Earth and Ocean Sciences

ALUMNI NEWSLETTER

Number 14 (2011)

Message from the Head

Dear Alumni and Friends

EOS celebrated its 15th birthday this past April, a milestone that provides an opportunity to reflect on how far we have come and on the changes currently underway. In 15 years, undergraduate students taught have increased by 170%, undergraduate majors and honours students by 100%, graduate enrolment by 60%, and total research funding by 70%. These numbers reflect the continued success of our disciplinary programs and research teams as well as the introduction of new interdisciplinary research clusters and academic programs. At the undergraduate level, geological engineering, one of UBC's oldest applied science programs, continues to operate at capacity. Environmental science (page 12) is thriving since moving to EOS with growth on pace to become the largest undergrad program in EOS within the next couple of years. The reintroduction of a defined majors program in geophysics has bolstered enrolment, and similar changes to combined majors in oceanography are on track to revitalize that program as well. The atmospheric science has recently undergone curriculum revision and enrolment remains steady. Curriculum review of the geological sciences program is a continuing priority for the coming year, and enrolment in that program remains strong. Our graduate program continues to attract exceptional student applicants from around the world, with current EOS grads representing 27 countries. A highlight of some of the many awards to EOS postdocs and students is listed on page 25.

Our faculty continues to be recognized internationally (see pages 19-24). Notably, EOS faculty delivered two Bowie Lectures at the fall meeting of the American Geophysical Union this past December (page 24). The fall AGU meeting is the largest earth science meeting in the world, and the Bowie lecture series recognizes one person from each of the 13 sections of the AGU. More broadly, EOS successes were recognized in the 2011 QS World University Rankings, where we placed 14th in the world and the top earth science department in Canada. These are truly remarkable accomplishments in 15 short years.

This past year two high-level staff retirements ushered in a reorganization of the administrative structure of EOS. Paul de Leon, EOS Administrator, accepted a position in the Department of Physics and Astronomy, and Deb Varley, Head's Secretary for many years moved to the Faculty of Applied Science. Paul and Deb's contributions to EOS are many, but I did not truly appreciate how much I relied on them until this year! Many thanks to Deb and Paul for their hard work over the years, and every success in their continued careers at UBC. The reorganization and re-staffing of the EOS admin office, including the creation of a new staff position in Human Resources, is now complete. Welcome to Renee Haggart, Director of Resources and Operations; Christina Girardi, Head's Secretary; Cary Thomson (formerly Graduate Coordinator), Human Resources Manager; and Michael Hermawan, Graduate Coordinator.

Other aspects of EOS have remained relatively constant over the past decade and a half. The physical facilities that house EOS have at best held steady, and the number of faculty members has increased by less than 10% over that period. But that is about to change as well. In August 2012, we will move into the new $75 Million Earth Sciences Building, funded by the mineral exploration industry and the Province of B.C. The building site for the ESB changes daily (viewable through a web cam accessed via www.eos.ubc.ca), and as it takes shape the magnitude of the changes in store for EOS are becoming increasingly apparent. Next year, EOS will be housed for the first time within a single complex consisting of the ESB, EOS Main, and EOS South. The new complex will allow us to re-organize and expand our core operations and to take full advantage of the new research and teaching linkages that have developed across the earth, ocean, and atmospheric sciences.

At the faculty level, EOS has struck three hiring committees in recent months. We are advertising to hire a tenure-track Instructor in Geological Engineering, a tenure-track Assistant Professor in Atmospheric Dynamics or Physical Oceanography of Climate and Climate Impacts, and a Canada Research Chair in Geomicrobiology to be shared with the Department of Microbiology and Immunology. These will be the first open faculty searches in EOS in some years and will build research strength and increase capability in delivering the environmental science, atmospheric science and geological engineering programs. By the time we move into the new building, these positions should be filled, and EOS will be in a strong position for continued success and growth.

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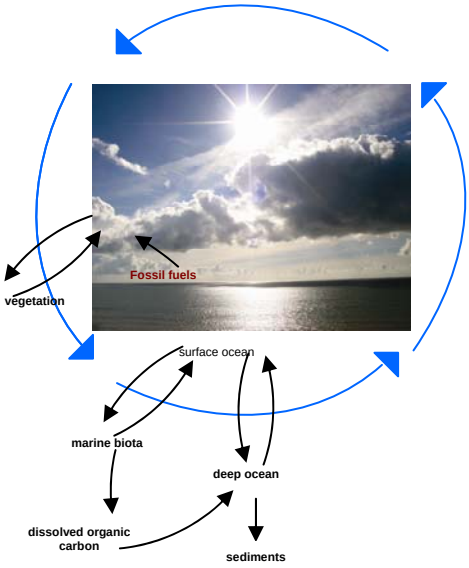

Global Climate Change

Dynamics and Consequences

(L-R): Phil Austin, Associate Professor in the Dept. of Earth & Ocean Sciences • Roger Francois, Canada Research Chair (CRC) in Marine Biogeochemistry and Climate Change Studies, EOS •, Maria (Maite) Maldonado, CRC in Phytoplankton Trace Metal Physiology, EOS • Christopher Harley, Assistant Professor in the Department of Zoology.

Observed increases in air and ocean temperatures, widespread melting of polar and glacial ice, and rising sea levels clearly indicate that the earth is heating up. UBC scientists are helping to answer critical questions: How fast? What is the tipping point whereby living systems become irreversibly compromised? How can we better quell, predict and prepare for climate change?

Scientists across the globe have established that we are at a pivotal point in the history of our planet. Survival of life as we know it is a numbers game. Earth's population has grown from 1.6 billion in 1900 to over 6.8 billion in 2010. Exponential growth, coupled with industrial and technological development, has resulted in increased burning of fossil fuels.

Over the past century, atmospheric carbon dioxide (CO_2) concentration has risen to a higher level than at any time within the last 800,000 years. Since 1960, atmospheric CO_2 has increased from 315 to 388 parts per million by volume (ppmv). By the year 2100, levels are predicted to rise to 750 ppmv if there is no effort to cut emissions (from Fourth Assessment Report of the Intergovernmental Panel on Climate Change, IPCC 2007).

During the 20th century, global air and sea surface temperatures rose by roughly 0.74 degrees Celsius (°C). Scientists estimate that in this century global temperature will rise by 1.8 to 4.0 °C (IPCC 2007), largely as a result of increased CO_2 emissions. The last 50 years have likely been the warmest period in the past 13 centuries.

The transfer of energy through physical, chemical and biochemical processes among the earth's atmosphere, oceans, soil and living organisms drives the complex dynamics of climate. When the global energy balance changes, the earth's climate changes (see text box). UBC scientists are working to map climate change over geological time scales and measure anthropogenic impacts in recent history to better understand the implications for future generations.

Human Evolution—A Hiccup in Time

Within the framework of global warming, it is difficult to believe we are living in the midst of an ice age. "If you look at the long-term changes of climate, we find ourselves in one of the rare cold periods, where ice remains on the poles," says Roger Francois, Canada Research Chair in Marine Geochemistry and Climate Change Studies, in EOS. His work in paleoceanography involves understanding how ocean biology and chemistry have controlled atmospheric CO_2 and greenhouse gas effects in the past, and how changes in ocean circulation have affected temperature distribution on the earth.

The Carbon Cycle and Radiative Forcing

Carbon is the fourth most abundant element in the universe and provides the chemical backbone of all life on Earth. The interchange of carbon between the atmosphere, the terrestrial biosphere (plants, animals, soil and freshwater systems), the oceans and the sediments (minerals and fossil fuels) is known as the carbon cycle (see illustration). Nature has been efficiently recycling carbon atoms for billions of years. Radiative forcing is the change in the balance between solar radiation coming into the atmosphere and radiation emitted back into space. Positive radiative forcing (caused by greenhouse gases) tends to warm the lower atmosphere of the earth, and negative forcing (such as caused by aerosols) tends to cool the atmosphere. Now, human activity is disrupting the balance. We are releasing CO2 into the atmosphere faster than it is being absorbed in natural carbon sinks, such as the ocean. This rise in atmospheric CO2 is altering the global energy balance and generating mechanisms that could force climate to change rapidly.

The current ice age began around 1.8 million years ago. It is marked by periodic shifts in climate from cold glacial phases to warm interglacial periods like the one we are living in now, which started around 10,000 years ago. Shifts from glacial to interglacial phases are initiated by periodic changes in Earth's orbital parameters, which alter the distribution of solar heat to the earth's surface. However, these orbital changes in themselves are too small to produce the dramatic contrasts in climate and must be amplified. One of the main amplifiers is the level of atmospheric CO2, which changed naturally in concert with climate, varying between 180 ppmv during glacials to 280 ppmv during interglacials. "Now, we are clearly 'rocking the boat,' having raised atmospheric CO2 to 388 ppmv and counting," Francois says.

While Homo sapiens have been on Earth for over 150,000 years, it has only been during the last 10,000 yearsthat the climate has been stable enough for humans to change from nomadic hunter–gatherers to agrarian groups and to civilization as we know it. "In a sense we are what we are because of a fluke in climate evolution," says Francois.

Evidence from ice cores, sediments and speleothems has shown that prior to 10,000 years ago very abrupt changes in climate occurred within just a decade or two. "The issue now is that we may well be the victim of our own success, because we are becoming such an important part of the climate equation that we could potentially shift the climate back toward an unstable period."

The Confounding Compounding of Multiple Variables

Warming sea water is causing the oceans to expand, and increased fresh water from polar and glacial ice-melt has caused the sea level to rise at roughly 3 millimetres per year over the past 10 years. While an increase in atmospheric CO2 drives up air and ocean temperature, increased CO2 uptake by the ocean also makes sea water more acidic. "Adding CO2 is like carbonating the ocean," says Christopher Harley, UBC assistant professor in the Dept. of Zoology. "The ocean pH we are seeing today is already more acidic than at any time over the past many millions of years."

While both positive and negative effects of increased temperature have been documented on individual species, much less is known about the effects on marine communities and their ecosystems. Even less is known about the effects of ocean acidification. "Scientists tend to study one variable at a time, but ocean temperature and CO2 concentrations are increasing simultaneously," explains Harley. "In many cases, the cumulative effects of these changes will be much worse than we might expect."

Good for Sea Stars—Bad for Mussels

To better understand the combined effects of increased temperature and CO2, Harley and his lab have studied the common sea star Pisaster ochraceus, a keystone predator—a species that has a disproportionate effect on its environment relative to its biomass. Surprisingly, they found that rising temperatures and, more significantly, higher CO2 levels ncreased sea star growth rate. Studies of other marine species showed a negative effect. Mussels, a favourite food for the sea star—and for humans—do not fare well.

"The mussel is the poster child for species that will fare the worst due to climate change, particularly in British Columbia," Harley says. Acidification is making their shells more brittle, increased temperature and CO2 is producing larger and hungrier predators, and warmer water is decreasing mussel habitat. While sea stars may be winning out over mussels in the short-term, the long-term effects of disrupting the balance in the food chain—and the ecology of an entire marine ecosystem—are unknown.

"Tipping the Tides"—Understanding Rates of Change

Climate change and its impacts occurred gradually over the 10,000 years before the industrial revolution. But when the scales are tipped in nature, rates of change are unpredictable. Harley has shown that certain changes can occur very rapidly once some threshold or "tipping point" is reached. He and his team studied the intertidal red algae Mazzaella parksii, which constitutes miniature seaweed forests that harbour snails and other marine life. They found that high temperatures, coupled with low tides and calm seas, spelled disaster for the tiny algae. When coastal air temperature hits 24 °C during a waveless low tide, they die; below that temperature, there is little change at all. "We expected that changes in the algae growth would be more gradual or linear, but above the tipping point the algae was wiped out," Harley says.

Mighty Phytoplankton—Primary Producers and CO2 Fixers

Some things in nature are taken for granted—like phytoplankton. These microscopic, unicellular marine organisms are responsible for transforming 45 gigatons of carbon from CO2 to organic carbon—roughly half of the total carbon fixation on Earth. One-third of the organic carbon produced by phytoplankton is exported to deep ocean, which serves as a carbon sink.

