provide an opportunity to recognize the support of our alumni and friends that has been instrumental to our growth and successes. We will use our website and email to publicize the details of these events and celebrations. If you are in Vancouver, please consider a trip out to the Point Grey campus to introduce yourself and explore a transformed Department of Earth, Ocean and Atmospheric Sciences. If you are farther afield, please stay tuned through our website, and keep in touch either through email or by using the form at the back of this newsletter.

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Earth Sciences Building Update

by Dr. Raymond Andersen

Spectacular View from the Fifth Floor Conference Room

For those of you who have walked down Main Mall recently, you will recognize that the ESB building is now looking substantially finished. It is hard to believe that demolition of the old Geophysics Building took place only a little more than two years ago. Since then, we have watched a large hole in the ground appear in its place, followed by the slow emergence of our new building. The time-lapse photos of the process that are on the EOAS web page are worth taking a look at.

The current date for handover of the ESB to EOAS is August 23, 2012. In preparation for the handover, we are now actively working on planning and scheduling the move into the new space. Most occupants will move sometime in September and there will be an official opening later in the fall.

ESB Atrium

Everyone is excited about getting into the new space. The building will provide state-of-the-art research facilities for EOAS and there are also three state-of-the-art lecture theatres that will advance our teaching mission. A café at the south end of the first floor will offer food and a meeting place for everyone from EOAS and visitors.

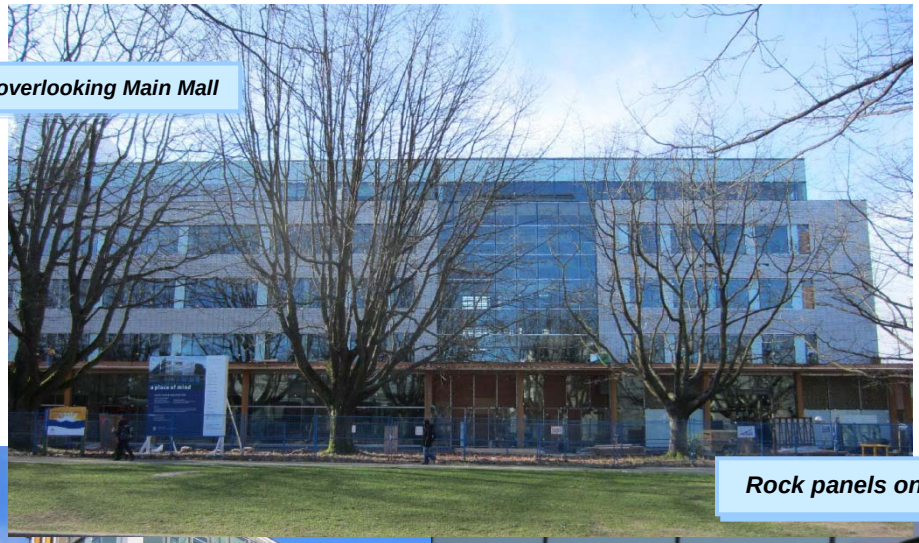
The building has many wonderful features; these include:

- A spectacular five-story high atrium;
- A boardroom on the fifth floor complete with video conferencing capabilities and a great view;
- A high-head research lab in the basement with an impressive red crane that can be viewed through glass walls on the ground floor; and
- An ultra-modern clean room facility on the fourth floor for trace metal research;

Two things to look for if you visit: a series of beautiful rock panels on the outside of the northwest corner of the building that are both decorative and teaching aids, and the fact that the entire north wing of the building was built with a wooden frame.

The wood construction theme is carried out in decorative ways throughout the building. It is estimated that the entire construction was carbon negative because of all of the CO_2 captured in the wood building components.

September 2012 promises to be a major milestone in the evolution of the EOAS Department, since it will mark the first time that the entire department has resided in one building complex. We anticipate that the new facility will help EOAS continue to build on its already exceptional research and teaching reputation.



ESB façade overlooking Main Mall

Rock panels on NW side of ESB

Portico in wood connecting EOS-Main

Bridge from ESB to EOS-Main

Architect's Rendering of the Oliver Field School

Oliver Field School - Rebuilding

In late October Earth, Ocean and Atmospheric Sciences faculty and alumni launched a long-awaited $2.4M fundraising campaign to rebuild the Department's Geological Field School in Oliver, BC. While facilities at the Field School are aging, the camp is uniquely situated to take advantage of the varied local geology and boasts a retired gold mine which has been mapped by UBC students for more than 50 years. The new camp will be located at the site of the current field school and will have capacity for up to 90 people.

Greg Dipple, Head of the Department of Earth, Ocean and Atmospheric Sciences, launched the evening event with thanks to event sponsors Mackevoy Geosciences Ltd. and to the volunteers and donors including Chan Buckland, Rob and Joan Carne, Gordon Davis, Lee Groat, Rob McLeod, Barry Price and Harry Wheeler who have helped hone the vision for the new camp and get the fundraising underway. Ken Hickey spoke of developments in the Field School curriculum in recent years, including the implementation of a pre-field school boot camp and the addition of two new mapping exercises.

The goal is that construction will begin in June 2013. Geological Engineering Class of '62 alumnus and donor Gordon Davis acknowledged the success of UBC Geological Science and Engineering alumni, and the significant contributions that his class has made to the Field School campaign. He challenged other classes to exceed the $300,000 raised by the GeoEng Class of '62 and encouraged prospective donors to speak with Jenny Yoshitani of the Faculty of Science Dean's office.

Following the speaking program, faculty and alumni shared field school memories and discussed plans for the new buildings and enhanced curriculum in more detail – and made plans to reunite at the opening of the new field camp.

In Memorium
Wilbert Roosevelt (Ted) Danner
February 28, 1924 - May 26, 2012

Ted Danner in his office - note the bag of pop cans in the background.

Wilbert (Ted) Danner was born in Morningside, King County, Washington on February 28, 1924, the son of Imogene Breed and William Delbert Danner, a farmer and salesman in a plant nursery. Testament to the knowledge Ted gained from growing up so involved in a nursery is the large palm tree that he planted in the rear of his house at 14th and Sasamat in West Point Grey. He wrapped it with insulating material each winter to protect it from freezing. His identical twin brother ran a flag store in Seattle; he passed away several years ago. Ted was the first of his family to attend university.

The family were poor and as a youth Ted worked several jobs, including selling eggs door to door from the family's chickens. His interest in geology was sparked by a Boy Scout trip in the Olympic Mountains, affordable at $12 for two weeks.

The four day hike was terrible - Ted got blisters, his pack board broke, he was cold at night because there wasn't sufficient bedding, and the food made him sick - but he also found quartz crystals and his first fossil, a cobble containing Buchia brought by glaciers from Harrison Lake. He loved it and decided to go into geology. Ted also remained involved in scouting for much of his life.

University was a struggle financially. Ted and a group of fellow first year geology students persuaded the department Head (George Goodspeed) to let them take three geology courses the first year, postponing physics, so they could get an early start in geology.

Ted graduated in 1946 and was admitted to grad school to do an M.Sc. degree on the geology of the Olympic Mountains under Peter Misch. He also began his Ph.D. with Dr. Misch and simultaneously took his first teaching position at Wooster College in Ohio, where he taught general geology, stratigraphy, paleontology, sedimentology and petroleum geology, and then drove home every summer to continue work on his Ph.D. Danner received his Ph.D. from the University of Washington and came to Vancouver and the University of British Columbia in 1954.

As a Professor and eventually Professor Emeritus at UBC, Ted's field of professional interest was carbonate petrology. He taught introductory geology for many years, and sparked an initial interest in geology among many students. His advanced courses were mainly in his field of professional interest but he also took delight in occurrences of placer minerals such as gold and platinum, unusual mineral specimens and unique geological situations. He taught a gem mineralogy course at UBC that was very popular. He continued teaching this course into his late 70s, well after official retirement, and amassed a truly impressive collection of collector-quality mineral specimens.

Ted corresponded with people all over the world who shared his interests in geology, stamp collecting or coins. His Christmas cards always had a unique photo of a scene or geologic detail from somewhere in the world that his recent travels had taken him and were awaited with interest each year by his correspondents.

Ted established two geological scholarships at UBC with the proceeds from the return of bottles and cans that he collected weekly on campus. Rather than have the awards in his name, as the administration would have preferred, he insisted it be called the 'Beer-Pop, Can-Bottle, Deposit Refund Bursary'. A trophy was constructed out of cans and bottles for the scholarship and continues to be a quirky landmark in the Department even today.

Ted Danner was a respected professor and teacher who inspired many young geologists. He will be missed.

The Vancouver Sun Article on the " Beer-Pop, Can-Bottle, Deposit Refund Bursary" Dated May 27, 2000

BILL KEAY/Vancouver Sun

TRASH, YOU LIKE IT: Wilbert (Ted) Danner with his trophy, which is made out of bottles, cans and other refuse.

Stray bottles and cans add up to a lot

Long before recycling was socially promoted, Dr. Wilbert Danner was perturbed that partying students left beer bottles strewn over the campus.

"It was a waste of money. I decided to collect them, get the rebate and put it into a fund and show what a waste of money it was."

Fifteen years ago, on his days off and on weekdays after classes, the UBC geology professor started combing campus parking lots and Wreck Beach for bottles. Over the years he became a familiar sight, burdened with bags and a backpack full of bounty.

Danner acknowledges that he could be regarded as eccentric. "Some people say to me, 'You're a professor, you shouldn't pick up garbage!' "

On his travels he often found coins, too, and was thus inspired to write a paper on money sedimentation — which, when published in a scientific journal, received so much international media attention he became a sort of celebrity, with interviews from the CBC to the BBC.

"Everybody that saw [the interviews] remarked about it. A lot of people said, 'You're the professor who p[illegible]cks up money and cans!' A student interviewed me and asked if I was embarrassed as a professor, going out and picking up garbage. I said, no, it was the principle of the thing."

Danner is now retired from UBC. But in his 15 years of collecting, he has earned nearly $30,000 and invested it in a fund. The annual interest provides two bursaries, worth $1,000 each, for geology students.

UBC, which initially snorted in disdain at Danner's bursary fund because he insisted it be called the "Pop/beer-bottle/can Deposit Refund Bursary, now displays a very large trophy in the geology building with the bursary winners engraved in bronze.

— Deborah Jones

Reprinted here with permission from The Vancouver Sun, July, 2012

Seeking Precious Minutes of Focused Attention

by Brian Lin, UBC Reports

Science Teaching and Learning Fellow Brett Gilley (left) discusses an in-class activity with Prof. James Scoates. Martin Dee Photography

What it takes to give your science class a makeover

Walking down the angular halls of the Department of Earth and Ocean Sciences (EOS), Brett Gilley stopped by Professor James Scoates' office to scan through a stack of activity sheets where fourth-year students had drawn, to the best of their recollection, cross-sections of the Earth's crust and possible locations of mineral deposits on the first day of class.

"What did students say was the hardest part of the activity?" asked Gilley, a Science Teaching and Learning Fellow (STLF) with the Carl Wieman Science Education Initiative (CWSEI).

"Scale," Scoates answered. That piece of feedback from Scoates' students will not only change how the 16-year veteran teacher begins this future classes, but is influencing the content of several other courses in the department by pointing out one of the major challenges students face, which happens to be one of the key competencies of geological scientists.

This kind of impromptu meeting has become commonplace since 2007, when 27 courses in EOS were selected to undergo transformation. They were chosen, based on reach and impact, to morph over a five-year period from the traditional "stand-and-deliver" model to something much more interactive.

"It was relentless," Scoates recalls. Over two years starting in 2009, Gilley, Scoates and Assistant Professor Ken Hickey dissected their course, identified the most important concepts in the syllabus and articulated clear goals they'd like students to achieve.

