VANCOUVER ISLAND UNIVERSITY

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THE FOURTH INSTALLMENT OF THE EARTH SCIENCE DEPARTMENT NEWSLETTER— FALL IS UPON US! BY TIM STOKES AND STEVE EARLE—EDITORS!

INSIDE THIS ISSUE:

Earth Science Department

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The fall is almost upon us and the summer appears to have whizzed by. It seems the Geology Department is undergoing some major changes along with the rest of VIU. After some deep deliberation it has been decided to change the department name to the 'Earth Science Department'. This an important step, and the key rationale for this is based on what we offer as a department. Earth Science is a much broader than geology, and includes not only the solid earth component, but also other processes related to the water and air around us. This name change is a more logical link to our main offering which is the 'Minor in Earth Science' program.

Other changes:

Steve Earle is now the Chair of the Department. Sandra is back an instructor for another year and Owen is back as our technician - be it only for a ¼ time. Two students will be hired to assist Owen in and around the lab. If you are interested let anyone of us know. We are also looking for volunteers to do some peer interaction with first year students in the GEOL 111 labs . If interested let us know. This could be a great opportunity to learn some mineralogy and petrology, as there is no better way to learn than to teach!

Swimming in a cenote in the Yucatan of Mexico

We now have about 120 students in GEOL 111 and GEOL111A. This is great for us to see, and is the most students we have had in years! Our intention is to provide these students with a great first year course and give then a good insight into what Planet Earth is about. Hopefully some will be interested in taking more of our courses and maybe sign up for the Minor in Earth Science!

A new course of Steve's is underway: GEOL 412 - Climate Change: Past, Present and Future. This course is well over due and we are sure those that take it will find it fascinating and useful.

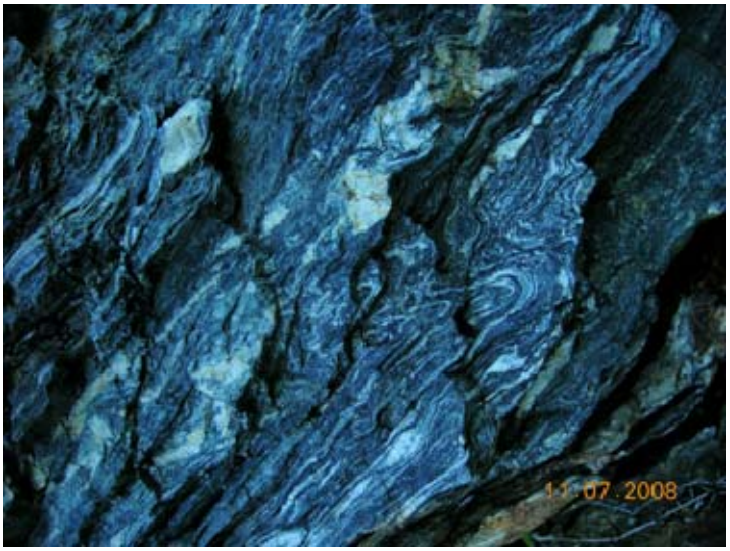
There was some interest in another new course GEOL 302 - Mineral Resources, but not sufficient for a class to run - maybe next year.

Two students: Natalie Cielanga and Lorill Ireland survived the rigors of their GEOL 490 Directed Study research projects on Quadra Island, where they 'dug holes in sinkholes' and 'dye-traced a karst spring'. They will both likely graduate with Earth Science minors in the fall.

Our key plans for 2008-2009 as a department are to continue to grow our student numbers in 2nd-year and upper-level courses, to develop a Geoscience Technician Diploma program (like the ones in Forestry and RMOT), and to eventually get a roof over that old palm frond!……..

A SUMMER EXPLORING FOR GOLD ON VANCOUVER ISLAND GOLD AT VALENTINE MOUNTAIN BY KEN PORTEOUS (A RECENT "MINOR IN EARTH SCIENCE" GRADUATE!)

For a couple weeks in June my son Connor and I worked at Valentine Mt. West of Port Renfrew doing some mineral exploration for gold. Specifically, I was involved in moss and rock sampling and the mapping of structures on the claim. This was a gold bearing quartz vein deposit - though I think that after a while we started to believe that the gold was also disseminated throughout most of the folded schists in the area! Lots of bears and grouse were seen by all , making it even more interesting. Connor and I also worked at Nahmint on the south west coast. This was a gold, copper skarn deposit. We did moss and rock sampling as well as mapping the structures on the claim.