Pytoplankton live in surface water, down to 200 metres in the water column, or as far as light can penetrate. When they evolved 3.5 billion years ago, the earth was nearly anoxic. When oxygenic photosynthesis developed, phytoplankton started to pump oxygen into the atmosphere. "All of the oxygen we breathe today we owe to photosynthetic primary producers like phytoplankton," says Canada Research Chair in Phytoplankton Trace Metal Physiology Maria (Maite) Maldonado, in EOS.

Iron is the fourth most abundant element in the earth's crust and the most important trace element (micronutrient) for most organisms. Because iron can take up and release electrons very readily, it is the best catalyst in redox reactions, a fundamental chemical process in living systems. Maldonado is studying how marine phytoplankton acquire, metabolize and use iron and other trace elements, to better understand how these organisms affect the global carbon cycle and, thus, climate.

When phytoplankton evolved, iron was readily available. Currently, about 40 percent of the earth's oceans are iron-limited. Maldonado's group has provided strong evidence that marine phytoplankton are able to access iron bound within organic compounds. "The biggest pool of dissolved iron in the ocean is this organic source, which we previously thought was unusable to them."

Her group is presently investigating how phytoplankton may substitute copper (Cu) for iron (Fe) in some key metabolic pathways. In collaborations with colleagues at TRIUMF, they used Cu radionuclides to make the first measurement of intracellular Cu concentrations in Fe-limited phytoplankton. This work has changed the way oceanographers think about copper. Oceanic Cu has been considered a toxic trace metal to phytoplankton, but their results suggest that Cu is essential for marine phytoplankton, especially when Fe is low.

Iron Seeding—A Case Against Meddling with Nature

Much current research focuses on increasing carbon sequestration (capturing and storing CO2) and providing new sinks for industry to obtain carbon credits under the Kyoto Protocol. Maldonado was involved in the first in situ iron fertilization experiment in the Southern Ocean, adding 1,700 kilograms of iron over 50 square kilometres of ocean. Within five days the group observed increased phytoplankton biomass, improved photosynthesis and a reduction of CO2 concentration in surface water from 360 to 325 ppmv. A month and a half later, however, the phytoplankton bloom had expanded to 1,100 square kilometres.

"Although these experiments have improved our understanding of the role of Fe in controlling oceanic primary productivity, the efficiency by which Fe fertilization sequesters CO2 to the deep sea remains constrained," says Maldonado. "Given our poor understanding of the unintended impacts of massive oceanic Fe fertilization, this is not a feasible strategy to lower atmospheric CO2." Introducing iron into the ocean—like the introduction of cane toads to Australia to eradicate beetles, or the invasion of carp into North American waterways and lakes—can have unforeseen, even disastrous consequences.

Scientific Evidence of Human Impact on Climate

The question of whether the increase in atmospheric CO2 is caused by burning fossil fuels rather than natural carbon cycles is easy to answer, says Phil Austin. The carbon in fossil fuels comes from plants, which preferentially store the light isotope, carbon-12, over the heavier stable isotope, carbon-13. Measurements taken in the atmosphere, ocean, ice cores, tree rings and corals show the ratio of carbon-13 to carbon-12 is steadily decreasing as fossil carbon enters the atmosphere as CO2. "We know from measuring the isotope content that the 40-percent increase in atmospheric CO2 since 1750 is due to fossil fuel burning and not the natural carbon cycle," he explains. "Also, background oxygen levels are decreasing, and that is what you would expect if carbon release is coming from combustion." Claims that global warming is due to natural climate forcing by sun spots or cosmic rays are equally unfounded. "While the lower atmosphere is warming, the upper atmosphere is cooling. These findings are consistent with an increase in CO2 but not with increased solar radiation, which would add energy to the upper atmosphere," Austin explains.

Forcing *versus* Feedback—A Cloudy Picture

The *Fourth Assessment Report* (IPCC 2007) states: "…the global average net effect of human activities since 1750 has been one of warming, with radiative forcing of +1.6 Watts/meter2."

"That forcing is really closer to +3 Watts/meter2, but our own pol-lution is actually reducing the effect of this energy increase in the short term," says Phil Austin, UBC associate professor in the Dept. of Earth & Ocean Sciences. "The aerosols emitted from exhaust and coal-fired industry reflect so much sunlight that we are reducing the radiative forcing by one-third." As we produce cleaner energy sources, the planet will initially warm even more, because pollution in the form of aerosol particles is washed from the atmosphere within days, while CO2 molecules stay in the atmosphere and upper ocean for centuries. Despite the short-term consequences, we have to reduce greenhouse gases and pollution to increase prospects of survival in the long term.

Austin works with the Cloud-Aerosol Feedback and Climate Network at UBC to determine the direct and indirect effects of aerosols in the atmosphere and on clouds. "Sixty percent of the variation found in the 23 models that contribute to the IPCC data is due to their different assumptions on clouds," he explains.

The altitude of clouds determines their impact on the greenhouse effect. Cold, high clouds absorb thermal radiation from below and emit very little upward to space, thereby enhancing the greenhouse effect and increasing warming. Low clouds are closer to the earth's surface temperature, and because they are brighter, they reflect sunlight back into space, thus cooling the planet.

"That's part of the cloud feedback question we are trying to solve," says Austin. "If you heat the planet up, are clouds going to increase or decrease, and will they increase at high or low altitudes?" Most models show that low clouds break up and reflect less radiation for warmer temperatures.

"The biggest long-term problem is that one-quarter of all the greenhouse gases we emit will remain in the atmosphere 10,000 years," says Austin. "Given what we already know, we have an ethical responsibility to future generations to be proactive."

SYNERGY, JOURNAL OF UBC SCIENCE, ISSUE 01/2010
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Halos, Sun Dogs, and Diamond Dust

by Roland Stull
Chair, Atmospheric Science Program

One of the perks of being an earth scientist is that our workplace is outdoors. In this and future alumni newsletters I will present beautiful and dangerous aspects of the weather that we can be mindful of during our field work. This year, the topic is atmospheric optics.

While going about our jobs, we can look up occasionally to enjoy nature's atmospheric light-show. Some phenomena, such as rainbows, are caused by rain drops. Others, like corona, glory, and iridescence, are caused by tiny cloud droplets. But others are caused by ice crystals in the air.

The ice crystals can be in the form of veils of high clouds, such as cirrus. Or falling as snow from mid-level (alto) clouds. Or they can be blown by gusty winds into the air from snowdrifts on the ground.

Other crystals form directly in cold, arctic air -- in skies that look clear and blue. These latter ones sparkle in the sunlight, and are nicknamed **diamond dust**. While they occur frequently and naturally in the Canadian North and the Arctic, they can also be enhanced due to the water-vapour exhaust from electric generators and other motorized equipment in field camps.

Ice crystals form by direct deposition of water vapour onto ice nuclei, not by the freezing of liquid drops. The natural crystal shape for the most common form of ice (Ice Ih) in the atmosphere is hexagonal. Many hexagonal shapes have been observed, including needles, sheaths, dendrites, scrolls, cups, bullets, and rosettes. However, the most visually striking optics are usually caused by hexagonal plates, columns, and pyramids. These latter ice crystals have prism and basal faces that can be identified with the usual crystal nomenclature (see Fig. 1).

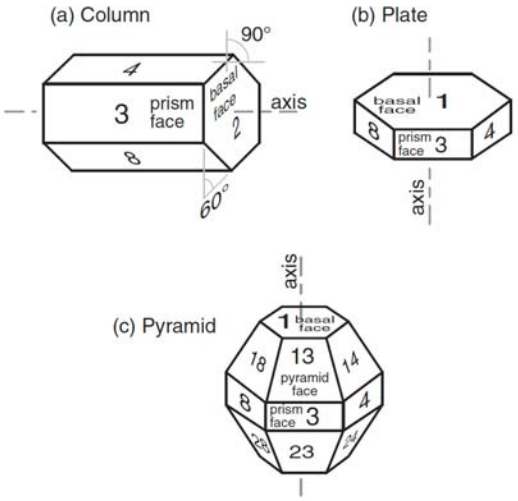

Figure 1

Ice crystals act like prisms for sunlight shining through them. The type of optical phenomena depends on the wedge angle (the angle between faces of the entry and exit light rays). While pyramids have a wide variety of angles and can cause an amazingly wide variety of halos, the most common wedge angle for **columns** and **plates** are 60° and 90°. These are the ones I will focus on.

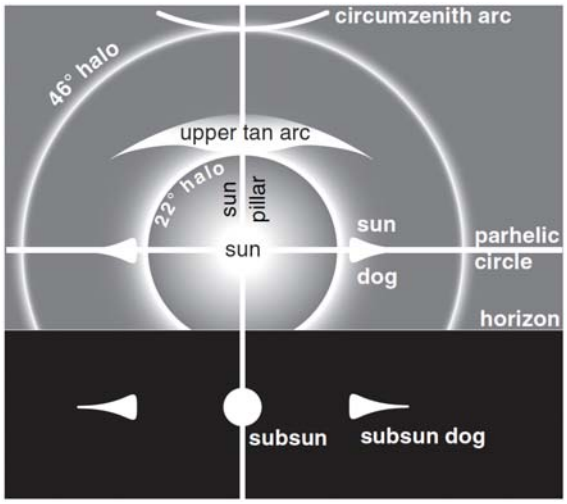

Figure 2

The most common optical phenomena associated with hexagonal columns and plates are sketched in Fig. 2. The subsun, which you can see only by looking down from a lofty vantage point, is caused by simple reflection of light off of the top face (basal face 1) of hexagonal plates, which tend to maintain their horizontal orientation as the gently fall through the air. It is a bright spot of light that is the same (angular) distance below the horizon that the sun is above.

The **sun pillar** extends above and below bright lights such as the sun, moon, or even streetlights at night. It, too, is caused by simple reflection, but this time from the prism faces of hexagonal columns. These columns tend to fall gently through the air with their column axis parallel to the ground, as sketched in Fig. 1. Because this crystal can have any rotational orientation about its axis as it falls, the prism faces from many different crystals can be pointing in many different directions, allowing reflection from a wide range of distances above and below the light source. These sun pillars are often faint, so they are most easily seen when the sun is just below the horizon, or is hidden behind a cloud.

A **parhelic circle** extends to the right and left of the sun as a horizontal line parallel to the horizon. It can also be cause by reflection -- this time off of vertical faces such the prism faces of the hexagonal plate, or the basal faces of the hexagonal column. The light rays can also shine into the ice crystal, then reflect from the inside of a vertical face, and then leave the crystal.

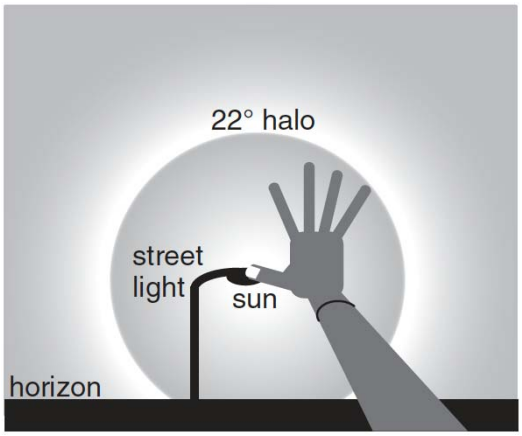

Figure 3

The other phenomena are caused by refraction (bending) of light as it passes through the ice crystal. Because light refraction causes dispersion of the different wavelengths, we can see a separation of colours. One of the most common halos is the **22° halo**. This is named because it appears at an angular distance of 22° from the sun. For most people, if you extend your arm fully and open your hand as widely as possible (Fig. 3), then the angle that you see subtended by your hand is about 22°. This works for people of different sizes, because hand size and arm length are often proportional. To avoid blinding yourself, it helps to position yourself so the sun is hidden behind a streetlight, traffic sign, or corner of a roof.