Learning activities such as the deceptively simple drawing exercise were discussed and tested against a growing literature of cognitive psychology research—a key component of Nobel laureate Carl Wieman's approach to improving teaching and learning undergraduate science through individual course transformations.

"I can't say I enjoyed all aspects of the process, but I definitely saw the value," says Scoates, who has since partnered with Gilley to revamp two more courses.

Half of the first-, second- and third-year courses in EOS have undergone transformation—and almost three quarters of the department's instructors have participated—with the help of Gilley and three other STLFs. As a result, approximately 10,000 students — a majority of them non-science majors —have learned about topics such as natural disasters and climate change in vastly different ways from their parents, or even slightly older cohorts. Nearly at the end of their five-year plan, EOS is now in the midst of a complementary curriculum reform.

"This sort of work usually takes a long time," says Gilley. "The degree to which the department has embraced this is absolutely amazing."

Halfway across campus, in Wieman's home Department of Physics and Astronomy, course transformations are moving ahead with characteristic meticulousness.

The partnership between STLF Louis Deslauriers and Assistant Professor Kirk Madison began over dinner with a visiting colleague.

"I told Kirk about the work I was doing with other courses and I could tell it was outside his comfort zone, but he was also excited by it," recalls Deslauriers, who helped Madison transform a third-year quantum mechanics course.

"The methods Louis described resonated with me because it's how I mentor my graduate students—less of a step-by-step cookbook instruction and more an open-ended exploration of ideas," says Madison. "The challenge was scaling it up to 90 undergrads."

Deslauriers and Madison focused on creating various points where students are asked, in groups of three or four, to articulate, debate and answer a question —what the two playfully call "learning events."

"The process of deliberating, communicating and discovering ideas creates a common bond that connects people," says Madison, who likens it to the spark people experience when falling in love. "Training our students to both think collectively and by themselves is a critical component of a university education because it forms the basis for the creation and acquisition of meaning and knowledge."

Giving the students time and space to think independently, however, meant relinquishing some control as *Master of the Classroom*.

"Before I tried these activities for the first time, I worried a lot about crowd control," Madison says. "Do they see I'm doing my job or would they think I'm downloading responsibility onto them? Are they going to respect me?"

What happened next was "unreal," says Madison. "When the discussion time was up and I began to offer my feedback, the room went silent. And for the next 180 seconds the students were on the edge of their seats hanging on my every word."

Madison and Deslauriers recorded such data throughout the term and found that this critical attention span lasted less than four minutes. Their findings are now submitted for publication.

"In a traditional lecture, you can do jumping jacks, cartwheels and back flips and you'd get some of the students' attention for maybe 10 seconds," says Madison. "But now I had the undivided attention of the entire class for three whole minutes—they were primed, it was my window of precious lecture time and I knew I had to make it count."

Madison's course now revolves around these 'learning events'—up to a half dozen in a 50-minute class – and his 'lecture' consists of feedback and Q&As to those activities. As a result, he has seen improvements in the students' behaviour and marks, both of which have been meticulously documented and analyzed, another key element of the CWSEI approach.

One of Deslauriers's recent studies about two other UBC physics classes made headlines worldwide after it appeared in the prestigious journal *Science*. For their part, researchers and instructors in EOS have produced more than 50 papers, presentations and workshops detailing their experience.

Both teams say establishing a "feedback loop" between instructors and students is key to an engaging learning experience, while mutual respect is the secret of their successful partnerships.

"The barrier has dropped between me and my students," says Scoates. "They aren't embarrassed about asking questions or saying what they might think is the wrong thing."

"I used to ask myself if I'd covered everything I wanted to in a lecture," says Madison. "Now the question I ask is 'Did they get it?' which is a much harder question. But, with constant feedback during class, I am much more certain of the answer."

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Tornadoes

by Roland Stull
Chair, Atmospheric Science Program

A tornado near Anadarko, Oklahoma. The funnel is the thin tube reaching from the cloud to the ground. The lower part of this tornado is surrounded by a translucent dust cloud, kicked up by the tornado's strong winds at the surface. The wind of the tornado has a much wider radius than the funnel itself. (Wikipedia/tornadoes)

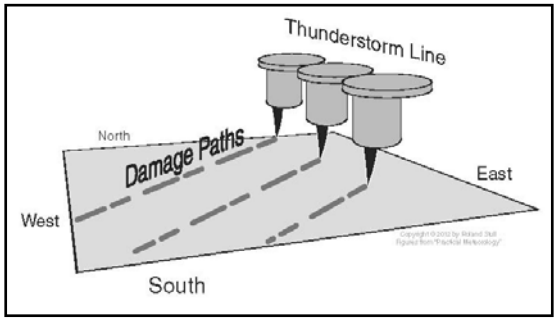


Figure 1

Tornadoes are violently rotating columns of air, in contact with the ground. All strong tornadoes are associated with thunderstorms. The most severe tornadoes are associated with the most severe thunderstorms, called supercell storms (Fig. 2). Supercell storms in North America often (but not always) move from southwest to northeast, hence most tornado damage tracks have this same orientation (Fig. 1).

Tornadoes move horizontally at an average translation speed of about 10 - 20 m/s, although faster and slower speeds have been observed. Thunderstorms are more frequent during several hours before and after sunset; hence, that is also when tornadoes are most likely.

For any one storm, such as in Fig. 2, if you were stationary as a storm moves towards you, you would experience the following sequence of events:

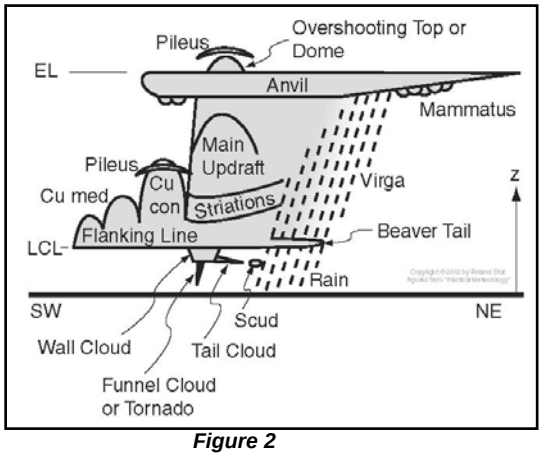
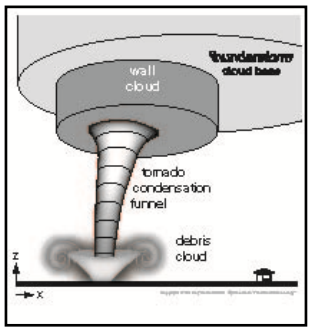


Figure 2

- See the storm in the distance to the southwest;
- High clouds of the anvil move overhead, while lightning is in the distance;
- A gust front of cold, ozone-filled (smells like a copy machine) air sweeps over you;
- Rain starts and intensifies;
- Some hail or graupel (small pellets of icy snow -- future hailstones);
- Just as the precipitation ends, the tornado arrives (if there is one);
- Clearing behind the storm, sometimes allowing beautiful rainbows to the east.

Supercell thunderstorms often rotate very slowly -- too slowly to see with the naked eye. This rotation is known as a mesocyclone, and is one of the ingredients needed to later spawn strong tornadoes. Evidence of this rotation often appears as cloud striations (Fig. 2) that wrap around the outside of the thunderstorm similar to threads of a screw.

Figure 3



As rotation speed increases in parts of the storm, an isolated lowering of the cloud-base sometimes appears. This is known as a wall cloud, and rotates fast enough to be visible by eye (Fig. 3). If you see a rotating wall cloud, keep an eye on it because they are often precursors to tornadoes. Tornadoes are made visible by water droplets (the funnel cloud) and/or by debris thrown up from the surface. Some tornadoes can be invisible.

The supercell tornado would come out of the bottom of the wall cloud. But not all wall clouds have tornadoes, and not all tornadoes come from wall clouds. Although the tornado and wall cloud are visible below the base of the thunderstorm, the violent rotation can extend much higher into the body of the thunderstorm itself. This intense rotation is a hazard to aircraft flying in thunderstorms. This rotation inside the storm can spin-up 15 minutes or so before the tornado appears at cloud base, which can be detected as a tornado vortex signature by Doppler weather radar in order to give a 15 minute (or so) warning of a possible tornado.

The normal lifecycle of supercell tornadoes is shown in Fig. 4. In stage one there might be a dust swirl near the ground. Stage 2 is the developing stage, where a condensation funnel cloud begins extending down from the wall cloud. Stage 3 is the mature stage, while stage 4 is the dissipating stage. Finally, the tornado disappears.

Even in their mature stage, supercell tornadoes can have many different shapes, a few of which are sketched in Fig. 5. But not all tornadoes come from supercells. Tornadoes from other systems are sketched in Fig. 6 -- most of these are weaker and less destructive than supercell tornadoes.

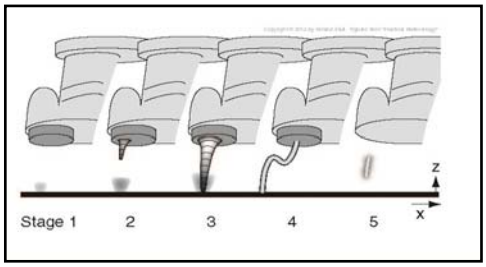


Figure 4

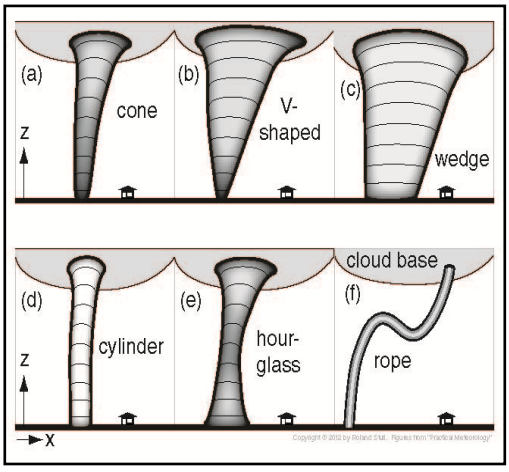


Figure 5

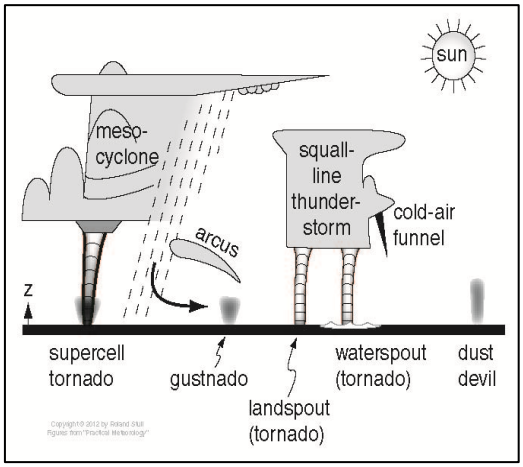


Figure 6

Tangential velocities around tornadoes vary from about 18 m/s to greater than 140 m/s. Tornado rotation is strongest about 15 to 150 m above the ground, where upward velocities can be 25 to 60 m/s. These faster speeds can tear trees from the ground and lift cars and trucks. Tornado intensity is classified not by their rotational speed, but by the damage they cause. The Enhanced Fujita Scale is the damage scale used in North America, where the weakest is EF0 and the strongest is EF5. In Canada, 45% of tornadoes are EF0 (29-38 m/s tangential velocity), 29% are EF1 (39-49 m/s), 21% are EF2 (50-60 m/s), 4% are EF3 (61-73 m/s), 1% are EF4 (74-89 m/s), and nearly 0% are EF5 (>90m/s, although one was observed near Elie, Manitoba in 2007).

If you are in a car, near a tornado, drive away. Do not park under a bridge overpass, because a wind-tunnel effect causes more destructive winds there. If you are in a wood-frame home, move to the basement or a tornado shelter. In a stronger commercial building, move to interior stair wells or to a basement. In mobile homes, evacuate and move to a detached tornado shelter or a ditch. If you are on foot, find a ditch to get in -- you will probably get wet from the rain, but you will avoid the flying debris which moves like a killing spray of bullets.