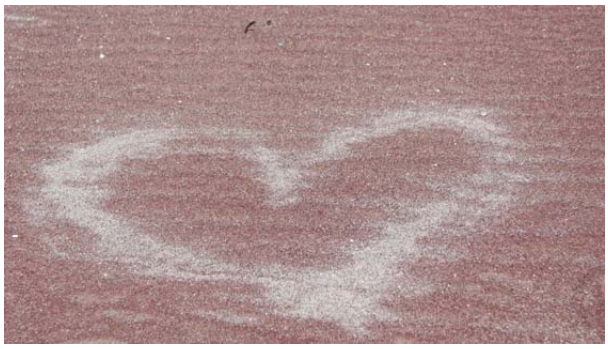


Fold schist from Valentine Mountain with gold-quartz veins.

Moss mat sampling for geochemistry

Finding karst bedrock for Tim. (Note , the hand signals!)

RED SAN BEACHES AND CONFISCATED ROCKS BY MARYON PAULSEN STRUGSTAD



Red sand beaches near Bodø, Norway

After you start taking geology it becomes part of you life and you might find yourself in situations where it takes over. This happened to me twice this summer. First I ”discovered” a red sandy beach in Norway and second I learned about the origin of the Dutch Antilles in the Caribbean.

The red sandy beach was discovered by chance when I was showing Chris Presslauer, a fellow student at VIU, around in my birth town Bodø, Norway. We were walking along a regular white sandy beach when we decided to go explore and see what was on the other side of a small hill. Suddenly we found ourselves surrounded by red sand! I went totally crazy because I had never seen or heard about a red sand beach before. Chris and I quickly decided that the redness of the sand must be due to an accumulation of garnet, a common red mineral. I later told Steve Earle about my discovery and he told me he knew about a red sand beach in Saskatchewan. So apparently this wasn't as unique as I thought… but still so very cool!

My other adventure went to the Caribbean where I went on vacation with my family. Steve wondered if I could find out whether the Dutch Antilles (ABC islands) are composed of volcanic rock or limestone. On Aruba it didn't take me long to find the limestone. It was all over the coast and when I drove by a limestone quarry in the middle of the island I was convinced it was all limestone. However, when I hiked the tallest mountain on the island (677ft) a few days later I spotted bedrock that looked like volcanic rock. I also noticed a gold mine symbol on the map of Aruba. From my previous field school experiences I knew that you can't find gold in limestone unless you have a skarn deposit (volcanic rock intruding limestone). This made me a little confused. Could the ABC islands be both? On Bonaire I found the answer: yes, they could and they were! At a museum in the national park I learned that the formation of the islands started about 110 million years ago in the Early Cretaceous when magma extruded on the seafloor. This was later covered by corals, which in turn turned into limestone. Happy and satisfied about my findings it was a bit of a bummer when the rock specimens I collected were confiscated at the airport… but they never said I couldn't try again.

Eroded limestone of Aruba along the shore (above) and in bluffs (below)

CENOTES AND METEORITES IN THE YUCATAN BY TIM STOKES

One of the unexpected highlights of my summer was getting the opportunity to do a short trip to the Yucatan Peninsula of Mexico. This was not my choice of a summer vacation spot, but was a chance to meet up and travel with my daughter who was spending part of her Gap Year there. After some rapid research it was readily apparent (as someone interested in caves and karst landscapes) that this was going to be a really neat place to visit! Could I convince my daughter of this and tie in visiting geology sites along with beaches, Mayan Ruins and refreshment sites?

The Yucatan Peninsula is an extensive limestone platform located on the northeast side of Mexico, bordered by the Gulf of Mexico on one side and the Caribbean on the other. It is probably similar or slight larger than Vancouver Island. For the most part this platform is dead flat with elevations above sea level of only 10-20 m. (We even took a photo of a hill when we at last saw one!) No streams are present on the thickly vegetated (jungle) surface with all of the water flowing underground. The limestones that cover this platform are very young geologically with most being Tertiary in Age (<10 millions years old).

During glacial periods, when sea levels were lower, the extensive cave systems formed under the limestone platform. It is quickly apparent that this is a karst landscape as streams are found on the surface. When sea level rose after glaciation many of these cave systems flooded and are now explored by divers, becoming one of the premier cave diving places in the world. It is possible for mortals (or non-cave divers) to get a glimpse of these flooded caves by visiting and swimming some of the many 4000 ‘cenotes’ that dot the region. These cenotes are large water-filled depressions that form ‘windows’ into the cave sys-

Reflecting light from a window into an underground cenote, with tree roots extending down

On the steps down to a cenote—a window into the karst underworld

Local cenote transport for 7 km!