The 22° halo is formed by light entering one prism face of a small hexagonal column, and leaving from an alternate face (Fig. 4), for faces having a wedge angle of 60°. Because the column can rotate about its column axis, a variety of entry and exit angles are possible, which gives a range of viewing angles for the light rays. However, none of these light rays can have a viewing angle smaller than about 22°. Thus, the air inside the halo looks relatively dark, the air on the halo looks bright, and the air just outside the halo gradually fades from bright to dim. Due to the refraction, you can sometimes see red, orange, and yellow colours in the halo, with red on the side closest to the sun. You usually cannot see the green, blue, and violet colours in a halo, because those light rays are "stepped on" by red and orange rays coming from slightly different angles.

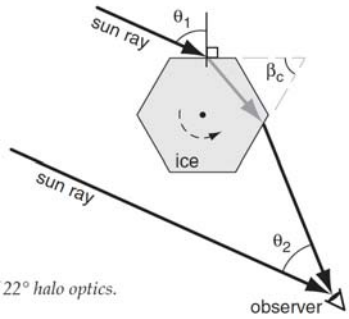

Figure 4

The column axis of these small hexagonal columns are free to tumble in any direction. Thus, you can see light rays at 22° from a whole circle of locations around the sun -- yielding the halo. For large hexagonal plates that maintain their flat orientation as they fall, refraction similar to Fig. 4 happens through the prism faces of the plate. However this flat orientation causes viewing angles only to the right and left of the sun. These spots of light are called parhelia, but are more commonly known as **sun dogs** because they faithfully follow their master (the sun) as it moves through the sky. **Subsun dogs** are possible below the horizon, for light rays such as enter prism face 8 in Fig. 1, then reflect internally off of basal face 2, and finally exit from prism face 4 of this large hexagonal plate.

There are a great many more ice-crystal optical phenomena -- even more than shown in Fig. 2. If you would like to learn more, I refer you to my new book "Meteorology for Scientists and Engineers, 3rd Ed" (see below). This is a fairly thick book -- not one you would want to carry as a field guide. But you might find it to be a useful algebra-based reference in your office. For more info on the book, and how to buy a pre-publication version at a very inexpensive price, see http://www.eos.ubc.ca/courses/atsc201/MSE3.html .

Meteorology for Scientists and Engineers, 3rd Ed.

by Roland Stull
University of British Columbia

This is a book on practical meteorology. It is quantitative and comprehensive, with equations describing atmospheric dynamics, physics, and thermodynamics. However, all calculus has been converted into algebra.

It is designed for students & professionals in science and engineering who want to understand and use the concepts, but who do not need to do derivations.

As a textbook, it has solved examples for nearly every equation. As a reference, it has extensive tables, figures, and graphs.

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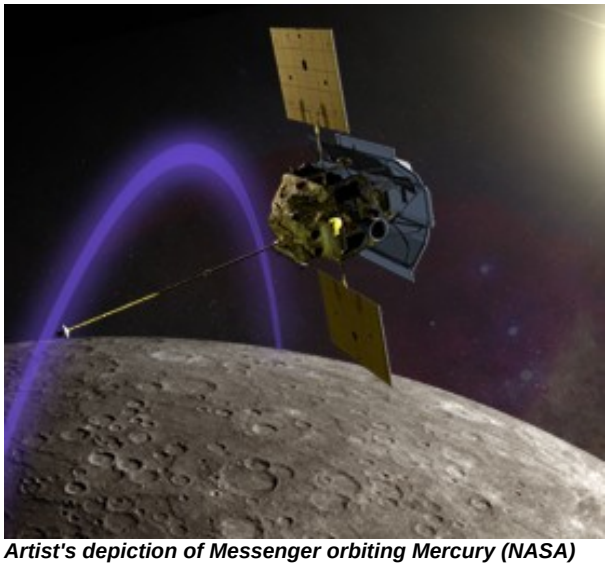
Details: www.eos.ubc.ca/courses/atsc201/MSE3.html

For your pre-publication copy at reduced price,
contact the author at: rstull@eos.ubc.ca

Mysterious Mercury Meets Messenger

Catherine Johnson, Professor
Earth and Ocean Sciences



Artist's depiction of Messenger orbiting Mercury (NASA)

On March 18, NASA's Messenger became the first spacecraft ever to enter the orbit of the planet Mercury -- one of the largely unexplored frontiers in our solar system. Messenger carries a wide range of instruments to map Mercury and answer burning scientific questions about the closest planet to the Sun, such as: Why is Mercury so dense? What is its geologic history? And is there really ice on its poles? **Dr. Catherine Johnson**, a geophysicist at the University of British Columbia is the only Canadian scientist participating on the Messenger mission. She will be using the data from Messenger to learn more about Mercury's magnetic field, which may reveal secrets about the planet's core.

A University of British Columbia geophysicist is part of a NASA mission that is unveiling the first images of Mercury taken from the planet's orbit, and capturing new data on the tiny planet's crust, topography and geologic history. UBC's Catherine Johnson, an expert in planetary magnetic and gravity fields, is part of NASA's MESSENGER Mission's geophysics group. Johnson, along with along with colleagues at Goddard Space Flight Lab and the Applied Physics Lab, is analyzing the initial data collected by the spacecraft's magnetometer, which has measured Mercury's magnetic field during 10 passes near the planet since the instrument was turned on March 23, 2011.

"A team of scientists is working away on analyzing the data from MESSENGER's various instruments, all of which are now on and returning data," says Johnson. "My group at UBC is working with the magnetic field, altimetry, and radio science data to try to understand the structure of Mercury's internally generated field and how it interacts with solar wind."

The spacecraft delivered its first photo of the planet early yesterday morning, after entering Mercury's orbit on March 17. MESSENGER is now in its orbital commissioning phase, during which its instruments are turned on and tested. MESSENGER's primary mission is to collect data on the composition and structure of Mercury's crust, topography and geologic history, thin atmosphere and active magnetosphere, and makeup of core and polar materials.

"Over the next few weeks, the focus will be on collecting results from the early data as well as getting set up for a year of data collection and analysis," says Johnson. "From what we've seen so far, it's a very dynamic environment."

Mercury, the solar system's smallest and densest planet, is one of only four terrestrial planets in the inner solar system, and in many ways is the most extreme, says Johnson.

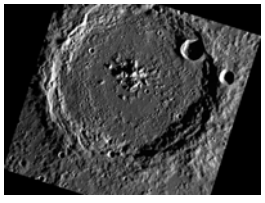
"Due to Mercury's proximity to the Sun, daily temperature variations are in the hundreds of degrees near the equator. Solar wind interacts with the magnetic field and the planet's surface. We want to know how this affects its environment."

"Understanding Mercury is crucial to understanding the family of inner solar system planets. The MESSENGER data will help us better understand our own planet."

The images are the first to be obtained from a spacecraft in orbit around the solar system's innermost planet. Over 360 photos were taken during the initial six hour period. Those images are being returned to Earth, where MESSENGER scientists are reviewing the data.

"The first images from orbit and the first measurements from MESSENGER's other payload instruments are only the opening trickle of the flood of new information that we can expect over the coming year." says MESSENGER Principal Investigator Sean Solomon, of the Carnegie Institution of Washington.

By the time MESSENGER completes its year-long survey of Mercury, over 75,000 images will be returned to Earth.



Meet Joe Green
The crater Verdi was named in 1979 for the nineteenth century Italian composer Giuseppe Verdi. Date acquired: May 02, 2011
Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington

NASA's Messenger mission www.nasa.gov/mission_pages/messenger/main/index.html

World's Largest, Most Complex Marine Virus is Major Player in Ocean Ecosystems: UBC Research

Curtis Suttle, Professor, Earth and Ocean Sciences,
and
Associate Dean, Research and Academic Services, Faculty of Science

UBC researchers have identified the world's largest marine virus--an unusually complex 'mimi-like' virus that infects an ecologically important and widespread planktonic predator.

Cafeteria roenbergensis virus has a genome larger than those found in some cellular organisms, and boasts genetic complexity that blurs the distinction between 'non-living' and 'living' entities.

"Virus are classically thought of small, simple organisms in terms of the number of genes they carry," says UBC professor **Curtis Suttle**, an expert in marine microbiology and environmental virology and lead author of the study.

"Much of the genetic machinery we found in this virus you would only expect to find in living, cellular organisms, including many genes required to produce DNA, RNA, proteins and sugars."

The findings are reported in the Proceedings of the U.S. National Academy of Sciences.

Viruses cannot replicate outside of living host cells and they depend on proteins provided by the cell, a boundary that is often used to delineate 'non-living' from 'living' organisms. Giant viruses challenge this definition, as they still need a cell to replicate, but encode in their own genome most of the proteins required for replication.

Curtis and his team where able to determine that the pathogen--discovered in Texas coastal waters in the early 1990s--has a genome that contains approximately 730,000 base pairs. That makes Cafeteria roenbergensis virus the largest known marine virus, and the second largest known virus, after the fresh water-borne Acanthamoeba polyphaga mimivirus, which weighs in at 1.2 million base pairs.

Cafeteria roenbergensis virus also infects a major marine zooplankter which occupies a key position in marine food webs.

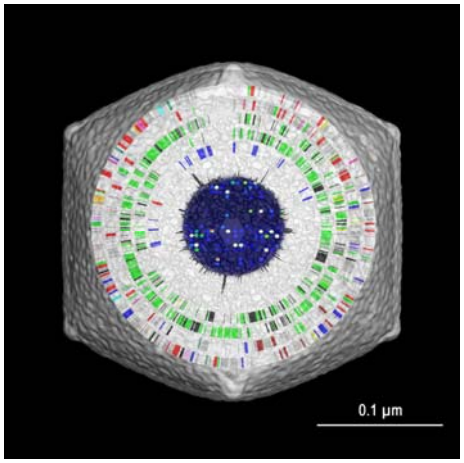
"Even though predation by these marine plankton grazers is a major pathway of carbon transfer and nutrient recycling in marine and freshwater systems, we know next to nothing about the role viruses play in this system," notes Curtis, cross appointed to the departments of Earth and Ocean Sciences, Botany, and Microbiology and Immunology.

"There's little doubt that this virus is just one representative from a major group of largely unknown but ecologically important marine giant viruses."

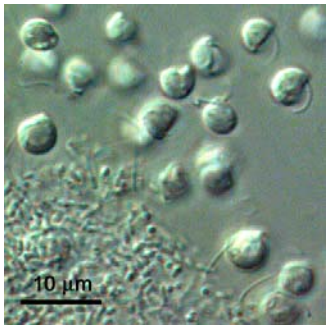
Also on the research team were UBC graduate student Matthias Fischer, Michael Allen of the Plymouth Marine Laboratory, United Kingdom, and William Wilson of the Bigelow Laboratory for Ocean Sciences, United States.

Funding for the research was provided by the Natural Sciences and Engineering Research Council of Canada and the Tula Foundation through the UBC Centre for Microbial Diversity and Evolution.

Pictured is the genomic map of Cafeteria roenbergensis virus (CroV) with part of a microarray tile in the center, superimposed on a low-resolution cryo-electron microscopy reconstruction of the CroV particle. CroV is a giant ocean virus infecting a common species of microzooplankton. Image courtesy of Chuan Xiao (University of Texas at El Paso) and Matthias G. Fischer (University of British Columbia).

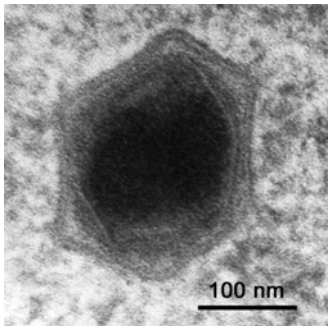


Cafeteria roenbergensis



Light microscopy image of the marine single-celled zooplankter *Cafeteria roenbergensis*, feeding on bacteria (small cells in the lower left corner). Image courtesy of Dr. Naoji Yubuki, University of British Columbia.