Worldwide, the greatest risk from tornadoes is in the USA, particularly in "tornado alley" of the southern plains states and the southeast states. Tornadoes are also observed in Canada, UK, Australia, Argentina, Europe, and South Africa. I used to live near tornado alley, so my wife and I had an action plan when we heard the tornado sirens: I would grab the camera and run outside, and she would grab the wedding photos and run to the basement.

GLASS
by Bruce Farquharson

Glass is not a mineral. Glass has no crystalline structure. It is made by fusing silica sand, with all its various impurities, frequently with the addition of boron to impart the property of chemical resistance.

***Robert Mitchell Thompson**, devoted teacher and meticulous scientist, passed away on April 15, 1967, after an illness of several months. Dr. Thompson, professor of mineralogy in the Department of Geology at the University of British Columbia, was widely known and highly regarded by his many students, prospectors and mining men and his colleagues in his field of mineralogy. He was conscientious and untiring in his willingness to help others identify rare or unusual minerals or to understand the peculiarities of minerals.*
Reproduced in part from: The AMERICAN MINERALOGIST, VOL. 54, MARCH-APRIL, 1969

R.M. Thompson seen here teaching at an evening class

R.M. Thompson was a short, slim, energetic man with dark, serious eyes that could detect the slightest flaw in judgment or truth. His nose was long and slender and his narrow lips would occasionally break into a conspiratorial smile to complement an anecdote or some academic tour-de-force. He typically wore a navy blue, pin-striped suit and, with his dark hair slicked back from a lined forehead, resembled either a banker or a Chicago gangster. His stride was forceful, there was much to be done and time was of the essence.

Professor Thompson was held in high esteem by his students in light of his academic accomplishments in the field of x-ray crystallography as well as his high expectations of those in his charge. His lectures were jam-packed with information and his verbal delivery was such a staccato of mineralogical missives that his middle initial, M, was considered to stand for "Machine-gun". In the early 1960's at the University it was both exhilarating and daunting to take Thompson's class in Mineralogy.

I had ventured to pursue studies in Geology after wallowing around in the rarified realm of Physics, discovering that I was more suited to the tangible interdisciplinary milieu that was slowly unraveling the mysteries of Mother Earth. I was entranced by the endless variety of examples of volcanism, folding and faulting, fossil assemblages and rock and mineral families. The microscope brought to my eyes a new universe of observations, and even the resinous odor of Canada Balsam glue used to cement thin sections of minerals to the glass slides seemed to permeate the aether of my fascination. I have to say that even my somewhat tenuous relationship to God and the Anglican Church was re-molded by revelations of astronomical hypotheses, evolutionary developments in fossils, mountain-building processes, and the overwhelming magnitude of geologic time.

I could have been a detective. The whole foundation of geological surmise is based on discovering and assembling clues to events of the past, things that happened with, at the most, mute witnesses; trilobites, clams, or even dinosaurs. To reconstruct some scenario based on a minimum of evidence required a sound understanding of the realm of possibilities, combined with an alchemy of ideas sprung from an apprenticeship to the past masters of geological literature. I was a keen observer and did well in my studies. My best subject and greatest passion as an undergraduate was mineralogy and so I became a disciple of Robert "Machine-gun" Thompson.

I remember that first day of class when about 35 third-year male students assembled in room 104 of the old ivy-covered, grey stucco Geology building situated on West Mall. The buzz of conversation abruptly stopped as Thompson strode into the room, taking up his position at the long, dark brown, paneled demonstration desk. He immediately launched into a synopsis of the mineralogy course, listing topics on the blackboard, and then suddenly swung around to face the class. In a vacuum of sound and in a low, casually firm voice he bluntly confided, "You should know that, based on past observations, 95 per cent of the class will become simply pedestrian geologists since most of you have neither the diligence nor the latitude of imagination to develop a truly creative and masterful mind." The shock was immediate, breath-taking and palpable: no one knew where to look and eye-contact was out of the question. This ingenuous view seemed, at once, insulting and ignorant (since he knew none of us) but also, I suddenly realized, a challenge - a device to see which of us might determine to squeeze into that 5 per cent that was still available to the potentially anointed. I was hooked.

As the semester proceeded we were introduced to the many forms of crystals, the chemistry and variations in compositions of minerals, the processes of their formation and the likely places in which they might be found. Our three-hour laboratory sessions were mainly for hands-on inspection of mineral samples, with simple equipment for magnifying, scratching, etching and heating. Later on we would learn to perform chemical tests to reveal the presence or absence of various metals. We worked in pairs, rehearsing diagnostic properties and related information; committing to memory the pedigree of each mineral. For a visitor to the laboratory this diorama of small knots of students, each hunched around a mineral tray reciting information, might resemble a sort of monastic ritual of rocking and nodding and low chanting. The high priest, Thompson, would circulate amongst us pointing out salient features, occasionally adding an anecdote concerning the mining or collecting of the mineral. Here, his eyes would gleam and his fleeting smile would be left as a small treasure of his presence.

The first exam was devastating. Mineral specimens were set out on counter tops in the lab so that we could move from one to the next, noting each identity and related features, until the cycle was complete. But so many of the specimens were a non-descript white and I was crammed with over-studied information, such that I became lost in a jumble of mixed clues and sweaty emotions. In no time the exam was over and I charged out of the laboratory choked with disgust and disappointment, craving fresh air and space, knowing that I had bombed the exam. The marks posted the following day confirmed this and my 55 % placed me squarely in the camp of the pedestrian geologist.

For the next few days I felt flaccid and disheartened, and neglected the textbooks and lecture notes that, up to now, I had worked with so assiduously. I seemed destined to wind up on the waste heap of mediocrity. Walking past Thompson's open office door on the way to a class in paleontology, I was stopped by a call from within. I turned to see the familiar dark, pin-striped suit emerge, and an earnest face began to converse.

"I notice", he said, "that you have been spending extra time in the mineral lab."

"Yes Sir", I replied, stiffly. This was our first one-on-one talk.

"You seem to have a keen interest in mineralogy. Am I right?" We made eye contact and suddenly I relaxed.

"Yes Sir", I replied again, for I was not a garrulous person.

"How would you like to have access to my own mineral collection - that I use for Graduate students? You may do so as long as my lab is open, that is, if you want to."

"I-I'd love to", I stammered, astounded by my good fortune. "That is, I-I'd really appreciate it, and would take good care of the specimens, and not mix them up. When can I start?"

"Today, if you wish. But you are honour-bound to make sure that nothing goes missing from either the collection or the lab. All right?" And with that, he slipped back into his office, leaving me in an exhilarated state of amazement.

I was suddenly recharged and took in almost none of the paleontology lecture on brachiopods of the Devonian Period, so great was my anticipation of my new and treasured relationship. After class I barreled along the high-ceilinged corridor to the other end of the Geology building to Dr. Thompson's lab. The door was ajar but there was no answer to my timid knock. I let myself in and stood for a moment to scan the layout of the room. There they were: the great floor-to-ceiling cabinets with dark-stained swing-out doors that housed the mineral collection. I opened one of the doors, pulled out one of the heavy drawers and reverently selected a tray labeled "Albite". It was a much larger specimen compared to those in the undergraduate collections, it was white, it was from Spain and it was beautiful. And so, I began.

As the semester progressed I settled into a comfortable routine of study and gained new confidence in my exam results which had markedly improved. I found that I could return to the Geology building after supper often to find Thompson's lab open as he performed his own research. It was a world apart to sit in the dimly-lit old building with its dark-brown wainscotting, beige plaster walls and oiled wooden floors; to sit with a drawer of minerals, turning each one over, noting details with a hand lens, gauging the density, the variations in colour, the cleavage patterns and crystal shapes. Gradually, with the familiarity that comes with repetition, I developed a sense of mastery in mineral identification. Thompson would come and go, occasionally stopping to chat or to quiz or instruct, never becoming chummy but nonetheless leaving me with a sense of his approval.

By year's end I was at the top of the class. We had by now learned some diagnostic chemical tests to aid in identification, and we were about to face our final laboratory exam in mineralogy. I was confident. I felt good. All those extra hours with Thompson's collection were going to pay off. I took my place at one of the lab stations, stocked with all the requisite diagnostic equipment, and waited with some nervous impatience for the graduate student overseeing the exam to come my way. He produced a small envelope containing the sample that I was to identify. Opening it revealed a crushed sample of a mineral. Picking through some of the coarser fragments with forceps, I noted that it was a vitreous white and fairly hard and under the magnifying lens showed no cleavage or distinctive features. Then, as I worked through a flow sheet of various chemical tests I began to sweat. All of the tests for common metals were coming out negative. The stuff was nondescript. My exam sheet was pitifully devoid of diagnostic clues. I knew what it wasn't – and that was a long list! Had I done the tests incorrectly? Where was my confidence? Finally, a positive test for boron. I tried repeating a few tests and got the same results. And now time was running out; I was the only one left still slaving away. The only fairly hard boron mineral I could recall was not even on our list but was in the Thompson collection. *Dumortierite*: I unbelievingly wrote it at the bottom of my exam sheet and turned it in just as the bell rang.

I couldn't restrain myself. I tore down the hallway to Thompson's office, faced the glass on his door and, heaving a deep breath, knocked with controlled panic.

"Come in", said the voice. I entered. Through the window I could almost feel the Scotch mist blowing across the campus, emanating from a heavy dull-grey sky.

"What was it – the sample – what was it?" I tried not to sound demanding but I desperately needed an answer. Robert "Machine-gun" Johnson turned slowly in his chair, cradled the left side of his chin in his left hand, smiled his conspiratorial smile and answered, "*glass*".

Bruce Farquharson *graduated with an Honours Baccalaureate from UBC in 1963 and finished his M.Sc. in '65, following up with a scholarship to the Australian National University where I completed my Ph.D. in Isotope Geochemistry in 1969. I now live in retirement in Nanaimo.*

The Pacific Museum of the Earth

is undergoing big changes.

The times they are a-changin'…

by Elspeth Barnes, Curator

As you may know **Mackenzie Parker** left her position as Curator of the Pacific Museum of the Earth (PME) last Fall. Showing another facet of her expertise she has taken up a position as Managing Editor of Canadian Mineralogist, a very well-respected scientific journal focusing on the mineral sciences. Mackenzie was with the PME since 2002 and during her time here she oversaw the move of material from the amazing Pacific Mineral Museum downtown to the PME and of the extensive fossil collection (>17,000 items) to its new residence in the wonderful Beaty Museum across Main Mall. She was an active department member and will be sorely missed by members of the Earth, Ocean and Atmospheric Sciences (EOAS) department, PME volunteers, friends and colleagues across the UBC campus, local schools, who loved her enthusiasm and exuberance, and the mineral and museum community as a whole. I am sure you will join with me in wishing Mackenzie all the very best for the future.

To give you a little bit of my background, I went through university as a mature student following a career in the arts. My academic studies culminated in isotope geochemistry and pegmatite research, and I recently completed my Ph.D. and a post-doc position here at UBC. I have always enjoyed walking through the museum lobby and it has been exciting to follow in Mackenzie's footsteps. Juggling the diverse aspects of museum life can be a challenge, but I love my weekday routine; opening the precious gem Vault, switching on the lava lamp (mantle plume analogy), planning new displays, changing the paper in the real-time seismograph, checking what earthquakes happened the night before, dusting the cabinets, putting tornado juice in the tornado machine, stocking the giftshop, organizing volunteers, tackling the budget, teaching earth science workshops, etc., etc., etc.

You just can't get complacent around here, there is *always* a surprise waiting to happen.