Lots of spectacular cenotes like these are used as local swimming holes, as well as for tourism

The past Mayan empire had close ties to many of the cenotes that were used for domestic water and religious purposes (e.g., sacrifices). Today this underground water in the Yucatan is of course a key resources for everyone and is the main domestic and drinking water source. However, there are lots of inherent problems related to contamination of this resources be it from septic systems, sea water incursion, agriculture or industry.

The cenotes also provide another great story that relates to the last major meteorite impact on Earth that wiped out the Dinosaurs at the end the Cretaceous 60 million years ago. The impact site is centre around the small fishing town of Chicuxlub. The actual crater itself is not visible as it was later infilled by the limestone deposits that may up the Yucatan. However the impact rings were found from gravity surveys done in the 1980's during oil exploration oil in the Gulf of Mexico. Since then satellite images have also revealed a fascinating 'Ring of Cenotes' which is thought to be the surface expression collapse faults that were active after the impact event.

All in all this was a great trip to see a whole different world geologically and culturally, plus hang out with my backpacking daughter. Mexico is very different place to ours – with way less concern for safety and cleanliness, however, they certainly know how to live and enjoy life. I am planning my next visit now!

EARTH SCIENCE CLUB AT VIU BY NATALIE CIELANGA

Views in Strathcona Park from a conglomerate bluff

The main activity of the Earth sciences Club is to explore our local geology through outdoor activities. Recent activities included a hike at Mt. Washington where vocanic and sedimentary rocks were observed along with glacial striations. A hike along the Cowichan River revealed folded Nanaimo Group sedimentary rocks. At the end of the Spring 2008 term, the club also took a wonderful 4 day trip to Mt. St. Helens. If these types of activities interest you please contact Natalie and/or Maryon by email at:

cielangan@shaw.ca or
maryonps86@hotmail.com

The surface of a rapidly cooled lave flow from Ape Cave—Mount Washington

RESEARCH ON THE KARST LANSCAPES OF QUADRA ISLAND BY LORRILL IRELAND

During June and July 2008 Natalie Cielanga and I completed our final course for the Earth Science Minor by each doing a GEOL 490 Directed Studies Project under the guidance of Dr. Tim Stokes. Natalie's project was to investigate the origin and functions of forested karst sinkholes (or depressions). She did this by carefully measuring the shapes of sinkholes and digging soil pits. From the morphological of the sinkholes and information gathered on soil profiles Natalie discovered that they were probably formed after glaciation by solutional processes. Also significant thickness of organic soils that accumulated in the base of many sinkholes likely play and important role in how they function . An ash layer found within the soil profiles of some sinkholes was probably the remains from a fire that occurred in the early 1900s, and provides a clue

My project involved a hydrological evaluation of a karst spring that supplies drinking water as well as micro-hydro power for the residents of the Stramberg Farm on Quadra Island. Dye tracing techniques (using non-toxic fluorescent dyes) were used to determine the subsurface flow paths leading to the springs. This information can be used to delineate the likely catchment area for the springs, and in turn identify areas that could potentially be impacted by hydrological changes associated with development and/or forestry activities

Measuring water temperature and conductivity at a road side spring

A small karst spring emerging from a conduit near the Stranberg Farm

Fluorescent dye appearing at a spring (above).

Collecting core samples from test pits in sinkholes

Measuring and recording soil profiles in a sinkhole

SUMMER EXPERIENCES IN THE YUKON LOOKING AT PAST GLACIAL EVENTS IN SEDIMNTS BY MELLISA DINSDALE

As part of my job with S.F.U. this summer, I got to spent 3 weeks in the Yukon, or more precisely at Beaver Creek, which is near the confluence of the White River and the Donjek River along western edge of the Yukon. The field site was a remote fly camp, so all our supplies had to be brought in by helicopter – which was a new experience for me. We camped on top of one of a series of several bluffs, consisting of Quaternary sediments. I was there assisting a PhD student from SFU collecting data for a series of straigraphic sections. The site is of particular interest as along this stretch of the White River there is morianal (till) material left from the last three glaciations, and because of the permafrost, there is material preserved that records the subsequent warming trends that followed these glacial periods - similar to what we are experiencing today.