CroV2 Close-up:



Lessons in Consulting for Science Fiction

by Mika McKinnon

Science consultant Mika McKinnon sneaks into the gateroom of spaceship Destiny during a break in filming.
Photo credit: Christopher Di Arman

During my first day at Bridges Studio, I fed the energy of solar flares into traversable wormhole equations and tried to muffle fan-girlish squeals of delight while meeting people I had only known as characters. For the four seasons that I consulted for *Stargate: Åtlantis* and *Stargate: Universe*, I discovered how much the entertainment industry cared about the science they presented, and how to help them blend science smoothly into popular entertainment.

A consultant is a guest star for the crew, showing up only when episodes demand it. At first, I was the perpetual new kid on set, but a scientist is still a scientist, whether in a laboratory or in a studio. Slowly, I developed guidelines on how to successfully work the interface fostering a strong relationship between science and entertainment.

Wear closed-toe shoes

Both the laboratory and the field are environments where function dominates over form. Lab equipment lurks underfoot, unstable rocks dump geologists in undignified sprawls, and vulnerable feet must be shielded within protective footwear.

On a film set, form dominates over function, yet delicate toes are still at risk and sturdy footwear is still essential. In the hallways of spaceship Destiny, I awkwardly leaned over gutters of LED lights to write on the walls. Scooting too close to put the final touches on an equation, I overbalanced, slipped into the gutter and nearly twisted an ankle. Filming intensifies the hazard, when snaking camera cables and wooden crates litter the halls and threaten to upend the unwary.

Accuracy creates plausibility

Although the science in fiction will rarely line up with recent journal articles, plausible science fiction must be drawn from credible references, as an extension of what might be discovered or could be true if the rules of physics were different. “The accuracy of your science is what grounds the fiction, allowing the reader or viewer to suspend their disbelief,” explains Stargate writer Carl Binder.

A science consultant serves as an illustrator to the authors, adding richness and depth of to the world beyond the story. Explicitly, the science will appear in only a few lines of dialog, to capture the essence without bogging down the story. Yet the background contains all the accuracy and detail behind the concept in interweaving equations and persistent variables carried from episode to episode.

It is impossible to over-prepare

A director sees scientific accuracy as an opportunity for authenticity. On my first day, I prepared twice as much material as instructed, and used every equation and diagram. Every scripted notebook and white board had variations, and extra equations snuck into unscripted moments.

Now when I walk through the studio gate my bag contains: an episodic notebook with at least four times more material than the script demands, topical textbooks, the latest particle data book, reference sheets on a variety of physical phenomena, and an all-purpose notebook tracking choices I have made adapting science to this fictional universe.

Be creative with the familiar

The appropriate use of science in film avoids a harsh disruption, balancing recognizable structures and symbols with complexity and creativity. A viewer’s disbelief is broken if a fictional biologist claims lines of C++ as the solution to a chemical reaction. To maintain plausibility, fictional geniuses must not be stumped by a high-school physics problem, and alien alphabets must be mixed with familiar mathematical notation.

Fiction demands a willingness to apply scientific research in defiance of practicality. The *Stargate: Åtlantis* episode “Brain Storm” required 15 meters of equations, the length dictated by the set and the topic dictated by plot. The tangle equations tied together string theory, parallel universes, thermodynamics, and the consequences of a steady temperature imbalance on atmospheric science. The science was recognizable, the application fictional, the combination plausible and aesthetically intriguing.

Photograph everything

Creating clear, useful lab notebooks to record data and procedures is a skill drilled into proto-scientists. Likewise, my episode files are filled with photographs of on-set science.

In the Stargate: Universe episode "Pathogen," trapped far from home, the character Nicholas Rush started scrawling on the walls of the spaceship in a desperate attempt to understand the unknown. On set, it took me twelve hours to fill the hall, leaving me with an aching wrist and sniffling from chalk dust. The crew claimed to find errors in my addition as I meticulously photographed each section.

A week later, in a single moment of miscommunication, the walls of chalk were washed clean. It took another full day of poring over photographs to replicate each smudge and overlapping equation. I didn't relax until the sealant dried, preserving it against future mishap.

Astrophysics is an irresistible backdrop for costume continuity photographs. Photo credit: Mika McKinnon

Teach while learning

Scientists are irrepressible teachers, who want to share the beauty of fluid dynamics in coffee cups and of optics in sunsets with anyone who will listen. The cast and crew quizzed me on the aerodynamics of dragonflies, natural hazards in Vancouver, and why the sky is blue. I traded answers for questions of my own, about the process of filming, the function of equipment, and stories of careers that had led to this moment.

Embrace fans' passion and curiosity

Theories are challenged in academic literature and debated at conferences. The first time I directly engaged with fans of the Stargate franchise, I assumed that I would face harsher questioning than I had experienced in my thesis defence.

The fans were as passionate as I had expected, but far more relaxed. Curiosity focused on scientific concepts rather than technical detail, and scenes from episodes illustrated ideas from forgotten science classes. Fiction allowed me to engage their passionate interest in the show to build scientific literacy.

Be a model scientist

Every scientist who interacts with the entertainment industry shapes the cultural image of a scientist. The crew continually seeks new knowledge to inform film portrayals; as the on-set scientist I became a resource. When the costumes department asked me about the realism of our fictional scientist working at home in his flannel moose pyjamas; I affirmed with stories of my late-night sessions curled up in fleecy polar bear pajamas while toying with rheological models.

For me, *Stargate: Universe* episode "Human" is a disorienting mix of fact and fiction. Filmed in the Hennings Building of UBC, fictional graduate students sipped from brightly colored water bottles deliberately purchased to resemble the one I habitually carted around on set. I ransacked my undergraduate notes on cryptography when drafting the fictional blackboard notes, and started with a friend's current research in quantum computing to take real physics and spin it somewhere entirely fictional.

Before I first stepped on set, I thought I would be conducting an uphill, one-sided campaign to include actual facts in stories. Instead, by breaking down the mutual intimidation, Stargate built a symbiotic relationship between science and entertainment to create something better than either could in isolation. I see the glow in other shows that have embraced science, partners in crafting strong and fascinating stories to set loose in the world, and I hope to see it more often.

Guest stars Neil Degrasse Tyson and Bill Nye, director Martin Gero, and physics consultant Mika McKinnon on location filming *Stargate: Åtlantis* "Brain Storm." Photo credit: Joseph Mallozzi.

Mika McKinnon consulted for Stargate while completing a thesis on landslide runout in the Earth & Ocean Sciences Department.

ENVIRONMENTAL SCIENCES PROGRAM

by Tara Ivanochko, Director

Dr. Tara Ivanochko
Earth and Ocean Sciences
Director, Environmental Sciences Program

Over the last year the Environmental Science program has been both expanding and settling down. With enrollment of 2nd year students increasing from 28 to 55, we are poised to be the largest undergraduate program in EOS. The capstone course, ENVR 400: Research Project in Environmental Science has been run twice, and next year will be required for all graduating students in the Majors stream. This challenges our best students to consider their interests and future career goals. Choosing the Honours program allows them to experience research, one on one, with an academic supervisor. Choosing the Majors program allows them to participate in a group project with community relevance.

As part of the program expansion, this year we added a new course ENVR 410: Energy, Environment and Society designed to add breadth to our program and to give students an opportunity to grapple with the science, economics and policy associated with past and present energy use.

The students entering the Environmental Science program continue to be keen and capable. They now have more and more opportunities to engage in research, with the community, in international exchanges and with industry. Some of these opportunities come from university programs such as Go Global and Co-op (work placement) programs; some come through new courses and the revised Environmental Science curriculum. Keep an eye out for our students, upon graduation (and sometimes before) they will be actively looking for opportunities to tackle the challenges of our day.

The following Executive Summary highlights one of the ENVR 400 Projects:

Commercial Shipping Noise Impacts on the Critical Habitat of the Southern Resident Killer Whale (Orcinus orca)

(L-R) Cassandra Paterson, Shasha Wang, Rebeka Ryvola, Kristina Moseley, Danica Crystal at the Blue Whale Exhibit, UBC

ENVR 400 PROJECT AUTHORS

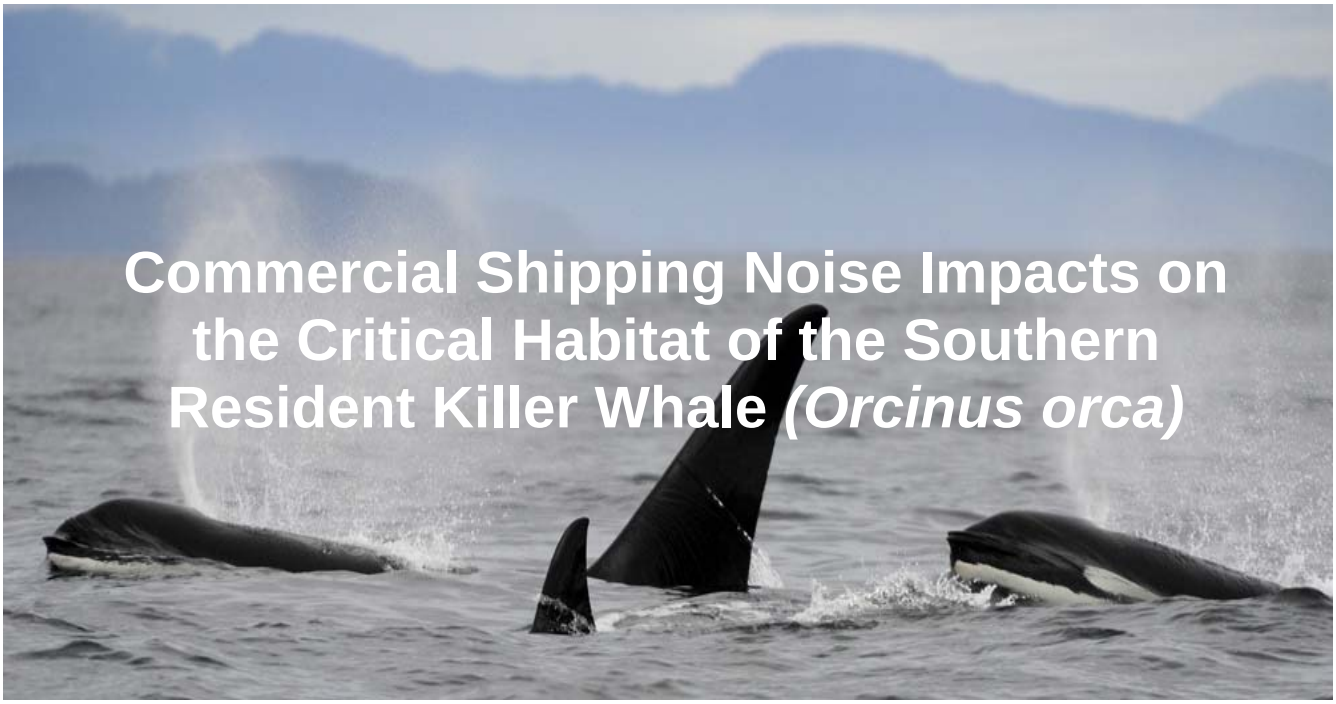
Danica Crystal is a graduating UBC student pursuing a B.Sc. in Environmental Sciences. Her areas of interest include ecology, natural resource management, environmental politics and policy, and specifically the integration of these fields. She plans to pursue a Master's studies in environmental management in the future.

Kristina Moseley is graduating from UBC in 2011 with a B.Sc. in Environmental Sciences. Her specialization is atmospheric and water environments and she is interested in the protection and conservation of these environments. After graduation, she plans to pursue a career in environmental consulting and management.

Cassandra Paterson is graduating this spring from UBC's Environmental Sciences Program. Her areas of interest include environmental issues such as climate change and their impacts on North American biogeography. She is looking forward to pursuing a Law degree at the University of Victoria this fall with a specific interest in environmental law.