One of the most exciting events in the PME calendar is the opening of the Earth Science Building (ESB) this coming Fall (see picture). All the staff and researchers in EOAS have been eagerly waiting for the improved facilities it will bring, the PME included. The museum will have an additional 120' of gallery space at ground level in this incredible state of the art construction. This prime location looking onto Main Mall will combine a work/study area for students with the opportunity to display some of our finest pieces in unique and custom designed cases. The north end of the atrium will house an extensive glassed-in area that will enable us to bring some of the larger museum pieces out of storage and place them where they should be . . . on display for your enjoyment. And we are hoping the atrium itself may hold an even more spectacular piece . . . fingers crossed. The museum will retain its current space in the EOAS Building. There will be a covered walkway, joining the new building to the old one, where you will be greeted (in the not-too-distant future) by a completely renovated, modern museum. It is an honour to be overseeing the PME during such an important transitional period.

The PME has something for everyone, I hope to see you soon.

New PCIGR Facility Opens in EOAS

After nearly 10 years since its establishment at UBC, and relocation to EOAS in 2005, the Pacific Centre for Isotopic and Geochemical Research (PCIGR) has more than doubled its analytical capacity and become a world-class facility with a pool of instruments that is unmatched in North America, dedicated to innovative research in the earth, environmental, oceanographic, atmospheric and biological sciences.

At the end of August 2011, the PCIGR completed construction of custom-built 2200 ft^2 laboratories on the ground floor of EOS-Main. The project was funded by the Canada Foundation for Innovation and the BC Government, and represents a total investment of ~$7.5 million. In September 2011, three instruments were installed in the new labs: the Nu AttoM high-resolution mass spectrometer, Agilent 7700 quadrupole mass spectrometer, and Resonetics M-50 laser ablation system. The Nu Plasma II multi-collector mass spectrometer arrived in May 2012. The final two instruments, including the extended geometry Nu Plasma 1700 (high-resolution capability with flat peak preservation for transitional metal analyses) and Nu TIMS (highest precision isotopic analyses), are expected in late 2012. Grand opening celebrations are planned.

The new facility has been named "**nUBC**" to reflect a recent partnership with Nu Instruments Ltd. (UK), a market-leading designer and manufacturer of high-performance mass spectrometers. The laboratories will house 4 Nu Instruments mass spectrometers and become an important testing facility and research & development centre.

Capitalizing on the unique design and setting of the new facility, educational displays and resources are being developed in collaboration with the Pacific Museum of the Earth, thanks to an outreach grant from the Canadian Geological Foundation.

The Nu Plasma II, the most recent addition to the new PCIGR facility.

PCIGR in EOAS to Host Major Student Training Program in Geochemistry

Dominique Weis, Director of the PCIGR, was recently awarded a prestigious and highly competitive NSERC Collaborative Research and Training Experience (CREATE) grant to train students and young scientists in applied geochemistry. The Multidisciplinary Applied Geochemistry Network (MAGNET) integrates state-of-the-art analytical laboratories and leading geochemistry researchers across Canada, including four EOAS faculty members in collaboration with specialists at McGill and the Université du Quebec (Montréal and Chicoutimi), University of Toronto and Ottawa.

The MAGNET program offers high-impact research projects in geochemistry under three themes: “fragile ecosystems,” “windows into the Earth” and “hidden resources.” For example, MAGNET will promote the development of new techniques to: detect, trace, and mitigate contaminants in the environment; document geochemical fluxes and cycles in the world’s oceans; determine the timing and recurrence of major geohazards; identify and quantify components and their distribution in the Earth's mantle; and improve geochemical indices/vectors in previously under-explored terrains.

This industry stream CREATE initiative provides internships with internationally recognized companies in the analytical, environmental and resource industries: Acme Analytical, Activation Laboratories, ALS Global, Lorax Environmental, Rescan Environmental, Anglo American Exploration, Barrick Gold, and Teck Resources. The program is also supported by Nu Instruments, who participate in MAGNET as part of their longer-term partnership with the PCIGR.

MAGNET trainees will also benefit from participating in conferences, weekly seminars, professional development workshops, annual research symposia, summer schools and university exchanges. MAGNET graduates will be uniquely prepared for careers in academia, government, or with analytical laboratories, environmental consulting firms, water resources development firms, mining and mineral exploration companies, where demand for personnel trained in geochemistry is at an all-time high.

PCIGR staff and students receive training from a Nu Instruments engineer on the Nu AttoM

Mineral Deposit Research Unit (MDRU)

Industry participants of the MDRU Porphyry Footprints Project led by Dick Tosdal (centre, sitting), John Dilles and Scott Halley during a field trip at Butte, Montana

MDRU-Mineral Deposit Research Unit continues to prosper as an industry-supported research group at UBC, and is as active as it ever was with a number of new research projects, lots of great people and a few new initiatives.

MDRU Research Projects

Over the past year, the very successful **Carlin 3** project (led by **Ken Hickey**) and the **Porphyry Footprints** project (led by **Dick Tosdal, John Dilles** and **Scott Halley**) were both completed. Each of these projects had several industry sponsors and the response from them has been very positive. Similarly, the **Yukon Gold Project** just had its fifth and final, "official" technical meeting and the fruits have flowed on to the ten companies that supported that project. Additional support from NSERC and NRCAN will allow this project to continue into 2014.

Three new projects are starting this year. The **Western Tethyan-Turkey Metallogeny Project** already has eight corporate sponsors, and will kick off with a meeting and field trip in western Turkey in August. Field work in Bulgaria and Serbia has already started, and Romania, Greece and Iran are also included in this project's mandate.

The **Carbonate Alteration Project** takes advantage of MDRU's development of the **Mineral Isotope Analyzer (MIA**), a new tool that can rapidly obtain carbon and oxygen isotope ratios on carbonate minerals such that they are now being used to map alteration distribution and intensity, and fluid pathways. This instrument provides a step change such that these isotopes can now be easily utilized as an exploration tool, a feature recognized by **ALS Minerals** who have partnered with MDRU to include it in their analytical offerings.

The **PIMS-Porphyry Indicator Minerals** project will characterize those resistate minerals that form in various alteration settings in and around porphyry systems such that they can be utilized as exploration vectors. This project had a very successful **Geoscience BC** supported pilot project, and is now being offered as an industry project.

MDRU People

MDRU operates with a Director and six support staff. **Craig Hart** is now in his fourth year as Director; Executive Co-ordinator **Karie Smith** recently married a Turkish geologist; Resource Co-ordinator **Arne Toma** is as stalwart as ever, keeping the pieces of the unit together; and **Fanny Yip** makes certain that the accounts are well managed.

There are currently 12 Research Associates and Post-Doctoral Fellows who contribute to a wide range of projects. **Murray Allan** continues to lead the Yukon Gold Project and is now supported by **Matias Sanchez** who will contribute towards developing a structrural framework for western Yukon. **Thomas Bissig** continues to lead our South American initiatives, managing our Colombia Gold and Porphyry Project, and carrying out other projects in Chile, Peru, Argentina and Ecuador. **Farhad Bouzari** is leading the PIMS project and contributes his expertise in exploration alteration footprints. **Shaun Barker** is leading the Carbonate Alteration Footprints project and provides analytical and structural expertise to other projects. **Melissa Gregory** leads our Geometallurgy Initiative, specifically working on gold deportment. **Henrik Friis** is developing quantitative mineralogy models of the Ilimaussaq alkalic REE-U deposit in Greenland. **Lucy Porritt** investigates Diavik kimberlite pipes and readily shares her knowledge of fragmental volcanic rocks. **Abraham Escalante** has recently completed a two year study on Peruvian carbonate-replacement Zn-Pb-Cu-Ag deposits. **Ian Power** works on Greg Dipple's CO2 Sequestration in Mine wastes project. We have two new researchers in the group; **Rob Duncan** brings his IOCG expertise to the department, and **Alex Miskovic** joins to take the lead on our Tethyan Project.

There are also about 30 graduate students in the MDRU group. We have recently had several MSc theses defended; **Jessica Norris**, **Brendan Scorrar, Santiago Vaca, Jaime Poblete** and **Tatiana Alva-Jimenez**. MDRU also supported six BSc theses this past academic year.

New Initiatives

MDRU Exploration Geochemistry Initiative

Responding to the significant deficiencies in research and training in exploration geochemistry, the MDRU Board of Directors has developed an Exploration Geochemistry Initiative to support developments in this discipline to the benefit of the minerals industry. There are three modules: 1) Industrial Research Chair; 2) a robust research group; 3) Exploration Geochemistry Field Camp. We are very fortunate that Acme Analytical is generously supporting this initiative, but other opportunities exist. Please go to the MDRU home page for more details: www.mdru.ubc.ca/

MDRU Training Initiative

The MDRU BoD wish to put a greater emphasis on training. In response, so far in 2012, MDRU have already offered five short courses and two field courses that were fully attended by industry participants. A key goal of this initiative is to develop a **Professional Masters Program in Mineral Exploration**. To fully realize the benefits of this initiative to the industry, additional financial support is required to hire staff to initiate and carry out this program.

Please contact Craig Hart (chart@eos.ubc.ca) for additional information on this or other MDRU initiatives.

Atmospheric Science Program Focuses on Career Tracks

by Roland Stull

The UBC Atmospheric Science (ATSC) Program is an interdisciplinary program headquartered in the Earth, Ocean, and Atmospheric Sciences Department. As new career opportunities have been opening for meteorologists in industry, the ATSC program is taking the initiative to develop tracks to give UBC graduates an edge in the job market. Industries gaining particular attention are involved in wind energy, air pollution, and broadcast meteorology.

As an example, a broadcast-meteorology green screen was installed in the Pacific Museum of the Earth, to give ATSC undergrad and grad students the opportunity to hone their weather-briefing and public-speaking skills using chromakey software similar to that in TV studios. With contributions from Global TV in Vancouver, this set-up doubles as an interactive museum display where all visitors to the museum can pretend to be a TV meteorologist.

ATSC grad student Dominique Bourdin presents a weather briefing at the green screen.

Environmental Sciences Program

By Douw Steyn, Acting Director

The Environmental Science (ENSC) program continues to mature within the Department of Earth, Ocean and Atmospheric Sciences, where it is a major part of departmental teaching effort. The capstone course, ENVR 400: Research Project in Environmental Science continues to grow as it becomes a required course for all graduating students in the Majors stream. This year, our students chose to work on three widely ranging topics, one of which is highlighted below.

The Environmental Science program has been ranked as 11th in the world among named environmental science undergraduate programs. We continue to attract some of the brightest and most engaged science students at UBC, and our classes are in demand well beyond our majors students. A number of our students participate in international exchange through the Go Global program, and many undertake Co-op (work placement) programs. After graduation, ENSC students enter a wide range of professional or disciplinary graduate programs, find work in various government departments, or the consulting industry.

The following reports were produced by groups of students in the ENVR 400 class. The report covering drinking water is highlighted in the newsletter. All reports can be accessed at the following link:
https://circle.ubc.ca/handle/2429/24465/browse?type=dateissued

Title: **Modelling Reductions of Carbon Emissions Under Various Scenarios of a Public Bicycle Share System Within Vancouver, BC**

Authors: **Elsliger, Julie; Enslow, Chelsea; Lam, Connie W.K.; Shodjai, Nur; Tuguldur, Zolzaya; Yeh, Vincent**

Title: **Implementing a Food Scrap Composting Program for Multi-unit Dwellings in Downtown Vancouver, British Columbia.**

Authors: **Cameron, Brittany; Khuu, Tiffany; Samels, Danielle; Sheikh, Aden; Sun, Crystal**

Assessment of Drinking Water at UBC: A Consideration Of Water Quality, Energy and Economic Costs, with Practical Recommendations

A self-directed group project for ENVR 400

About the Authors

Allina Tran is in her final year of the Environmental Science Program at UBC. Oceanography, terrestrial water, meteorology and physical geography courses taken within her chosen area of concentration, Land, Air, and Water provides her the knowledge to investigate current environmental concerns from a dynamic interconnected perspective. Through a geographical biogeosciences field course, she has also gained field sampling, instrumentation, surveying and mapping techniques while further refining her abilities in data analysis. Past work experiences as a coordinator for a youth at risk summer program with aims to incorporate/promote more environmentally sustainable practices, has also first handedly expanded Allina's understanding of the complexity and energy required to bridge the gap between science and social aspects of environmental issues.