As part of this work I learnt about Marine Isotope Stages (MIS), which are alternating warming and cooling periods in the Earth's history - with even numbers being a cooling trend (glacial onset) and odd numbers a warming trend (glacial retreat). The main stages mapped in the study area that I worked on are part of Stages 2 to 6. There is some conflicting data about the exact age limits of the stages, and thus the mapping and dating done in this study will help to narrow down the times of the stages. Materials such as till, gravels, and loess from at least Stages 2 and 4 were seen in the stratigraphic sections we measured. Also preserved in this area, are the macrofossil remains of Stages 1, 3, and 5. This macrofossil material consisted of tree bark, peat, leaves, bugs, animal burrows, bones, and paleosols. The macrofossil remains and the glacial materials in the stratigraphic sections can be used to reconstruct paleo-environments, and will assist in understanding about the evolution and conditions of glacier/non-glacier transitions. My job was to assist with the collection of this data, and I got to experience some really cool things. When we arrived at a particular section we had to move a lot of dirt, and there really is a definitely and art to cleaning off a section! The idea is to create a vertical face, as this is when the details come out. We usually spent about 2 days per section.

A 'cleaned' stratigraphic section on the side of the glacial bluffs

There were four sections of particular interest. The 'Beaver' section has a large sequence of lacustrine materials. Within the section we saw piles of sticks that still had the teeth marks left on the wood from beavers, and were most likely from Stages 3 or 5 and could be up to 120,000 yrs old. A second section we looked at had a very large exposure of loess paleosols (full of carbonate material) and also very weathered gravels. A third section exposed several vertebrae and small animal bones in gravel lenses within the loess. This indicated a grassland environment likely during the time of Beringia, Stage 3. The fourth section was the "peat" section, and here we exposed a ~1m thick section of peat on top of a diamict, likely till. This peat exposure is likely from Stage 3 as well.

Location of fly camp on top of glacial sediment bluffs

The exact dates and stratigraphic reconstruction has yet to be completed. Most of the sections have layers of tephra (volcanic ash) layers which can be dated. This in turn will help with constraining the ages of the adjacent materials. Carbon dating will also be done on the bones and wood materials that were found. Macrofossils could also return some age dates, as well as information about the environment at the time of material deposition. All of this information will assist with reconstructing glacial history of the region, as well the

Some of the specific things I learned to do in the summer included: measuring till fabrics to tell you the direction of flow of the glacier (by using trend and plunge of elongate clasts within the till); techniques of taking samples for macrofossil analysis; how to clean a stratigraphic section in sediments; and how to take soil thin sections. I also learned that a 3 week fly camp isn't easy and that 120,000 permafrost ice in your whiskey is a little silty!

Examining the peat layer located between two glacial tills

Spring 2009 Geology Courses

GEOL 112—4 credits with lab;
GEOL 112A - 3 credits without lab

Prerequisite: None

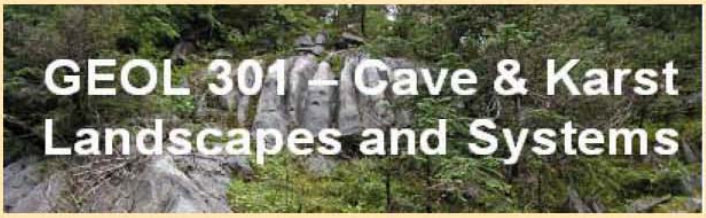
Classes: Tuesday and Thursday 10am to 11.30 am.
Labs: Tuesday 1 pm to 3 pm or 3 pm to 5 pm

Prerequisite: GEOL 112

Classes: Monday 10.00 -11.30 am and Friday 8.30 am - 10 am
Labs/Field Trips: Mon 1 pm—4 pm

Prerequisite: GEOL 111 or GEOL 112

Classes: 10.00 -11.30 am Wed and Fri. Labs/Field Trips: 12.30-3.30 pm Wed



Prerequisite: 2nd year standing in any science, geography, anthropology or forestry,

Classes: All completed online.
Optional Lab 1.00-3.00 pm Fri.

Prerequisite: GEOL 200 and CHEM 122 or CHEM 112

Classes: Tuesday and Thursday 8.30-10 am
Lab/Field Trips Thurs 1 pm –4pm

For details check the geology web site at http://www.mala.ca/geology or e-mail Tim Stokes at stokesty@mala.bc.ca