Rebeka Ryvola is a 2011 graduate from UBC's Global Resource Systems (B.Sc.) program. She loves being outside, preferably in the presence of animals. Most passionate about understanding the intersection of environmental science and society, she will be working on environmental policy issues post graduation.

Shasha Wang is a 2011 graduate from UBC's Environmental Sciences Program, with a focus on water and atmosphere. She is most interested in issues surrounding environmental science and international development. After graduation, Shasha wants to pursue a career in environmental consulting



Commercial Shipping Noise Impacts on the Critical Habitat of the Southern Resident Killer Whale *(Orcinus orca)*

Executive Summary

Southern resident killer whales (SRKWs), found commonly on the south coast of British Columbia, are an endangered species struggling to maintain its population size. The critical habitat of the SRKW, an area important to the recovery of the species, is also an area traversed by commercial ships on a daily basis. Among other challenges to the whales such as habitat destruction and contamination, noise pollution produced by these commercial ships is one of the threats preventing the recovery of the SRKWs, through masking of whale communications. Masking, the interruption of killer whale vocalizations by background noise produced by ships, reduces group cohesion and forces the whales to spend more time and energy foraging, ultimately decreasing their ability to reproduce and sustain their population.

The Canadian Federal Court recently established that protection of this endangered species, managed by the Department of Fisheries and Oceans (DFO), must take into account the impact of noise pollution on the whales, a factor that has not yet been considered. With an expected increase in commercial shipping to BC facilitated by expansions at two ports, there is potential for further threats to the SRKWs through masking of vocalizations. The purpose of this study is to examine the current masking sounds created by commercial ships in the critical habitat of the SRKW and to determine whether imposing speed limits on ships can reduce the amount of masking that occurs.

The objectives of this study are to:

1. Identify the areas on the south coast of BC where ships have the potential to mask the SRKW vocalizations when the whales are inshore (May through October).
2. Determine the frequency of masking within these areas.
3. Model speed limit scenarios imposed on ships and assess the effectiveness of these limits at reducing masking sounds.
4. Recommend further research that will contribute to minimizing the effect of ship noise on this endangered population.

In order to identify the areas on the south coast of BC where masking occurs, we calculated the noise levels produced by ships traveling in and out of southern BC. Using GIS and data supplied by the Marine Communications and Traffic Services (MCTS) branch of the Canadian Coast Guard, we determined the spatial extent and frequency of masking generated by commercial ships. We then modeled speed limit scenarios of 10, 15, and 20 knots (kn) and calculated the reduction in total masking.

The key findings of this study are as follows:

1. 20% of all shipping activity produced noise loud enough to mask killer whale vocalizations.
2. The area affected by masking (Figure i) covers the majority of the Juan de Fuca Strait, Haro Strait, and Boundary Pass (Figure ii).
3. Masking was produced in Haro Strait and Boundary Pass 90% of days sampled during the study period. This area overlaps heavily with the critical habitat of the SRKW.
4. A speed limit of 20 kn did not create any reduction in masking, a 15 kn speed limit reduced the occurrence of masking by 30%, and a 10 kn limit reduced masking by 100%.

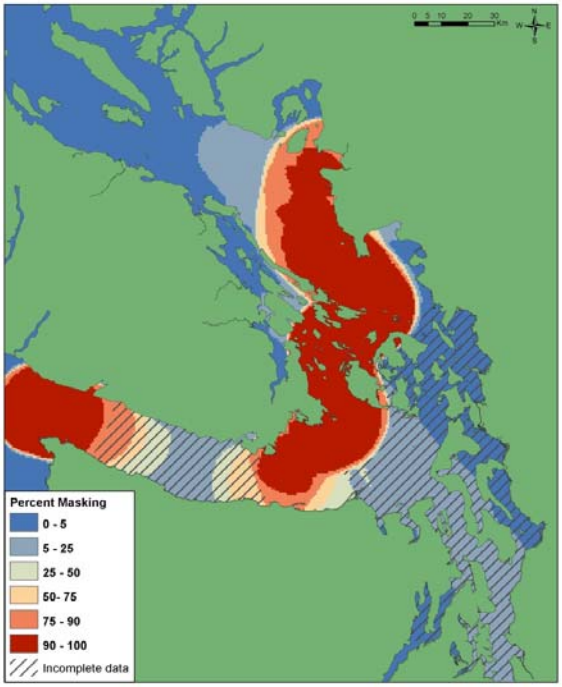


Figure i - Percent of time areas along the south coast of BC are subject to masking. Areas of incomplete data are shown due to limitation in available data. Data from: MCTS, UBC Geography, Washington Department of Ecology

Figure ii - Geography of the south coast of BC. Areas that are important to this study are labelled here. Data from: UBC Geography, Washington Department of Ecology.

As a result of these findings, we present the following recommendations to better inform SRKW protection:

1. Further research is needed to better understand the ecologically important areas for the SRKW and to identify their physiological responses to masking.
2. Critical times of day for SRKW feeding, mating, and other social behaviour need to be researched in order to better inform shipping schedules.
3. Management strategies, including the development of marine protected areas, should consider the acoustic environment of the killer whales, which encompasses noise pollution created by nearby shipping traffic.
4. Because a 10 kn speed limit would cause a 100% reduction in masking, discussions around limiting speed should seriously consider implementing a 10 kn limit, especially in areas of concern for the SRKWs.
5. Because of the trans-boundary nature of the species, recovery of the SRKWs needs to involve cooperation and coordination between U.S. and Canadian organizations, both governmental and non-governmental.

This study has established that, within the study period, masking occurs on an almost daily basis on the south coast of BC. Masking has the potential to reduce the fitness of the endangered southern resident killer whales, a species that the DFO is mandated to protect. Further research is needed to determine the specific physiological effects of ship noise on killer whales; however, it is clear that masking occurs within their critical habitat and this could have detrimental impacts on the recovery of the species.

The complete study can be found here:
https://circle.ubc.ca/bitstream/handle/2429/34597/Commercial_Noise_Impacts_Critical_Habitat_Southern_Resident_Killer_Whale_ENVR_400_2011.pdf?sequence=1

Pacific Museum of the Earth

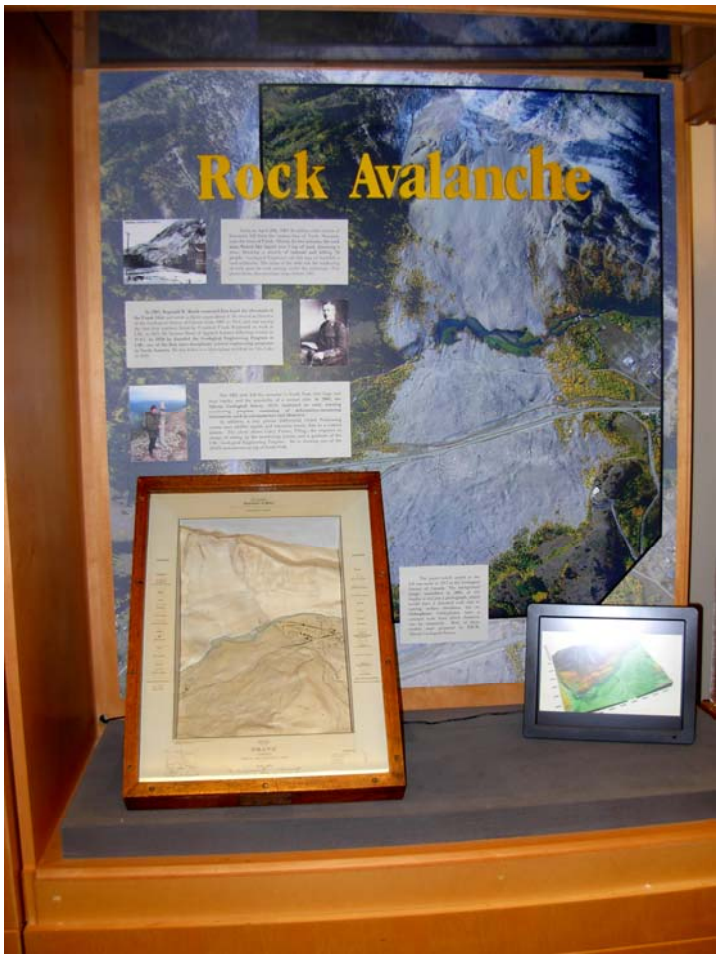
by Mackenzie Parker, Curator

This year has been all about educational programming at the Pacific Museum of the Earth. Our fossil displays were relocated to allow the new PCIGR lab construction to begin, our Earthquake Corner was updated, a new landslide display was installed, and our Teacher Training Workshop more than doubled in attendance!

Alumni probably remember the fossil displays, since the largest one hadn't been updated since Joe Nagel and his people installed it! There's a reason that display lingered so long; when the PCIGR construction finally provided the drive to crack it open and get the samples out, we discovered that it literally wasn't possible to remove the case without removing the wall as well.

Fortunately, the construction required removing the wall anyway, so we got all of the fossils out of there and scrapped the display case. I wish I had pictures of the removal of the carbonized tree trunk—we had to wrap it in plastic and foam, build a wooden support, recruit four people to help, and sacrifice one not quite-sturdy-enough cart. Of the fossils removed (the large case and four smaller ones), one small case (The Burgess Shale) has been restored to display. We are taking this opportunity to redesign and update the rest of the displays.

On the subject of updates, I'm very pleased to report that we have updated our "Earthquake Corner". Three truly ancient computers running PowerPoint presentations have been replaced with a large touch screen display and a small but new standard display. The touch screen runs IRIS's Active Earth Display, supplemented with 16 pages of local content developed by museum staff, while the smaller screen displays live earthquake data from the Quake Catcher Network and runs a "jump pad", allowing visitors to view detection of local ground movement. Some minor fact checking and content refinement remains to be done, but the displays are installed and we encourage you to check them out. Many thanks go out to the Faculty of Science for grant support and Lauren Krakau (EOS student) for content development.



We also have one new, complete display installed. Thanks to the hard work of Dr. Oldrich Hungr and the museum admin assistant, Ravneet Gill (EOS student), we have "Rock Avalanche" ready to share with you! This display highlights the Frank Slide and some departmental history with the use of an amazing orthophoto and landslide models old and new.

The new developments haven't been limited to the exhibits, of course. We moved the Teacher Training Workshop from the summer (August in 2009) to the Province Wide Professional Development Day in October (2010) and were rewarded with more than double the attendance! We grew from 16 teachers attending to more than 40. If you know any K-12 teachers who would like to brush up on their geology, oceanography, and atmospheric science content, let them know we'll be back for the next Pro-D Day this fall (Friday, October 21).

Last but not least, we have a new hands-on workshop available! Developed by Claudette Martin and supported by the NSERC PromoScience program, "What's Shakin'" lets grade 4 to 12 students learn about plate tectonics and earthquakes by modeling plate boundaries with Playdoh and experimenting with detecting vibrations from jumping up and down at various distances from a real seismometer. The workshop has run six times since debuting in mid-May and has received enthusiastic responses from all participants.

I'm proud of what we've accomplished this year, and I hope to have more to share over the year to come!

CONSTRUCTION OF NEW PCIGR FACILITY BEGINS

Construction began on the new laboratories of the Pacific Centre for Isotopic and Geochemical Research. This project, funded by the Canada Foundation for Innovation and the BC Government, represents a total investment of ~$7.5 million. This integrated analytical facility will foster innovative and collaborative research in the earth, environmental, oceanographic, atmospheric and biological sciences.

In January, the former EOS Main Office was vacated and demolition began. Since then, significant progress has been made including construction of a 500 sq. ft. vibration isolation slab, replacement of the exterior glazing, and the recent installation of the cleanroom walls. Construction is scheduled to be completed at the end of August 2011, followed by cleanroom certification and instrument delivery, with the sixth and final instrument arriving in June 2012.

Please visit the PCIGR website for additional construction updates and photos –
http://pcigr.eos.ubc.ca/CFI%20new%20facility/index.php

Excavation of the ground for the vibration isolation slab

Completed vibration isolation slab (>100 tonnes of concrete).