Beatrice Li is a fourth year Environmental Science student in the Faculty of Science at UBC. Within her chosen area of concentration, Land Air Water, she has completed a wide variety of courses that have equipped her with knowledge and skills in environmental chemistry, oceanography, meteorology and physical geography. In addition, courses in environmental science and social geography have helped her develop a good understanding of the environmental issues we currently face. Past experience in group class projects includes:

- Using GIS to develop a multi-criterion model for finding ideal locations for senior care facilities in the City of Vancouver.
- Field sampling using sensory equipment to collect data for statistically comparing the photosynthetic rates of Lodgepole Pine saplings found in different canopy conditions in the Kananaskis Valley. Microsoft Excel was used to analyze data and results were presented in electronic poster format.

Darcy McNicholl is a graduating student in Environmental Science with an AOC in Ecology. She has a primary interest in biology and is currently working as a lab assistant for Bill Harrower in the Beaty Biodiversity Center classifying insects collected from pit fall traps. Darcy has also had a considerable amount of field experience not only working for Harrower in the Lac du Bois grasslands but also through volunteering in South Africa, Namibia and Costa Rica. Darcy has her level one field guiding certification in South Africa, in addition to her advanced biological surveying qualification through BTEC. Her skills include telemetry, computer programming using Python, invertebrate identification and small mammal trapping. Although her focus is in biology Darcy is keen on addressing environmental issues that pertain to everyday life, and does so by being an active member of the Environmental Science Student's Association (ESSA). She is the director of finance and is heavily involved in planning events for 5 environmental science students as well as outreach activities such as Career fairs and giving lectures to elementary school classes at University Hill on environmental issues.

Josh Noble is a fourth year Environmental Science student in the Faculty of Science at the University of British Columbia. His area of concentration and interests lie in the Land, Air and Water category of the program. The completion of a spectrum of courses within the program has given him knowledge on subjects such as: atmospheric sciences and meteorology, oceanography, environmental sciences and Geographic Information Systems. In the GIS courses he mapped new bike routes for Vancouver and is currently working on mapping salmon spawning routes. Throughout his undergraduate degree, he has used Excel to perform many analytical analyses such as the phytoplankton blooming cycles in the Strait of Georgia. Throughout Josh's post secondary education, he has worked cooperatively and effectively on many group projects.

Katherine Van Dijk is a fourth year Environmental Science student in the land, air and water area of concentration. With a variety of classes, she has experience in oceanography, atmospheric science, soil science, ecology, as well as a background in astronomy, physics and mathematics. Completed projects include an individual study of phytoremediation in regards to mine contamination, and modelling the spread of forest fires using cellular automata. She has also worked in many group endeavours including analyzing the nutrient concentrations in the Western English Channel, and the effects of pollutants in the Yangtze River. She shares Darcy's interest in environmental problems which affect everyday life, particularly quality and conservation, fair trade, sustainable agriculture, and mine contamination.

Nicole Lee is in her fourth year of studies in the Environmental Sciences program at UBC. She is interested in aquatic systems and her courses have reflected this, within her chosen Area of Concentration of Ecology. Success in courses in environmental sciences, biogeography, ecology, and GIS, have provided her with a skill set that includes the abilities to collect, compile, and analyze data through statistical means, critically review scientific papers and write research and project proposals, and to use ArcMap10 to answer spatial questions. In 2010, she worked in a group of four to develop a Wastewater Management Plan Proposal for the UBC Point Grey Campus as part of the Applied Sustainability: UBC as a Living Laboratory (APSC 364) course. In the summer of 2011, she gained experience collecting field samples, mapping topography with Total Station equipment, and recording data. Course projects, labs, and field work have allowed her to work effectively both independently and as part of a team.

Executive Summary

Introduction

Students, faculty, and staff at the UBC Vancouver campus currently have three choices for drinking water; tap water from drinking fountains, bottled water sold at food service locations and vending machines, and water filtered by various additional filtration systems. These three drinking water systems each have different environmental, economic, and health implications. People have begun to question the necessity of the bottled water industry due to increasing awareness of its environmental costs.

However, UBC students, staff and faculty may still choose bottled water over tap water if they have concerns or misconceptions over tap water quality. In response to concerns over the environmental impacts of bottled water and tap water quality, the UBC Alma Mater Society (AMS) has invested in the installation of water filtration units known as WaterFillz stations. There have been previous student papers written to compare the environmental, economic and social implications of these three drinking water choices; bottled water, tap water, and WaterFillz filtered water. While these papers have provided a good overview of the general impacts of the three drinking water options, our project aims to further develop the analysis by exploring questions in a more systematic and quantitative way.

Research Objectives

Environmental Implications

1a) Estimate and compare embodied energy costs of the bottled water, tap water, and WaterFillz systems and identify system components which contribute the most.

1b) Qualitatively discuss other environmental implications such as waste generation and recycling.

Water Quality Assessment

2) Determine whether heavy metal contamination of campus tap water merits cause for concern.

Economic Considerations

3a) Quantify the economic implications of the potential removal of bottled water from UBC campus.

3b) Compare the economic costs of three different water filtration systems; Elkay, Brita, WaterFillz.

Recommendations for the placement of WaterFillz stations

4) Make recommendations for where to install additional WaterFillz units on campus, based on conclusions of the water quality assessment combined with survey responses and building traffic data.

Section 1: Environmental Implications

Environmental impacts of the drinking water options (bottled water, tap water + reusable bottles, WaterFillz filtration + reusable bottles) are compared through quantitative assessment of the energy consumed in all steps leading up to the consumption of water by the consumer, using a systems-based approach. Waste generation and recycling for these systems are qualitatively discussed. We found that the energy impact of bottled water scenarios (280 -3340 MJ), based on the 591 ml Dasani bottle, is considerably larger than tap water + reusable bottles scenarios (8.05 -734 MJ) even after the addition of WaterFillz stations to tap water + reusable bottle scenarios (22.9 – 749 MJ). The main contributor of energy costs to the bottled water system is the production of plastic disposable bottles, followed distantly by the cost of transportation. The main contributor of energy costs to the tap water system is energy used in heating water for washing of reusable bottles. Washing bottles in cold water significantly lowers energy costs. Steel appears to be the least energy intensive reusable bottle material, followed by durable plastic and aluminum in increasing order.

Not included quantitatively in our calculations are any credits or savings that may be gained for materials that are recyclable. Each of our three examined systems has components that can be recycled; plastic or metal bottles and steel or plastic WaterFillz parts. We found that while the recycling of the disposable plastic bottles reduces the amount of virgin material required for products down the line, the recycling of the bottles does not contribute directly to material for new plastic bottles. Materials used to package both disposable and reusable bottles for shipping or selling can contribute to waste generation. Used filters and bleach used for periodic disinfection of WaterFillz units would also contribute to waste generation.

Section 2: Water Quality Assessment

Our water quality assessment focuses primarily on the concentration of copper, zinc and lead in campus water, and investigates the concentration of these metals from a few chosen buildings at UBC. Using water quality data from Plant Operations, in combination with results of our own water quality testing experiments, we found elevated concentrations of Copper and Zinc in Totem Residence and Earth and Ocean Science (EOSC) Main while Fred Kaiser, Geography, Buchanan and Scarfe contained moderate concentrations. Metal concentrations in Dasani bottled were found to be the lowest (too low to be detected) followed by WaterFillz filtered water and the water from water fountains in the Student Union Building (SUB). We also observed a decline in metal concentration as the week progressed and with increasing flushing time. Because our test results for copper, zinc and lead concentrations all fall within the 8 Canadian Health Guidelines, we conclude that tap water on campus provides no prominent health risks but the installation of better plumbing and filtration units would improve the current water quality. Our results also show that the WaterFillz stations can effectively lower metal concentrations, if that is still desired.

Section 3: Economic Considerations

The economic analysis considered the loss of profits for the AMS and UBC Food Services should they stop selling bottled water. Although these are important sources of revenue, if the costs were to be spread out among students in the form of fees, the cost to students would be fairly negligible. We also considered these, and other costs to students. Buying bottled water regularly is very expensive for students when compared to using re-useable water bottles, which pay for themselves after only five to eight refills, depending the bottle purchased.

Three options were compared for providing filtered water, namely the WaterFillz kiosks, Brita Hydration Station, and an Elkay model. After five years of running costs, the WaterFillz were found to be the most economical because of considerably larger filters which do not need to be replaced nearly as often as the other models. The WaterFillz Station came out cheaper with or without considering the costs of energy required to run the systems. This is important to consider some of the models have the option of no refrigeration, thus changing the energy demands, and the WaterFillz may be run using solar power.

Some suggestions for recouping the costs of no longer selling bottled water are to advertise on the WaterFillz kiosks, have fundraisers and collect donations, possibly increase student fees and sell more re-useable water bottles.

Section 4: Recommendations for the placement of WaterFillz units

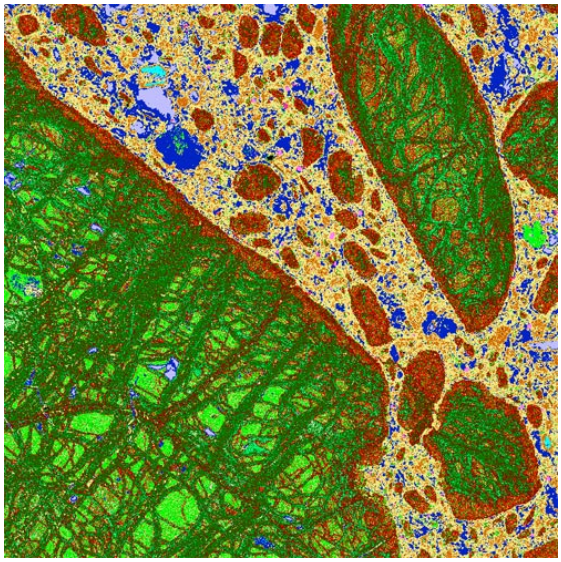
Ideal potential locations for additional WaterFillz stations are identified by synthesizing water quality data, building traffic data, water fountain accessibility data and survey results (survey, Appendix A). With consideration of all factors, we recommend placement of water filtration stations in the following buildings:
Geography, Totem, Swing, Buchannan, Scarfe, Civil & Mechanical engineering, Woodward, Forestry, Macmillan, EOSC, Math, Hugh Dempster, Sauder.

Buchannan and Woodward had the highest student traffic to water fountain ratios and were identified in our survey as popular locations for water fountains use. EOSC, Totem.

Geography and Scarfe are included because of relatively high metal concentrations, although still within Canadian health guidelines. Forestry, Swing, Civil & Mechanical Engineering, Math, Hugh Dempster and Macmillan are included because they were found to have only 0-1 water fountains. Sauder is included because of high student traffic

Carbon Dioxide Gas Reaction Fuels 'Diamond Taxis': UBC Volcanologist, Kelly Russell

JANUARY 19, 2012



Diamonds may be a girl's best friend, but diamond miners may have a fairly simple chemical reaction to thank for much of their industry's success.

Geologists have long known that diamonds are often embedded and transported upward to the Earth's surface by molten kimberlites.

But kimberlites are dense, large rocks, and the question of how they erupt to the surface--sometimes in a matter of days or hours from depths as great as 120 kilometres--has been a mystery.

According to new findings published in the journal Nature by UBC volcanologist **Kelly Russell**, the abrupt arrival of diamonds on the Earth's surface may be in part driven by carbon dioxide oozing from the magma surrounding the gems as they are transported upward.