Visit of Belgian Delegation

On June 1, the PCIGR received the visit of an official delegation from French speaking universities lead by the Minister of Higher Education and Economy, Jean-Claude Marcourt, the Ambassador of Belgium in Canada, Bruno van der Pluijm, the provost of the Université Libre de Bruxelles, Pr. Didier Viviers, the first vice-provost of the Université de Liège, Pr. Albert Corhay, the provost of the Université de Louvain, Pr. Bruno Delvaux, as well as representatives responsible for research administration, industry interface, and international relations.

The visit was prefaced by a 15 minute presentation by Dominique Weis about the PCIGR and the funding opportunities in Canada. After the presentation, three groups were formed so that visits of the clean labs and instrument labs could be organized. An overview and brief look at the new CFI space was also arranged.

Overview of the new CFI labs.

Field School Reunion Mines Rich Vein of Memories

Earth & Ocean Sciences classes of 1950 to 1989 shared memories—and a BBQ lunch of hotdogs and burgers at the department's venerable Oliver Field School—at an Okanagan reunion and wine tour this fall. After lunch, many alumni and guests opted for a tour and impromptu lecture at the nearby Gypo mine silica deposits. The reunion's evening was less rustic, with alumni sharing 60 years of geological field school reminiscences over cocktails and dinner at the Spirit Ridge Vineyard Resort in Osoyoos.

UBC's geological field school, past, present and future. The current student training facilities on the site range in age from 35 to 60 years—including the field school's rustic cookhouse. The reunion might just have inspired the next generation of geologists. Credit: Anna Grabowski.

Reminiscences by Professor Emeritus, Dr. W.R. (Ted) Danner

The history of EOS a couple of Alumni Newsletters back reminded me of several things. M.Y. Williams was an interesting person. He was a United Empire Loyalist and never crossed the border into the U.S. While at UBC. he informed the UBC library to restrict their purchases of Geology publications to "Canadian only". He developed the museum in the old building and his home in Kitsilano was also a museum.

I came to UBC in the fall of 1954. He took me aside and told me what I should teach in my course entitled Geology of Canada and North America. One day he asked me to go with him to an oil drilling project near Abbotsford. When we got close, he told me to get out of the car and walk to the drilling rig and find out all I could, but did not want them to know that he wanted the information as he consulted for major oil companies. I was his spy! He was a terrible driver and I never went with him again.

The dinosaur in the Museum was dug up and assembled by the famous Sternburg family. It was excavated and prepared for a university in Eastern Canada. The process took several years and when it was ready, the university said they weren't prepared to take it. M.Y. said UBC would take it so we got it on permanent loan. Every few years a member of the Sternburg family would come to UBC to see that it was properly taken care of.

When EOS-Main was built, the dinosaur had to be moved to the site and the pre-fab building was built around it as it could not be moved into the building after it was built. When EOS-Main was formally opened the Geological Engineers put male sex organs on it much to the chagrin of the Head, Hugh Wyn Edwards.

In the spring of 1955, I went to field school for a week to replace Bill Waite. The field school was originally established in the Cultus Lake area of the Lower Mainland but was moved to Oliver to escape the rain. The Oliver site was chosen so they could use the Susy Mine for the underground mapping exercise. In 1953, there was the cookhouse and open huts for sleeping. The water supply was the stream running through the camp. There was no well; no washing facilities. The latrine was a trench and a couple of logs, north, up the hill. Women were not allowed to take field school. Two students were on KP each day and got up early to prepare breakfast and make dinner in the evening. There were no showers or bathing facilities so the two KP students would heat water and pour it into a tub to take a bath.

One of the exercises was the 20 Mile Traverse. It was from a Geological Survey of Canada exercise to check the stamina of student field assistants. When I was there it went from the road going North from camp, up into the mountains to the west and then north down into White Lake Basin. There wasn't much time to do geology along the route but I remember visiting a mine dump and some lucky students found specks of natural gold in quartz in the dump.

I have a funny memory many years later at the White Lake Basin exercise. The Highway Department was spraying the roadways with grass seeds and fertilizer. They came around a corner where the students were on the outcrop and the students were seeded and fertilized!

Award Highlights in EOS

A.G. Huntsman Award for Excellence in Marine Science
The 2010 Huntsman Recipient is Dr. Curtis Suttle

The **2010 A.G. Huntsman Award** recipient is **Professor Curtis A. Suttle** (FRSC) in recognition of his contributions to biological oceanography. The award ceremony took place in the auditorium at the Bedford Institute of Oceanography on November 4, 2010.

Dr. Suttle is one of the world's leading marine virologists, and is among a small group of researchers that is credited with launching the field of marine virology nearly twenty years ago. These studies demonstrated that viruses are not only the most abundant and genetically diverse biological entities in the world's oceans, but they are major agents of mortality. The results have had a significant impact on our understanding of nutrient and energy flow in the oceans, and have been a catalyst in the re-invigoration of phage biology and environmental virology. His contributions cross over many fields including biological oceanography, environmental microbiology, microbial ecology, virology and phycology.

Dr. Suttle was an Associate Professor (1996 – 2000), Professor (since 2000), and Associate Dean of Science (since 2001) at the University of British Columbia in Vancouver. He received his B.Sc. in zoology in 1978 and his Ph.D. in botany in 1987, both from UBC. His career has taken him to government laboratories and academic institutions in Canada, the United States, and Germany, with a significant amount of time (1988 – 1996) at the University of Texas at Austin.

ABOUT THE AWARD: The A.G. Huntsman Award was established in 1980 by the Canadian marine science community to recognize excellence of research and outstanding contributions to marine sciences. The award honours marine scientists of any nationality who have had and continue to have a significant influence on the course of marine scientific thought. It is presented annually in one of three categories:

- **marine geosciences**
- **physical/chemical oceanography**
- **biological oceanography and fisheries science**

The award is named in honour of Archibald Gowanlock Huntsman (1883–1973), a pioneer Canadian oceanographer and fishery biologist.
The A.G. Huntsman Award, a specially-designed and engraved sterling silver medal, is presented by the Royal Society of Canada during a ceremony at the Bedford Institute of Oceanography. As well, the recipient delivers a distinguished lecture in his or her field of specialty

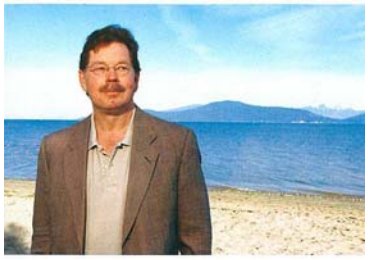
The Timothy R. Parsons Award
for Excellence in Ocean Sciences
Recipient Dr. Curtis Suttle

The adjudication committee acknowledged Dr. Suttle's groundbreaking research on marine viruses and its contribution to multidisciplinary ocean science. For example, his work has changed the way the scientific community looks at ocean carbon transport through a closer examination of chemical, physical geological, and biological processes. Dr. Suttle's contribution is well known world wide, as was articulated by letters of support from a number of international institutions. He also received exemplary support from the academic community for his leadership and mentoring roles.

The Award was presented to Dr. Suttle at the CMOS conference in Victoria, June 2011

(L-R) Tim Parsons, Curtis Suttle, Siddika Mithani (presenter)

ABOUT THE AWARD:
Fisheries and Oceans Canada (DFO) has established the Timothy R. Parsons Award for excellence in Ocean Sciences to recognize a Canadian scientist for outstanding lifetime contributions to multidisciplinary facets of ocean sciences or for a recent exceptional achievement, while working within a Canadian institution. This award is named after Dr. Timothy R. Parsons, and honours his distinguished career as a Fisheries Research Board of Canada researcher, university professor, (Oceanography and EOS), broadly read author and recipient of the 2001 Japan Prize. For more information on Dr. Timothy R. Parsons, please visit: http://www.dfo-mpo.gc.ca/science/award-prix/parsons/index-eng.htm



UBC's Top Research Prize Goes to Marine Metabolite Hunter Professor Ray Andersen

Ray Andersen
ProfessorChemical/Geochemical Oceanography

A UBC organic chemist and oceanographer who studies the metabolites produced by marine organisms--often to help evaluate their potential as drug candidates--has been awarded UBC's premier prize for research.

Raymond Andersen, with the departments of Chemistry and Earth and Ocean Sciences, has been awarded the 2010 Jacob Biely Faculty Research Prize.

Andersen's group isolates and studies the structure of novel organic metabolites produced by marine organisms--either due to the novelty of their biogenesis, their potential as pharmaceutical agents, or to the central role they play in the biology of the organism.

The Jacob Biely Research Prize was established in 1969. Eminent researcher and professor Jacob Biely joined UBC in 1935 as an instructor in the Department of Poultry Science. He was appointed full professor in 1950, and two years later was named head of the department, a position he held until his retirement in 1968.

Professor Douw Steyn wins National Earth Science Mentorship Medal of the Canadian Foundation for Earth Sciences (CFES)

CFES/FCST, established in 2006 as the successor to the Canadian Geoscience Council, brings together 14 affiliated member societies of earth scientists in industry (minerals, hydrocarbons, environmental/geotechnical), government (Federal and Provincial/Territorial Geological Surveys) and academia, representing a total of about 20,000 earth scientists in Canada. CFES/FCST also closely cooperates with 4 observer organizations.

Dr. Douw Steyn, an atmospheric scientist at the Department of Earth and Ocean Sciences, University of British Columbia, has been awarded with the third CFES/FCST Mentorship Medal.

Dr. Steyn hails originally from South Africa where he did his first degrees in Physics and Applied Mathematics. He came to Canada in 1976 to do his PhD research at UBC under Dr. Timothy Oke, thus entering the world of atmospheric sciences, where he made important contributions. His nomination was supported by colleagues and mentees from Canada, Italy, Germany, Australia, South Africa, the United States, Singapore, the UK, and Saudi Arabia. His enthusiasm is infectious and he has regularly gone beyond the call of duty to help graduate students and those in early phases of their career.

Dr. Steyn is currently on sabbatical at the African Institute of Mathematical Sciences (AIMS) in Cape Town. The time and date of the award ceremony is therefore still in the planning. In the photograph, he celebrates with his wife Margaret at AIMS.

Paul Smith, Department of Earth and Ocean Sciences, Faculty of Science, has been appointed Vice Provost and Associate Vice President Academic Facilities and Enrolment pro tem

Following the announcement from Doug Owram that Wes Pue has been appointed Provost and Vice Principal of UBC's Okanagan campus, I am pleased to announce that Paul Smith, Department of Earth and Ocean Sciences, Faculty of Science, has been appointed Vice Provost and Associate Vice President Academic Facilities and Enrolment pro tem. Dr. Smith's appointment is for a one year period, beginning July 1, 2011.

Dr. Smith is a geologist specializing in paleontology, educated in the United Kingdom, the United States and Canada, earning a B.Sc. from the University of London, a M.S. from Portland State and a Ph.D. from McMaster University. He has worked in the oil industry and as a consulting geologist. Dr. Smith joined what was then, the Department of Geological Sciences at UBC in 1980, becoming involved in the merger of several UBC units that formed the Department of Earth and Ocean Sciences in 1996.

From 2000 until 2009 Dr. Smith served as Head of Earth and Ocean Sciences helping it achieve its status as the foremost geoscience department in Canada, ranking within the world's top 20, and soon to be housed in the Earth Sciences Centre currently under construction on Main Mall. He has served on NSERC grant selection and site visit committees and, while Head of EOS, Dr. Smith led the Canadian Council of Chairs of Earth Science Departments.

His research interests, which focus on the relationship between Earth evolution and the evolution of life, have taken Dr. Smith to many remote field areas, including the Himalayas, and resulted in over a hundred scholarly publications. A strong believer in innovative teaching, Dr. Smith is a recipient of the Killam Teaching Prize for outstanding undergraduate teaching and has served on the Board of the Carl Wieman Science Education Initiative.

Please join me in welcoming Paul as Vice Provost and Associate Vice President Academic Facilities and Enrolment pro tem.