In lab experiments, Russell and colleagues sprinkled a silica-rich mineral called orthopyroxene onto a molten, carbonate-rich rock designed to mimic kimberlites. The two substances reacted and began bubbling carbon dioxide in 20 minutes.

In practice, as magma rises it may dissolve much of the rock containing orthopyroxene that it encounters, generating the same reaction underground. The gas helps speed the kimberlite--and any diamonds it may contain--to the surface. The molten material would encounter more and more rocks containing silica as it nears the surface, and accelerate.

Russel told PostMedia News that the findings may eventually help miners refine the search for diamonds, which are found in geological structures called kimberlite pipes. The pipes, which can measure up to 150 metres across and 800 metres deep, form when the foaming magma blows through the Earth's crust.

His team is now working to see how quickly orthopyroxene dissolves in the magma to better estimate how quickly the kimberlites rise.

Nature www.nature.com/nature/journal/v481/n7381/full/nature10740.html

Lava Fingerprinting Reveals Differences Between Hawaii's Twin Volcanoes

Underwater action scene of robotic mechanical arm on the JASON2 submersible collecting a pillow lava sample from Mauna Loa volcano at 10,000 feet below sea level during 2002 expedition.

(Photo taken by camera on JASON2Credit: M. Garcia and J.M. Rhodes).

Hawaii's main volcano chains--the Loa and Kea trends--have distinct sources of magma and unique plumbing systems connecting them to the Earth's deep mantle, according to UBC research published this week in Nature Geoscience, in conjunction with researchers at the universities of Hawaii and Massachusetts.

This study is the first to conclusively relate geochemical differences in surface lava rocks from both chains to differences in their deep mantle sources, 2,800 kilometres below the Earth's surface, at the core-mantle boundary.

"We now know that by studying oceanic island lavas we can approach the composition of the Earth's mantle, which represents 80 percent of the Earth's volume and is obviously not directly accessible," says **Dominique Weis**, Canada Research Chair in the Geochemistry of the Earth's Mantle and Director of UBC's Pacific Centre for Isotopic and Geochemical Research.

"It also implies that mantle plumes indeed bring material from the deep mantle to the surface and are a crucial means of heat and material transport to the surface."

The results of this study also suggest that a recent dramatic increase in Hawaiian volcanism, as expressed by the existence of the Hawaiian islands and the giant Mauna Loa and Mauna Kea volcanoes (which are higher than Mount Everest when measured from their underwater base) is related to a shift in the composition and structure of the source region of the Hawaiian mantle plume. Thus, this work shows, for the first time, that the chemistry of hotspot lavas is a novel and elegant probe of deep earth evolution.

Weis and UBC colleagues **Mark Jellinek** and **James Scoates** made the connection by fingerprinting samples of Hawaiian island lavas--generated over the course of five million years--by usiing isotopic analyses. The research included collecting 120 new samples from Mauna Loa--"the largest volcano on Earth" emphasizes co-author and University of Massachusetts professor Michael Rhodes.

"Hawaiian volcanoes are the best studied in the world and yet we are continuing to make fundamental discoveries about how they work," according to co-author and University of Hawaii volcanologist Michael Garcia.

The next steps for the researchers will be to study the entire length of the Hawaiian chain (which provides lava samples ranging in age from 5 to 42 million years old) as well as other key oceanic islands to assess if the two trends can be traced further back in time and to strengthen the relationship between lavas and the composition of the deep mantle.

Award Highlights in EOS

2011 Distinguished Lecturer

Society of Exploration Geophysicists
The international society of applied geophysics

Doug Oldenburg

Earth, Ocean and Atmospheric Sciences, UBC

Imaging the Earth's near surface: The why and how of applied geophysics for the 21st century

Selection as a Distinguished Lecturer is viewed as a major honour and recognition of excellence by the SEG. In addition to recognizing an individual's contributions to the science or application of geophysics, this position is an active effort to promote geophysics, stimulate general scientific and professional interest, expand technical horizons, and provide a connection to SEG activities and practices.

SEG cooperates annually with AAPG to support a jointly endorsed lecture. The purpose of this effort is to bring local geophysical and geological Sections/Societies into a common forum. The lecture should therefore be relevant to both disciplines. Each year, SEG and AAPG Distinguished Lecture Committees agree upon and submit a lecturer for approval by both Executive Committees.

Abstract
The top few kilometers of the Earth's surface are of extreme importance to our society. This near-surface region houses mineral and hydrocarbon wealth that are crucial for industrialized development, contains water needed for life, and is an environment with which we must interact to build our infrastructure. Substantial insight about the structure and composition of this region can be gleaned by determining its physical properties. Density, magnetic susceptibility, electrical conductivity, and elastic parameters can be critically diagnostic and data from appropriate geophysical surveys can be inverted to generate 3D distributions of these.

This talk will look at problems in which applied geophysics has made a major contribution and review the essential elements of the inverse problem needed to map survey data into 3D images of physical properties. Characterization of Earth materials generally requires knowledge of multiple physical properties, and this talk will show examples of this for mineral exploration and unexploded ordnance discrimination. The emphasis is on surveys sensitive to electrical conductivity. It is only recently that we have developed the capability to invert electromagnetic survey data in 3D and a plethora of applications now exists for mineral and hydrocarbon exploration, environmental and geotechnical problems. The talk concludes with a vision for the future and a discussion of the skill set required by a new generation of quantitative geophysicists who want to tackle important practical problems so that we can live sustainably on this planet

Doug Oldenburg awarded 2012 J. Tuzo Wilson Medal of the Canadian Geophysical Union

Doug Oldenburg will receive the 2012 J. Tuzo Wilson Medal of the Canadian Geophysical Union at the annual Awards Dinner in Banff on June 8. The medal is "to recognize scientists who make outstanding contributions to Canadian geophysics"

Raymond Andersen Awarded Prestigious CIC Medal

Dr. Raymond Andersen, a faculty member of both the Chemistry and Earth, Ocean and Atmospheric Sciences Departments at UBC, has received the 2012 CIC Medal. The CIC Medal is the most prestigious award granted by the Chemical Institute of Canada, and is given annually to a person who has made an outstanding contribution to the science of chemistry in Canada.

Dr. Andersen is known for his research into the identity and structure of novel chemical compounds derived from marine organisms, the molecular routes to their biosynthesis, their role in ocean ecology and their potential as new drugs.

His research interests encompass all aspects of the chemistry of biologically active marine natural products. Andersen has made important contributions in the areas of structure elucidation, synthesis, biosynthesis, chemical ecology, and drug discovery. Three experimental drugs based directly on Andersen's research have reached Phase II clinical trials in humans.

Dr. Andersen presented his award lecture at the CIC Conference in Calgary this past June.

Raymond Andersen was also awarded the 2012 Paul J. Scheuer Award in Marine Natural Products Chemistry

Ron Clowes awarded a Queen's Diamond Jubilee Medal as a Member of the Order of Canada and in recognition of his scientific contributions and achievements.

Lieutenant Governor presents Order of Canada recipients with the Queen Elizabeth II Diamond Jubilee Medal

VICTORIA – On Wednesday, April 11, 2012, at HMCS Discovery, His Honour the Honourable Steven Point, Lieutenant Governor of British Columbia, presented the Queen Elizabeth II Diamond Jubilee Medal to recipients of the Order of Canada who live in Vancouver and the Lower Mainland.

His Honour presented the medal on behalf of the Governor General to members of the Order of Canada who live in British Columbia. Presentation ceremonies also took place in Victoria and in Kelowna.

This commemorative medal was created to mark the 2012 celebrations of the 60th anniversary of Her Majesty Queen Elizabeth II's accession to the Throne as Queen of Canada. The Queen Elizabeth II Diamond Jubilee Medal is a tangible way for Canada to honour Her Majesty for her service to this country. At the same time, it serves to honour significant contributions and achievements by Canadians. During the year of celebrations, 60,000 deserving Canadians will be recognized.

Valentina Radić received the 2011 Cryosphere Young Investigator Award at the 2011 AGU Fall Meeting, held December 5 to 9, in San Francisco, California. The award is for "a significant contribution to cryospheric science and technology."

Citation

Valentina Radić is an outstanding young glaciologist whose trajectory has taken her from Croatia, where she had never seen a glacier, to the highest levels of cryospheric science. Having received bachelor's and master's degrees in physics and geophysics from the University of Zagreb, she launched her doctoral studies at Stockholm University, in Sweden, and completed them at the University of Alaska Fairbanks. Currently she is a postdoctoral fellow , Earth, Ocean and Atmospheric Sciences, at the University of British Columbia, in Vancouver, Canada.

When Valentina started her doctoral work she had only a vague idea about what a glacier might be. She caught on very quickly and in a relatively short research career has made significant and enduring contributions to the field of glaciology by focusing on big questions that span several disciplines. She has made substantial contributions to global-scale glacier mass balance modeling and to projecting the future evolution of glaciers and their contribution to global sea level rise based on global climate change scenarios. Her 100-year projections for all glaciers on Earth (excepting the Greenland and Antarctic ice sheets) are the most detailed ones that have been published to date. She has developed fresh approaches to deal with incomplete and inconsistent glacier data sets and applied these skills to computing a new global estimate of how much ice there is outside the ice sheets. She has critically explored the physical basis of volume-area scaling as a tool for glacier projections. Finally, she has demonstrated that gridded climate products, such as reanalysis and regional and global climate models, can be usefully applied to large-scale mass change modeling.

Valentina Radić is innovative, creative, and efficient and is fastidious on matters of detail. Her work is finding prominent entry in international assessments and has received considerable media attention. She is a truly remarkable and talented young scientist whose impressive work ethic and exemplary collegiality make her an outstandingly deserving recipient of the AGU Cryosphere Young Investigator Award.

—REGINE HOCK, University of Alaska Fairbanks; and GARRY CLARKE Earth, Ocean and Atmospheric Sciences, University of British Columbia, Vancouver, Canada

John Amor (left) and Stephen Toope, President

John Amor - President's Staff Award Recipient (Vancouver Campus)
Enhancing the UBC Experience

John Amor, Department of Earth, Ocean and Atmospheric Sciences has stayed ahead of the curve in computer technology, to support Earth and Ocean Sciences with their evolving computing needs for research and learning. One of John's many projects at UBC was the development of an innovative method of processing large quantities of digital data collected as a result of seismic field experiments for Canada's national geoscience project, LITHOPROBE. John's work was one of the factors contributing to the success of the $5-million research project. In the eyes of the nominator, "Without John Amor, the Department would not be as successful as it is." From Greg Dipple, Head, "I can think of no better recognition of John's efforts to support teaching, research, and administration in EOAS since the earliest days of the Department."

David Farrar, UBC Provost and Vice President Academic (left) presenting award to Jason McAlister

Jason McAlister recipient of the Killam Graduate Teaching Assistant Award

Chemical Oceanography Ph.D student, Jason McAlister was awarded the Killam Graduate Teaching Assistant Award, a recognition given annually to a small number of graduate students for outstanding contributions to teaching and learning at UBC. He is studying under Dr. Kristin Orians' supervision.

STUDENT SOCIETIES

G.M Dawson Club's
May Sze Photo Contest
Winners

1st Place
Matt Hosfordm Undergraduate
Grand Prize:
12"x18" Frame with Photograph and a $20 Gift Certificate to Lens and Shutter

2nd Place
Ian Herbranson, Undergraduate
Runner-up Prize:
12"x18" Frame with Photograph

3rd Place
Dan Woodell, Graduate
Prize: 5"x7" Frame

Awards and Honours in EOS

FACULTY

Raymond Andersen - 2012 CIC Medal - Chemical Institute of Canada and the 2012 Paul J. Scheuer Award in Marine Natural Products Chemistry

Ron Clowes - Queen's Diamond Jubilee Medal

Doug Oldenburg- SEG Distinguished Lecturer and he will receive the 2012 J. Tuzo Wilson Medal of the Canadian Geophysical Union at the annual Awards Dinner in Banff on June 8. The medal is "to recognize scientists who make outstanding contributions to Canadian geophysics".

Christian Schoof - 2011 James B. Macelwane Medal of the American Geophysical Union. The Macelwane Medal is awarded annually for significant contributions to the geophysical sciences by an outstanding young scientist. Christian's award is in recognition of his fundamental contributions toward understanding ice sheet dynamics.

Douw Steyn - CMOS Executive and Council has conferred the title of CMOS Fellow to Douw Steyn, on the recommendation of the Fellows Committee, chaired by Susan Woodbury, who have provided the following citation:

"To Dr. Douw Steyn for his outstanding contributions to our understanding of ozone pollution, especially in the Lower Fraser Valley region, for his exemplary contributions to CMOS and his extensive efforts towards improving educational and administrative programs in atmospheric science."

A certificate of CMOS Fellowship will be presented at the Awards Banquet to be held the evening of Thursday 31 May at the 2012 Joint CMOS-AMS Congress, in Montreal.

Roland Stull - On Sept. 30, 2011, Prof. Roland Stull was elected "Fellow" of the American Meteorological Society (AMS). The formal announcement and award ceremony was held at the annual AMS Conference in January 2012 in New Orleans. Stull has also been a Fellow in the Canadian Meteorological and Oceanographic Society since 2007.

Dominique Weis - ECORD Distinguished Lecturer

September 2011 BBQ - EOS Awards

Susan Allen and **Mark Jellinek** - Undergraduate Instructors of the Year

Mary Lou Bevier - EOS Leadership and Service Award

Anita Lam and **Henryk Modzelewski** - EOS Award - Excellence in Administration and Technical Service Award

Sharon Blackmore and **Dave Marchant** - Outstanding Teaching Assistant Awards

STAFF AWARDS/HONOURS

John Amor - UBC Vancouver President's Staff Award - "Enhancing the UBC Experience"

RESEARCH ASSOCIATE

Brian Hunt - Marie Curie International Incoming Fellowship, a Research Associate working with Evgeny Pakhomov, was awarded the Fellowship for project entitled: Isotopes of Zooplankton to measure climate and human impacts on pelagic food webs (ISOZOO). The fellowship will include shared time between UBC and the Universite de Luminy, France.

POSTDOCTORAL FELLOWS

Valentina Radić received the 2011 Cryosphere Young Investigator Award at the 2011 AGU Fall Meeting, held December 5 to 9 in San Francisco, California. The award is for "A significant contribution to cryospheric science and technology."

Matthew B.J. Lindsay, Ph.D.Postdoctoral Research Fellow received a Mitacs Elevate Postdoctoral Fellowship valued at $67,500 for April 1, 2012 through March 31, 2013.

GRADUATE STUDENT AWARDS

Andrew Caruthers - Bolton Award at the Canadian Palaeontology Conference hosted by UBC. This award recognizes the most outstanding student presentation at the conference.

Anna Harrison - Best Student Poster Prize at the Goldschmidt Conference in Prague

Jason McAlister - Killam Graduate Teaching Assistant Award.

Carmen Emmel - .selected winner of this year's Conference Student Presentation Competition of the American Meteorological Society's 30th Agricultural and Forest Meteorology First Atmospheric Biogeosciences Conference in Boston.

Ph.D.

Asher, Elizabeth, Ph.D. OCGY, Captain Thomas S. Byrne Scholarship; **Bordet, Esther,** Ph.D. GEOL, Endeavour Silver Corp Scholarship in Earth Sciences; **Devriese, Sarah,** Ph.D. GEOP, George E. Winkler Memorial Scholarship ; **Fagan, Andrew,** Ph.D. GEOL, W. H. Mathews Scholarship; **Harrison, Anna,** Ph.D. GEOL, Doctoral Four Year Fellowship; **Harrison, Lauren,** Ph.D. GEOL, Doctoral Four Year Fellowship; **Hund, Silja,** Ph.D. GEOL, Egil H Lorntzsen Scholarship; **Kang, Seogi,** Ph.D. GEOP, Doctoral Four Year Fellowship; **Marchant, David,** Ph.D. GEOP, NSERC PGSD2; **Shelford, Emma,** Ph.D. OCGY, Chih-Chuang and Yien-Ying Wang Hsieh Memorial Scholarship ; **Sihota, Natasha,** Ph.D. GEOL, NSERC PGSD3; **Tommasi, Desiree,** PhD OCGY, W. H. Mathews Scholarship/George L. PICKARD Scholarship in Oceanography ; **Zangeneh, Neda,** Ph.D. GEOL, Lisle and Sheila Jory Award/W. H. Mathews Scholarship.

M.Sc.

Capelle, David, M.Sc. OCGY, NSERC PGSD3; **Campbell, Michelle,** M.Sc. GEOL, W. H. Mathews Scholarship; **Chong, Andrea,** M.Sc. GEOL, W. H. Mathews Scholarship / Vancouver Geotechnical Society Scholarship; **Dalsin, Malloery,** M.Sc. GEOL, Colin D Spence Memorial Scholarship Geology; **Dixon, Andrea,** M.Sc. GEOL, J.Jay McNee Memorial Scholarship; **Fohring, Jennifer,** M.Sc. GEOP, Egil H Lorntzsen Scholarship; **Heagy, Lindsey,** M.Sc. GEOP, W. H. Mathews Scholarship; **Kolzenburg, Stephan,** M.Sc. GEOL, Thomas and Marguerite MacKay Memorial Scholarship; **Le Souef, Kate,** M.Sc. OCGY, W. H. Mathews Scholarship/Robert Rutherford Rae Scholarship; **McMillan, Michael,** M.Sc. GEOP, NSERC CGSM; **Scheifele, Benjamin,** M.Sc. OCGY, W. H. Mathews Scholarship; **Spurgin, Jessica,** M.Sc. OCGY, Affiliated Fellowship; **Woodell, Daniel,** M.Sc. GEOL, Thomas and Marguerite MacKay Memorial Scholarship; **Ya'acoby, Avee,** M.Sc. GEOL, Endeavour Silver Corp in Earth Sciences

M.A.Sc.

Ashwood, Wesley, M.A.Sc. GEOE, Affiliated Fellowship; **Dick, Graham**, M.A.Sc. GEOE, Dr. F. J. Nicholson Scholarship/Hugh Nasmith Graduate Scholarship

UNDERGRADUATE STUDENT AWARDS

Erin Crockett (Environmental Sciences student) - Wesbrook Scholar - $1,000 Scholarship. An annual designation, Wesbrook Scholar, is awarded to a maximum of twenty outstanding undergraduate students who have demonstated the ability serve, work with and lead others. The winners are presented with a scholarship, a certificate, and a memento. The Wesbrook Scholar desgination appears on the student's permanent record.

Annie Seagram - EURSAP Young Researcher Award, who completed the Environmental Sciences Program, (Starting ATSC MSc in September 2012) won a "EURSAP Young Researcher Award" for her paper: "Modelling recirculation of pollutants during ozone episodes in the Lower Fraser Valley, BC," presented at the 32nd International Technical Meeting on Air Pollution Modelling and its Application in Utrecht, The Netherlands May 7 - 11, 2012.

Heather Friday, B.A.Sc. - Geological Engineering - Dr. Aaro E. Aho Foundation Scholarship and **Gareth Wolff,** B.Sc. - Geological Sciences - Dr. Aaro E. Aho Foundation Scholarship

The Governors of the Dr. Aaro E. Aho Foundation are pleased to award you the Foundation Scholarship for Geological Engineering of $5,000 and the Gold Medal.

2011-2012 Shell Geological Mapping prizes for the Oliver Field School (EOSC328). Each prize is awarded $800.00 and is open to 3rd and 4th year students. The following students won the awards:

Friesen, Oliver-Honours Geology; **Gainer, Dan**-MAJ GEOL; **Herbranson, Ian**- Honours Geology; **Armstrong, Jacqueline**-Combined Honours, Oceanography

(APEG) Association of Professional Engineers and Geoscientists Achievement Award in Geoscience – Plaques

Geology – **Noah J. Phillips**; Geochemistry – **Gareth Wolff**; Geophysics – **Dominique Fournier**; Environmental Science – **Erin Crockett**

APEG Gold Medal in Geoscience – Medal - **Nicholas Bueckert**

APEG Achievement Award in Engineering – Plaque - **Murray K. Helmer**

Dr. Roy Graham Memorial Prize in Geological Engineering-**Angeleen E. Ramey**

Morris Menzies Prize in Geological Engineering-**Julian T.G. McGreevy**

Honours Theses 2011-2012

Jacqueline Armstrong: Petrological Analysis of Mineralization of the Pb-Zn-Ag Treasure Mountain Deposit, British Columbia

Tara Howatt: A Numerical Investigation of Shelf Slope in the Scaling for Upwelling over Submarine Canyons

Alison Stocks: Transition Time from Fresh to Saltwater of Juvenile Sockeye Salmon (Oncorhynchus Nerka) Determined by Laser Ablation ICP-MS of Otoliths

Stacie Jones: Geological Map and Structural Evolution of the Black Hills Creek Area in the Smash Minerals Whiskey Project, Yukon Territory

Nicholas Bueckert: Petrography and Textural Relationships of Primary Silicate, Alteration, Sulphide and Platinum Group Minerals in the J-M Reef at the East Boulder Mine, Still Mater Complex, Montana

Dominic Fournier: Solutions to the Muon Tomography Problem: Implementation of an Hybrid Objective Function

Ben Kary: Petrophysical Forward Modeling the DC Resistivity and Chargeablity of the Titan Property

Theresa Coyle: Salinity Variation, Trophic Interactions and Community Structure on Rocky Shores

Noah Phillips: The Role of Calcite on the Mechanical Strength and Permeability of Dolomite

Wesley Perrin: Measuring the Hydrothermal Footprint of the Cortez Hills Carlin-Type Deposit, Nevada, Through the use of Oxygen Isotopes

Gladys Oka: An Assessment of Trace Metals in the Soil, Vegetation and Atmospheric Deposition of Urban Areas in Vancouver

James Welles: Effects of Porosity on Compressional Wave Velocities in Volcanic rocks

Gareth Wolff: Microstructures and Trace Element Signatures of Orogenic Quartz Veins in the Klondike District, Yukon Territory, Canada

Charlotte Greenhaf: Mantle Xenoliths from the Muskox Kimberlite Pipe, Slave Craton: Implications for the Lithospheric Mantle and Diamond Stability Potential

Rebecca Siefert: The Effects of Multiple Predators as Nested Biotic Filters on Ecosystem Function in Streams

Chelsea Raley: Mineralogical Characterization of Sulfide Mineralization, Alteration and Microthermometry of Related Fluid Inclusions of the La Plata Prospect, Columbia

Erin Crockett: Modeling Cumulative Human Impacts on a Coastal Ecosystem Service in British Columbia
Roy Greig: Stratigraphy of the Tarachi South Area, Sonora, Mexico
Jessica Kalynn: Characterizing the Depths and Central Peaks of Lunar Complex Craters with Lola Topography
Xena Montague: A Textural Study of Ladder Dikes in the Cathedral Peak Granodiorite

Reinstatement of Major Degrees in Oceanography - Dr. Susan Allen

Three new major degrees in oceanography were started in September 2011. Each is a Combined Major with a basic science subject to ensure the students have a strong science skill set in addition to a love of oceanography. The three sciences are: Biology, Microbiology and Physics. We are currently in discussion with Chemistry to add a fourth. Second year students enrolled in the summer of 2011 and both biology and microbiology filled with 10 students each. These combined major degrees have much broader appeal than the still existent combined honours degrees because they do not require students to carry a full load of courses each term and because they allow greater numbers of electives. We are looking forward to having these keen students in our upper year courses starting this fall.