I am immensely grateful for the support and thoughtful advice that Wes has provided during the past four years. It has been a pleasure working with him and I look forward to our continued work together on behalf of the University.

A formal search for the Vice Provost and Associate Vice President Academic Facilities and Enrolment will take place in early 2012.

David H. Farrar
Provost and Vice President Academic

Government, Industry Support to Help 'De-Noise' Seismic Data

A new five-year, $5 million government- and industry-funded project at UBC will see researchers in the departments of Earth and Ocean Sciences, Computer Science and Mathematics designing the next generation of seismic imaging technology.

The Dynamic nonlinear optimization for imaging in seismic exploration (DNOISE II) project received funding from the Natural Sciences and Engineering Research Council of Canada this October, and matching support from industry partners including BG Group, BP, Chevron, ConocoPhillips, PetroBras, Total SA and WesternGeco.

“This work will address fundamental issues related to the quality and cost of seismic data acquisition, and to the ability to mine exceedingly large data volumes,” says Felix Herrmann, director of the UBC-Seismic Laboratory for Imaging and Modeling and principal investigator on the project.

"These investments will help keep UBC and Canada at the forefront of advancing seismic imaging technology by adapting transformational developments in applied and computational harmonic analysis, convex optimization and geophysical inversion."

The interdisciplinary project involves researchers from across UBC Science, including Michael Friedlander (Computer Science), Ozgur Yilmaz (Mathematics) and **Herrmann (Earth and Ocean Sciences)**. Much of the funding will provide research support for graduate students and postdoctoral fellows.

Earth and Ocean Sciences' Students Win Prize

This BC Mining Blog (http://bcminingblog.com) is an initiative of the BC Mineral Exploration and Mining Industry Labour Shortage Task Force. The blog is designed to raise awareness and open dialog about mineral exploration and mining in British Columbia and the job opportunities in the industries. Each month a new topic regarding the mining industry is posted and participants are encouraged to write about either their personal experiences, things they've read, or seen on that topic. This last March, the EOS group posted the most about the topic and won first prize. Part of the money has been set aside to send to those in need in Japan, following the earthquake and tsunami.

(Left to right) Dept. Head Greg Dipple, Blog Coordinator Jill Tsolinas, Blender Media Executive Ryan Tapping, Blog participant Wren Bruce, AMEBC President Gavin Dirom, Blog participants Yvette Beausoleil, Evan Smith, and Chrissy Miller.

STUDENT SOCIETIES

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

Antarctica near the Le maire Channel
by Darcy McNichol, Undergraduate Student

Whirlpool Canyon, Liard River, British Columbia,
by Jeffrey Charters, Graduate Student

Awards and Honours in EOS

FACULTY

Raymond Andersen was awarded the 2010 UBC Jacob Biely Research Prize. The prize was established in 1969 and is regarded as UBC's premier award for research.

The prestigious Bowie Lecture Series recognizes one person from each of the 13 sections of the American Geophysical Union. Those so honoured deliver a lecture at an annual meeting of the AGU. This year, 2 of the 13 lectures were delivered by members of the UBC Earth and Ocean Sciences Department: **Michael Bostock** delivered the Gutenberg Lecture in Seismology, and **Dominique Weis** delivered the Daly Lecture in Volcanology, Geochemistry and Petrology.

Joshua Caulkins, Science Teaching & Learning Fellow won the Margaret Fulton Award on April 21, 2011 for improving undergraduate science education via his work as a Fellow in EOS and additionally for spear-heading the creation of an Ombuds Office at UBC.

Craig Hart, MDRU director, won the Society of Economic Geologist Distinguished Lecturer Award for 2010. He gave an invited lecture on "Redox Controls on Intrusion-related Metallogeny" at the Geological Society of America Meeting in October, and another lecture on "Tectonic Controls on Asian Gold Metallogeny" in London in January.

Jim Mortensen and **Craig Hart** won 100% matching funds from NSERC for industry contributions to their "Yukon Gold Project", which is being run through the Mineral Deposit Research Unit. This 2.5-year project began in the summer of 2010, supported by a consortium of eleven companies as well as Natural Resources Canada. Together with the matching funds from NSERC, the project has a total budget of ~$1.7 million. There are currently four MSc students, one PhD student, and a Research Associate (Murray Allan).

Felix Herrmann received NSERC matching funds for DNOISE II, a 5-year project to design the next generation of seismic imaging technology. The project is supported by BG Group, BP, CGG-Veritas, Chevron, Conoco-Philips, Inova Geophysica, Petrobras, Total SA, and Western Geco.

Oldrich Hungr received the Meritorious Achievement Award of the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) in recognition of his contributions to landslide research and undergraduate and graduate education.

Michael Bostock and **Oldrich Hungr** were awarded NSERC Discovery Accelerator Supplements. These awards provide substantial and timely additional resources to accelerate progress and maximize the impact of superior research programs. This is the first time in the history of EOS that we have won two such awards in one year.

Sara Harris was awarded a UBC Killam Teaching Prize by the Office of the Provost for excellence in teaching.

Maite Maldonado and **Philippe Tortell** were awarded UBC Faculty Killam research fellowships, highly coveted awards to assist promising faculty members who wish to devote full time to research and study in their field during a study leave. Nine such awards, for "special distinction of intellect" were given across all of UBC this year.

Douw Steyn was awarded the National Earth Science Mentorship Medal of the Canadian Foundation for Earth Sciences. This award recognizes sustained and inspirational mentorship of at all levels and was set up in honour of Paul F. Williams, a geologist known for scientific and mentoring excellence, candour and integrity -- a description that applies equally to Douw.

Roland Stull was awarded a UBC Faculty of Science Achievement Award for Service to recognize his leadership in establishing the EOS Distance Learning Program.

Curtis Suttle was awarded the 2010 Huntsman Award for excellence of research in, and outstanding contributions to the marine sciences. He was awarded the Parsons Medal for 2011 at the CMOS conference in Victoria.

Dominique Weis was chosen to give the Daly Lecture at the Fall Meeting of the American Geophysical Union. The Daly Lecture is the Bowie Series Lecture and was inaugurated in 1989 to commemorate the 50th presentation of the William Bowie Medal. Selection is by the President of the Volcanology, Geochemistry and Petrology Section.

Dominique was also selected as a 2011 Geochemical Fellow, an honorary title bestowed jointly by the Geochemical Society and the European Association of Geochemistry to outstanding scientists who have, over some years, made a major contribution to the field of geochemistry.

ALUMNI

Anjali Nayar, a 2003 graduate in combined honours Geology and Biology, won one of two 2010 Global IUCN-Reuters-COMplus Media Awards for Excellence in Environmental Reporting for her article on saving the forests in Madagascar (Nayar).The award was presented in October 2010 in Nagoya, Japan.
Further information is available at:
http://www.iucn.org/about/work/programmes/forest/

EOS Awards presented at the Annual September BBQ:

Lora Pakhomova and Chris Payne received the 2010 EOS Award for Excellence in Administration and Technical Services.

Douw Steyn and Stuart Sutherland won awards for 2010 EOS Undergraduate Instructors of the Year

Betsy Friedlander and Jade Shiller won awards for 2010 EOS Outstanding Teaching Assistant Awards

POSTDOCTORAL FELLOWS

Johannes Jenkner, post-doctoral fellow working with William Hsieh and Alex Cannon, won the first prize in the Fourth Annual AMS Artificial Intelligence Forecasting Contest sponsored by the American Meteorological Society.

Valentina Radic, a postdoc in Glaciology working under Garry Clarke's supervision, has learned that she will be the recipient of the Young Investigator Award from the Cryosphere Focus Group of the American Geophysical Union. The award will be presented at the Fall 2011 Meeting of the American Geophysical Union in San Francisco

"The primary focus of Valentina's research is on the processes on climate-glacier interface in order to simulate recent and future changes in glacier volume on local, regional and global scales. For her PhD research at the University of Alaska Fairbanks she investigated glacier mass balance modelling using climate reanalysis data and global climate models, and the use of volume-area scaling to simulate volume evolutions of glaciers. She used this information to project the contribution of all the world's glaciers and ice caps to 21st century sea level rise. Currently she is investigating the impacts of climate change on glaciers in western Canada and the consequences for the regional hydrology. Her present research support comes from the Canadian Foundation for Climate and Atmospheric Sciences."

GRADUATE STUDENTS

In recognition of outstanding contributions to teaching and learning, **Rebecca Taylor** was awarded a Killam Graduate Teaching Award. These awards go to less than 1 percent of the teaching assistants on campus.

Carlos Gaitan won "First Place (tie) Student Paper Award" for his work: "Evaluation of STARDEX indices calculated from linear and nonlinear statistical downscaled daily temperatures" presented at the 9th Conference on Artificial Intelligence and its Applications to the Environmental Sciences in conjunction with The 91st Annual American Meteorological Society Meeting. Seattle, WA. 24-27 January 2011.

EOS graduate students who secured Geoscience BC scholarships in 2010 were **Tatiana Alva-Jimenez, Esther Bordet, Jessica Norris, Santiago Vaca, and Dikun Yang**.

Leanne Smar, an MDRU M.Sc. student supervised by Ken Hickey won best student talk at the Yellowknife Geosciences Forum (November 16-18, 2010), for her presentation on "Investigations into the P-T-t-d history of the Paleoproterozoic rocks of the Coronation Supergroup, Southern Wopmay Orogen." Leann received a prize of $1000.

Corey Wall (M.Sc. candidate) was awarded the runner-up prize for best student talk at the 11th International Platinum Symposium held in Sudbury, Ontario in June 2010. Corey's talk was entitled: "Refining the precise age and duration of magmatism related to the Stillwater Complex" by Corey J. Wall, James S. Scoates, Richard M. Friedman, and William P. Meurer (abstract available at http://11ips.laurentian.ca/Laurentian/Home/Departments/Earth+Sciences/NewsEvents/11IPS/Abstracts.htm?Laurentian_Lang=en-CA)

Leye Adeboye won the Best Student Oral Presentation Prize at the 2010 TSOP annual meeting in Denver (September 12th-16th) for a talk entitled "Variation of gas flow properties in coal with probe gas, composition and fabric in the Western Canada Sedimentary Basin" by Leye Adeboye and R. Marc Bustin. (Abstract available at: http://www.tsop.org/2010Denver/TSOP2010_OralPresentations.pdf)

At the Mineral Exploration Round-Up in Vancouver, January 2011

Elizabeth Stock (Mineral Deposit Research Unit, advisors Greg Dipple and Dick Tosdal) won second prize for her poster: "Superposed metamorphism and alteration at the Red Lake Gold deposit, Ontario"

Dikun Yang (Geophysical Inversion Facility, advisor Doug Oldenburg) won third prize for his poster: "Delineation of Porphyry Cu-Au Deposit by 3D Airborne Time Domain Electromagnetic Inversion".

Graduate students **Evan Smith, Christine Miller, Wren Bruce and Yvette Beausoleil** of the Diamond Lab won the first of four prizes to be awarded by the BC Mining Blog (http://bcminingblog.com), an initiative of the BC Mineral Exploration and Mining Industry Labour Shortage Task Force. The blog is designed to raise awareness and open dialog about mineral exploration and mining in British Columbia and job opportunities in the industries.

UNDERGRADUATES

Second year students **Kyle Larson** (Major EOS) and **Trevor Tamburri** (GEOE) were awarded Aho Entrance Scholarships of $3000 each by the Dr. Aaro E. Aho Foundation. These awards go to students interested in mineral exploration who are in their initial year at UBC after transferring from another post-secondary institution.

Halley Keevil (Honours Geological Sciences) received the poster presentation award at UBC's Multidisciplinary Undergraduate Research Conference.

Shell GeoCanada Awards

UBC Geology students, **Nicholas Joyce** and **Eric Lethan**, Geophysics student, **Taylor Milne** and Geological Engineering students, **Erica Lewynsky** and **Jake Matthews** have received 2011 Awards. The award, one of several that Shell Canada underwrites at UBC, supports student attendance at the annual Canadian Society of Petroleum Geologists conference.