Reinstatement of Major Degrees in Geophysics - Dr. William Ramey (Chair, Curriculum Committee)

We proposed to reinstate the undergraduate Majors degree program in geophysics. The updating was necessary because course names have changed; all GEOP courses have become EOSC courses and mathematics offerings have become more varied. UBC offered this program until 1996, when the geophysics component of the old Geophysics and Astronomy department merged with EOS. At that time, EOS began to offer just the EOSC Majors degree, rather than degrees in specific disciplines, to unify the department and simplify our degree offerings. Several of our students who could not qualify for honours degrees followed our curriculum anyway (except for the thesis course), obtained EOSC degrees, and sought employment as geophysicists. In essence, they completed a majors geophysics degree program suitable for students who are interested in careers in industry (whereas our honours program is intended for students who are interested in graduate school). These students now have "geophysics" indicated on their diplomas to reflect what they studied at UBC, and to make their qualifications clear to potential employers. Our undergraduate students enthusiastically supported this change. Last year, EOS undergraduates spontaneously circulated a petition to reinstate the geophysics majors degree program (without input from any faculty member), and they obtained 30 signatures.

Number of Major and Honours students in programs offered by EOS

	2008	2009	2010	2011	2011 Honours/Majors
EOS - Major	93	97	96	96	Majors - 96
ATSC	27	27	29	27	Majors-ATSC - 23 DMTY-3
ENSC	86	82	106	113	Honours - 10 Majors - 103
GEOL	19	18	18	18	Honours - 17 Comb Hons - 1
GEOE	134	130	130	128	N/A
GEOP	6	7	14	24	Honours - 6 Majors - 18
OCGY	1	1	2	21	Comb Hons - 2 Comb Maj - 19
TOTAL	366	362	395	425	

Total enrollment in undergraduate courses offered by EOS. Numbers in brackets (%) indicate change from previous years.

	2008	2009	2010	2011
1st Year	1894 (-2.3)	2285 (+20.6)	1806 (-21%)	2166 (+19.9)
2nd Year	848 (+ 10)	881 (+3.9)	836 (-5.1%)	761 (-9.0)
3rd and 4th Yr	1839 (+ 4.1)	1799 (-2.2)	1993 (+10.8)	1910 (-4.2)
Service Courses	551 (-.04)	543 (-1.5)	832 (+20.9%)	419 (-49.6)
TOTAL	**5132 (+2)**	**5653 (+10.2)**	**5467 (-3.3%)**	**5256 (-3.9)**
Summer	386 (+10)	668 (+73.1)	578 (-13.5%)	879 (+52.1)
Distance Ed	466 (+8.6)	1644 (+252.8)	2238 (+75.5)	2870 (+28.2)
Grand Total	**6462 (+3.4%)**	**7596 (+17.5)**	**8283 (+9%)**	**9005 (+8.7)**

Graduate Enrollment: 2011-2012

Program	ATSC	OCGY	GEOE	GEOL	GEOP	Total
MEng			11			**11**
MASc			9			**9**
MSc	12	12		64	10	**98**
PhD	7	22	5	33	28	**95**
Total	**19**	**34**	**25**	**97**	**38**	**213**

Graduate Theses Completed in 2011-2012 Supervised by Earth, Ocean and Atmospheric Sciences Faculty, Including Thesis Programs External to the Department (Name of Supervisor in Brackets)

Ph.D.

Bakhshaii Shahrbabaki, Atoossa, ATSC, Exploration of the Potential for Gene Expression Programming to Solve some Problems in Meteorology & Renewable Energy (Stull, Roland)

Cassis, David, OCGY, The role of phytoplankton and environmental variables in Pacific oyster (Crassostrea gigas) aquaculture in British Columbia (Maldonado, Maite)

Clarke Murray, Cathryn Lynne, OCGY, The role of recreational boating in the introduction and spread of marine invasive species (Pakhomov, Evgeny)

Hodge, Kristen FitzGerald, GEOP, Field and experimental constraints on the deformation and breakup of injected magma (Jellinek, Mark)

Guo, Jian, OCGY, Copper requirements and acquisition mechanisms in marine phytoplankton (Maldonado, Maite)

Nipen, Thomas, ATSC, A component-based probabilistic weather forecasting system for operational usage (Stull, Roland)

Payet, Jerome Patrice, OCGY, Ecology and diversity of Marine viruses on the Canadian Arctic Shelf, Arctic Ocean (Suttle, Curtis)

Riche, Olivier, OCGY, Time-dependent inverse box-model for the estuarine circulation and primary productivity in the Strait of Georgia (Pawlowicz, Rich)

Tafti, Reza, GEOL, Metallogeny, geochronology and tectonic setting of the Gangdese belt, southern Tibet, China (Pawlowicz, Rich)

Vaghri, Ali, GEOP, Viscoelastic finite-element models of the earthquake cycle along plate-boundary faults (Pawlowicz, Rich)

M.Sc.

Ajmani, Asha Megan, OCGY, The growth and diet composition of sockeye salmon smolts in Rivers Inlet, British Columbia (Pakhomov, Evgeny)

Alva Jimenez, Tatiana Romy, GEOL, Variation in hydrothermal muscovite and chlorite composition in the Highland Valley Porphyry Cu-Mo district, British Columbia, Canada (Dipple, Greg)

Brotz, Lucas Morgan, OCGY, Changing jelly fish populations: trends in large marine ecosystems (Pakhomov, Evgeny)

Bruce, Loryn Frances, GEOL, Diamonds in an Archean greenstone belt: a study of diamonds and host meta-conglomerate from Wawa (northern Ontario) (Kopylova, Maya)

Charters, Jeffrey, OCGY, Biogeochemistry of dissolved Pb in the Northeast Pacific Ocean (Orians, Kristen)

Choi, Francis Ming Pong, OCGY, Assessing intertidal marine non-indigenous species in Canadian ports (Pakhomov, Evgeny)

Cobbett, Rose Natalie, GEOL, Timing and kinematics of the Duke River Fault" insights into the evolution of the insular terrane, Southwest Yukon Territory (Mortensen, Jim)

Corbel, Christophe, ATSC, Correlation between atmospheric stability, dynamics, and cloud properties in observations, re-analysis, and models (Austin, Phil)

Erven, Lisa, ATSC, An observational study of slope air and free air temperatures in Whistler Valley, British Columbia, Canada (Black, Andy)

Friedlander, Elizabeth Anne, GEOL, The nature and evolution of conduit faults in the 2004-2008 Mount St, Helen's lava dome eruption (Russell, Kelly)

Granek, Justin, GEOP, Computing geologically consistent models from geophysical data (Oldenburg, Doug)

Jumah, Bander Khalid, GEOP, Dimensionality-reduced estimation of primaries by space inversion (Herrmann, Felix)

Norris, Jessica, GEOL, Evolution of Alteration & Mineralization at the Red Chris Cu-Au Porphyry Deposit, Northwestern British Columbia, Canada (Hart, Craig)

Poblete, Jaime Andris, GEOL, Geology, geochronology and structural reconstruction of the Cerro Bayo epithermal district, Chilean Patagonia (Hart, Craig)

Podeswa, Yasha, OCGY, Active carbon transport and feeding ecology of pelagic decapods in the North Pacific subtropical gyre (Pakhomov, Evgeny)

Ramshaw, Brock, OCGY, The spatial and temporal variation of kelp-derived detritus and its dietary importance to zooplankton and benthic invertebrates along the west coast of Vancouver Island, Canada (Pakhomov, Evgeny)

Brendan, Scorrar, GEOL, The Age and Character of Alteration and Mineralization at the Buckhorn Gold Skarn, Okanogan Count, Washington, USA (Hart, Craig)

Taylor, Rebecca Lynn, OCGY, Studies in Fe bioavailability: co-limitation of primary productivity by iron, light, and nitrate in the Beaufort Sea, and direct Fe-siderophore uptake mechanisms in Fe deficient phytoplankton (Maldonado, Maite)

Yan, Jiupeng, GEOP, Seismic ground roll prediction by interferometry and separation in curvelet domain (Herrmann, Felix)

M.A.Sc.

Hirsche, Trevor, GEOL, A field cell and humidity cell study of molybdenum and zinc attenuation in neutral rock drainage from the Antamina Mine, Peru (Mayer, Ulrich)

Van Esch, Kristen, GEOE, Failure behaviour of bedrock and overburden landslides of the Peace River Valley near Fort St. John, British Columbia (Eberhardt, Erik)

M. Eng. - Geological Engineering (non thesis)
Brash, Jennifer
Emmerson, Michael
Evans, Paul
Kosarewicz, Olga

M.Sc. (non thesis)
Davidson, Christopher Andrew, GEOL
McIvor, Ian James, OCGY,
Paszkowski, Dawn Elysia, GEOL,
Todd, Jennifer Ann, GEOL,
Wells, Douglas Mitchell, GEOL,
Zimny, Nicola, GEOL,

Alumni Feedback

Reminder: We mail this newsletter to over 3,000 recipients, and we would really like to hear how YOU are doing.

Robert Barager, 1950, B.Sc.

I've been retired for 20 years but for 18 of these continued work as a Scientist Emeritus with the Geological Survey of Canada. Currently I am a volunteer who works twice a week. My wife Dorothy (UBC, 1942, 1947 née Shaw) and I live in a Retirement Residence in the country, in the beautiful Ottawa Valley, not far from where we lived for about 40 years. I'm delighted to hear of the work being done in Earth and Ocean Sciences, especially Climate Change - Good Work!

Frank W. Baumann, 1971, B.A.Sc. Geological Engineering

As I look back at a very satisfying 40 year career, I have nothing but the greatest admiration for the instruction I received at U.B.C.

In those days, the primary interest of most of the 14 of us who eventually graduated was economic geology- petrology, mineralogy, structural geology; and so on. But we also had to take courses in hydrology, rock mechanics, soil mechanics, geomorphology- and a host of other courses that were interesting, but not directly related to our primary interest. We never complained or questioned why we had to take all those additional courses- we just trusted that our professors knew what was best for us. Well, eventually, I ended up doing projects in all of those specialty areas; I never realized at the time what a diversity of different subjects make up the geological sciences, and how those different subjects have provided me with such an interesting and exciting career!

Jason Bosher, 1985, B.Sc. Geology

Went back to school 2006-2008 for writing and editing due to a physical disability. Am now freelancing and have written many articles for Alive magazine. Hope to find full-time employment in the writing/editing field in the near future.

H. Warren Newcomen, 1985, B.A.Sc.

I am now managing the BGC office in Kamloops which continues to grow in response to the booming mining business. This summer I managed to go on a salmon fishing trip near Gold River with my father and brother, and a camping trip in the Escalante Canyon in southern Utah with my wife Nan Stevens and my boys Westin and Finn.

Gwyneth Cathyl-Huhn (née Bickford), 1993, M.Sc. Geology

Married again in summer of 2009 and now spend my time travelling between Vancouver Island, rural Massachusetts, and various coal mines. Am quite enjoying making my own personal centre of excellence* in coal-mining geology and hope to be doing this for many more years. Have now arrived at that happy state of middle age and middle career, where my memories of university are rather wistfully fond; UBC was good to me! Glad to see that our department will once again have a brand new building! Best regards to all, and especially to Professors Bustin and Danner, who have continued to set a good example as scientists. *said "tongue-in-cheek" of course!

KEEP IN TOUCH

Enjoy keeping up with friends and classmates in the Alumni News section? Why not return the favour - drop us a line. Please fill in your current address below even if the Newsletter was correctly addressed - it helps us maintain our records, or email us at **alumni-contact@eos.ubc.ca** . Also visit the Earth, Ocean and Atmospheric Sciences website at **www.eos.ubc.ca** . Please do not provide any information that you would not want published in the next Alumni Newsletter.

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