Number of Major and Honours students in programs offered by EOS

	2007	2008	2009	2010
EOS - Major	**93**	**93**	**97**	**96**
ATSC	**23**	**27**	**27**	**29**
ENSC	**83**	**86**	**82**	**106**
GEOL	**23**	**19**	**18**	**18**
GEOE	**121**	**134**	**130**	**130**
GEOP	**5**	**6**	**7**	**14**
OCGY	**3**	**1**	**1**	**2**
TOTAL	**351**	**366**	**362**	**395**

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

	2007	2008	2009	2010
1st Year	1938 (+2)	1894 (-2.3)	2285 (+20.6)	1806 (-21%)
2nd Year	771 (+11)	848 (+ 10)	881 (+3.9)	836 (-5.1%)
3rd and 4th Yr	1767 (-3)	1839 (+ 4.1)	1799 (-2.2)	1993 (+10.8%)
Service Courses	553 (-8)	551 (-.04)	543 (-1.5)	832 (+20.9%)
TOTAL	**5029 (+.1)**	**5132 (+2)**	**5653 (+10.2%)**	**5467 (-3.3%)**
Summer	249	386 (+10)	668 (+73.1)	578 (-13.5%)
Distance Ed	429	466 (+8.6)	1644 (+252.8)	2238 (+75.5%)
Grand Total	**6249 (+8.9%)**	**6462 (+3.4%)**	**7596 (+17.5%)**	**8283 (+9%)**

Graduate Enrollment: 2010-2011

Program	ATSC	OCGY	GEOE	GEOL	GEOP	Total
MEng			8			**8**
MASc			8			**8**
MSc	7	16		47	11	**81**
PhD	6	21	6	29	16	**78**
Total	**13**	**37**	**22**	**76**	**27**	**175**

Graduate Theses Completed in 2010-2011 Supervised by Earth and Ocean Sciences Faculty, Including Thesis Programs External to the Department (Name of Supervisor in Brackets)

(i) Ph.D.

Jackson, Jennifer, OCGY, Changes to the Near Surface Waters of the Canada Basin, Artic Ocean 1993 to 2009 (Allen, Susan)

Oueity, Jounada, GEOP, Near-Vertical and Wide Angle Seismic Reflection Studies of the Moho and sub-crustal Lithosphere in NW Canada (Clowes, Ron)

Micko, Janina, GEOL, The Geology and Genesis of the Central Cone Deposit, Galore Creek Alkalic Cu-Au porphyry District, Northwestern British Columbia, Canada (Dipple, Greg)

van Straaten, Bram, GEOL, The Eruption of Kimberlite: Insights from the Victor North Kimberlite Pipes, Northern Ontario, Canada (Kopylova, Maya)

Barnes, Elspeth, GEOL, The Rare Element Little Nahanni Pegmatite Group, MWT: Studies of Emplacement, and Magmatic Evolution from Geochemical and Li isotopic Evidence (Weis, Dominique)

Shiel, Alyssa, OCGY, An Investigation of Cadium, Zinc, and Lead Isotope Signatures and their Use as Tracers in the Environment (Weis, Dominique)

(ii) M.A.Sc.

Lavoie, Thierry, GEOE, An Analytical Geomechanical Upscaling Approach for Modeling Jointed Rock Mass Behavior Using Uniquitious Joint (Eberhardt, Erik)

Smithyman, Megan, GEOE, Distance-element Modeling of Intermittent Deformation Behavior and Fatigue in Two Large Rick Slides (Eberhardt, Erik)

Ellis, Scotland, GEOE, Numerical Modeling Techniques for Assessing Three-Dimensional Diffusion Processes in Heterogeneous Rock Samples on the Sub-mm Scale (Mayer, Ulrich)

(iii) M.Sc.

Wolfe, Megan, OCGY, Impact of wind and river flow on the timing of the Rivers Inlet spring phytoplankton bloom (Allen, Susan)

Koenig, Cassandra, GEOL, Hydrogeochemical Site Characterization and Groundwater Flow Modeling of the Arsenic-Contaminated Gotra Aquifer, West Bengal, India s(Beckie, Roger)

Adeboye, Oyeleye, GEOL, Effects of Coal Compostion and Fabric Porosity, Sorpition and Gas Flow Properties in Western Canada Sedimentary Basin Coals (Bustin, Marc)

Lum, Tina, OCGY, Ecological interactions between two non-native clams, Venerupis philippinarum and Nuttalia obscurata, in the Strait of Georgia, British Columbia (DiBacco, Claudio)

Ahmed, Ayesha, GEOL, Beyond the Confines of the Ore Deposit: Mapping Low Temperature Hydrothermal Alteration Above, Within and Beneath Carlin-type Gold Deposits (Hickey, Ken)

Rasouli, Kabir, ATSC, Short lead-time Streamflow Forecasting by Machine Learning Methods, with Climate Variability Incorporated (Hsieh, William)

McKinnon, Mika, GEOP, Landside Runout: Statistical Analysis of Physical Characteristics and Model Parameters (Hungr, Oldrich)

Bain, Amelia, GEOL, Quantitative Field Constraints on the Dynamics of Silicic Magma Chamber Rejuvenation and Overturn (Jellinek, Mark)

Wilson, Heather, GEOL, A New Method for Diagnosing and Distinguishing Magma Mixing and Overpressure Events using Chemical Variations in Plagioclase (Jellinek, Mark)

Hodal, Michal, OCGY, Net Physical transports, residence times, and new production for Rivers Inlet, British Columbia (Pawlowicz, Rich)

Farrell, Rebecca, GEOL, Volcanic Facies Architecture of the Chilcotin Group Basalts at Chasm Provincial Park, British Columbia (Russell, Kelly)

Peterson, Nils, GEOL, Carbonated Mantle Lithosphere in the Western Canadian Cordillera (Russell, Kelly)

M.Eng. (Geological Engineering) - Non-thesis

Belfry, Michael, MEng.
Lau, Veronica, MEng.
Magnusson, Shane, MEng.
Willms, David, MEng.
Brash, Jennifer, MEng.
Emmerson, Michael, MEng.
Evans, Paul, MEng.
Kosarewicz, Olga, MEng.

Alumni Feedbasck

Reminder: We mail this newsletter to over 2,500 recipients, and we would really like to hear how YOU are doing.

Ralph Belmore Toombs, 1940; 1952. BASc, MSc., Geology

Now in retirement residence. I appreciated very much getting the Earth and Ocean Sciences Alumni Newsletter Number 13 (2010), and learning of the amazing changes and progress in UBC since I graduated in Mining Eningeering (BASc 1940)

Wilfred Gordon Holland, 1952, Geology

Retired in 1992 after 40 years as an exploration geologist with Imperial Oil, Canberra and Husky. Lifemember AAPEGA, member of CSPG, attend conferences. Keep active through "Reservoir Magazine". Heard from Ron Johnson ('52) who was going to field school reunion in Oliver. Keep busy with art classes, member of three art societies, three gold groups, volunteer at the food bank; hiking walking clubs. Travel extensively, take university courses.

Karl Ricker, 1959; 1968. B.Sc; MSc. Geology

Recovering from the Olympics!! Several long treks last summer in the South Chilcotin Ranges and Canadian Rockies. Mountain bike riding on the Kettle Valley railroad bed, great fun and interesting signs of former human activiity, (including mining) not seen from the highway. Two thirds of the 1400 km of former trackway has now been cycled. For a challenge try the Kaslo and Sandon railbed from Retallack to Cody, and a coffee afterward at Sandon, then descend to New Denver and Roseberry on the old CPR rail route. Daughter Maëlle recently inducted into the BC Sport Hall of Fame (and she hasn't retired yet!). Many thanks for your story in Newsletter #13.

Ray Lett ,1979, Ph.D, Geology

Retired from BC Geological Survey Ministry of Mines, Forests, and Lands, Victoria, on October 1 after 20 years as Survey Geochemist. Still maintaining an association with the Survey as an Emeritus Geoscientist. Was Chief Geochemist, Barringer Research, Toronto following graduation from UBC in 1979 until joining BC Geological Survey in 1990. No firm retirement plans beyond part-time teaching (UVic-SEOS-Geochemistry), some travel and kayaking in local waters.

Jon Dent, 2006, B.Sc. EOSC

Since having graduated back in May of 2006, I have resided and worked in both Japan and Australia. During that time, I have worked as an English instructor in Tokyo (at a couple of companies, including Nova Corporation, which, in 2007, went bankrupt and left over 6000 employees - many of which were the young, fresh-out-of-university types - unemployed and with few savings) and as a Tele-fundraiser in Sydney. My time in Australia consisted a total of eight months (from November 2009-July 2010), whereby my girlfriend and I lived, worked and travelled throughout the country on Working Holiday visas. We have since returned to Tokyo, married (she is Japanese), resumed work and obtained her Permanent Residency for Canada.

It has also been over three months since the Great East Japan earthquake and tsunami (also known here as 3/11) hit the Tohoku region of northeastern Japan. I clearly remember when it happened. It hit at approximately 2:45 PM on Friday, my regular day off. At that time, I was in my third floor apartment when suddenly the shaking began. It was unlike anything I've experienced here in Japan with respect to earthquakes. Trees and lamp posts swayed considerably, as did my apartment. Surprisingly, nothing collapsed - aside from my neighbour's traditional-style shed, which was approximately the same size as my apartment - a testament to the engineering and earthquake-proofing capabilities of buildings here. Also, my wife was safe at her parents place at the time, and one of my friends who works downtown on the 18th floor of some office building, thought it might be the end for him. Luckily, for him, his building, as did most others in the Tokyo area, remained intact. Aftershocks have become less frequent, but still continue to this day.

Following the disaster, there has been considerable focus on the Fukushima Daiichi powerplant meltdown. If there is one thing that I gained from my time at UBC and the education I received, it would be the ability to think critically. I still remember taking Dr. Kelly Russell's Volcanology course in my senior year, and participating in various field trips, including one where we observed and took measurements of various volcanic deposits in the Pemberton area.

To this day, I use these skills of science and reason to monitor the ongoing crisis - and subsequent radiation leaks and contamination - that plagues Fukushima and the surrouding area. This, I feel, has been particularly useful in that there have been many conflicting reports in relation to the risks and danger posed by this accident - by both domestic and foreign news agencies.

All in all, I feel that having studied EOS and Geography has allowed me to better take everything in, think critically about the issues surrounding the disaster and make the best possible decision. My wife and I plan on returning to British Columbia in October, with plans to move back to Vancouver sometime shortly thereafter.

Thank-you once again EOS and UBC! - Best Regards, Jon Dent

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 Sciences website at **www.eos.ubc.ca** . Please do not provide any information that you would not want published in the next Alumni Newsletter.

PLEASE PRINT

Name: _____

UBC Degree: _____ Graduation Date: _____

Address: _____

_____

_____

Telephone: _____ Fax _____

Email Address: _____

Has the above changed since last year? ☐ Yes ☐ No

What's new with you?

☐ Married? ☐ New job? ☐ Back in school?

☐ Take a trip? ☐ Promoted? ☐ See a classmate?

☐ Retired? ☐ New Baby? ☐ Other?

_____

_____

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Thanks for your response

Our Mailing Address:
E-mail: alumni-contact@eos.ubc.ca
UBC Dept. of Earth & Ocean Sciences, Alumni Contact,
6339 Stores Rd., Vancouver, B.C. Canada V6T 1Z4

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☐ Please direct my gift to the following:
☐ Earth and Ocean Sciences Student Development Fund (Student Scholarships)
☐ Earth and Ocean Sciences Teaching & Learning Centre
☐ Mineral Deposit Research Unit (MDRU) Endowment Fund
☐ Pacific Museum of the Earth Endowment Fund
☐ Other: _____

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I authorize UBC to debit my credit card or bank account as indicated

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Signature, Date

Thank you!

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