



The Geological Newsletter

NEWS OF THE GEOLOGICAL SOCIETY OF
THE OREGON COUNTRY

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The Geological Society of the Oregon Country
P.O. Box 907, Portland, OR 97207-0907
www.gsoc.org

Lasers Light Up Prehistoric Perils in Oregon!!!

by Carol Hasenberg

The title of this article is the 'alternative title' shown to us by Dr. Ian Madin, the speaker featured at the GSOC 84th Annual Banquet on March 10. Madin came to describe three new areas of Oregon containing active faults that were discovered by analyzing the 'bare earth' maps of the ground produced in LiDAR scans of the terrain.

See *LiDAR Fault Search Yields Results*, Page 26



*Boots on the ground verification of the Twin Lakes Fault.
Source: DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.*

Calendar

Friday Night Lecture

May 10, 2019, Cramer Hall, Portland State University

Guest speaker Dr. Seth Moran, Scientist-in-Charge, USGS Cascades Volcano Observatory, will present "The Relevance of the 2018 Kilauea Eruption to Volcanism in the Pacific Northwest."

see *Lessons Learned from the Kilauea 2019 Eruption*, Page 24

Friday Night Lecture

June 14, 2019, Cramer Hall, Portland State University

Guest speaker Dr. John Armentrout, native Oregonian and retired petroleum geologist, will present "Progress Report on the Marine Coaledo Formation: an integrated study of an Eocene subtropical shelf-margin delta, Coos Bay, Oregon."

see *Marine Coaledo Formation*, Page 31

Downtown Ancient Walls South Tour – still open!

June 1, 2019 – 10 a.m. – 12 p.m.

Wallowa Mtns Field Trip

June 19, 2019 – June 24, 2019

East Bank Bike GeoTour

Jun 29, 2019

See [GSOC website](http://www.gsoc.org) for current information on GSOC field trips

GSOC Friday Night Lectures are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Check the GSOC website (www.gsoc.org) for more information and updates to the calendar.

Hourly rates for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

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Lessons Learned from the Kilauea 2019 Eruption

May 10, 2019, 7:30 to 9:00 pm, Cramer Hall

The 2018 eruption on the Lower East Rift Zone of Kilauea Volcano was a remarkable event in many regards. From early May through mid-August scientists and society alike bore witness to voluminous amounts of lava erupted out of a new fissure system that formed within the middle of the Leilani Estates subdivision, ultimately destroying over 700 homes and creating 875 acres of new land. Fortunately, casualties from the eruption were few in number. This is attributable to a number of factors, including a good monitoring network as provided by USGS and other academic agencies, a good county emergency management system, boots on the ground both monitoring and coordinating crisis management efforts and good communication and trust between agencies and the public.

There are places in the Cascades where a similar eruption could unfold. These include Newberry Caldera near Bend, and in the Boring Lava Field of the greater Portland area. It's important to note that such eruptions are much less likely than in Hawaii; however it is important to stress having good working models of the volcanic systems, having monitoring equipment in place before unrest begins, engaging stakeholders in the emergency response community, land-management agencies, and communities near volcanoes so that when a volcano wakes up there is broad familiarity with roles and responsibilities which is critical to a smoothly functioning response to such a crisis.

Seth Moran is a seismologist and Scientist-in-Charge (SIC) for the U.S. Geological Survey's Cascades Volcano Observatory (USGS-CVO) in Vancouver, Washington. CVO, one of five U.S. volcano observatories, has responsibility for evaluating volcanic hazards, monitoring activity, and communicating hazards information for volcanoes in the States of Washington, Oregon, and Idaho. Moran arrived at the CVO (from the AVO in Alaska) in 2003, just in time to take part in the response to the 2004-2008 eruption at Mount St. Helens. He also helped establish and/or expand monitoring networks at Mount Rainier, Mount St. Helens, Mount Hood, Three Sisters, Newberry, and Crater Lake volcanoes.

GSOC Board Meeting Notes

April 13, 2019

President Sheila Alfsen called the meeting to order at Barbara Stroud's home. Other board members in attendance constituting quorum were Barbara Stroud, Dawn Juliano, Rik Smoody, Megan Faust, Julia Lanning, Paul Edison-Lahm, and Denny Chamberlin. Also in attendance was Evelyn Bennett. Minutes of the February 2019 board meeting were approved.

EVENTS

Friday night lectures

Audio system – we will be requiring future speakers to use the microphone we purchased as some people had trouble hearing the speaker at the last meeting.

Holiday Party and Our Year in the Field – after much discussion, there was no consensus on when to do the Year presentation, during the party, have a regular December meeting and do it then, or do it as the January meeting presentation. We did vote to form a committee and ask for volunteers to find a place and recommend a structure for the holiday party as we need a bigger venue.

Speakers for May, June and July lectures have been arranged.

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". Plans are continuing for this event.

Field Trips and Other Events

FUTURE TRIPS

Wallowas Trip, June 19-24: The registration phase of the trip has been completed and the trip is full. There is a waiting list. Trip reconnaissance will happen in mid-May.

Mary's Peak/Coast Range Trip, July 13-14: Sheila would like to do a 30-minute pre-lecture to the attendees, time TBA.

Metro trips: Downtown (June 1, Oct), Eastside Bike (June 29), Johnson Creek (Sept 28) (Paul): Trip registration has commenced for the June 1 Downtown trip and the June 29 Eastside bike trip. The bike trip is full.

Lewis River: Rik determined a date for this one-day trip to be August 17.

OTHER EVENTS

Annual Picnic: Date has been changed to August 4 and the venue will be Hagg Lake.

GSA Cordillera Meeting May 15-17, 2019; Sheila will be presenting on Puerto Rico at the AWG breakfast May 17. GSOC will have a table at the meeting manned by several of the attendees.

Other Old and New Business

Treasurer's Report submitted by Dawn and approved by board.

There are quite a few members who have not paid their dues for 2019. Please recall that membership dues payments are due on January 1 for 2019 no matter when you've paid the previous year.

New Meetings

GSOC has expanded somewhat in the past couple of years, and more activities are being discussed and planned. To facilitate this activity, GSOC is adding an informal meeting of the past and present board members sometime around mid-month on most of the odd months. An email will be circulated prior to these meetings.

There are also meetings planned for the Meetup GSOC attendees, and in general, these will be on the 4th Saturday of most months at 2 pm. Sign up online with Meetup to receive the announcements. Meetup is a social media platform used for posting local activities, and it has helped to introduce a lot of people to GSOC and Oregon geology. Questions about signing up can be referred to Paul Edison-Lahm.

BOARD MEETING NOTES

continued from Page 25

Other Old and New Business

Next board meeting will be on June 15, 2019, 10:00 a.m. at Barbara Stroud's house.

Notes compiled by Carol Hasenberg from minutes written by GSOC Secretary Barbara Stroud.

LiDAR Fault Search Yields Results,

cont. from pg. 23

Synopsis of the GSOC 84rd Annual Banquet lecture given on March 10, 2019, with speaker Dr. Ian Madin

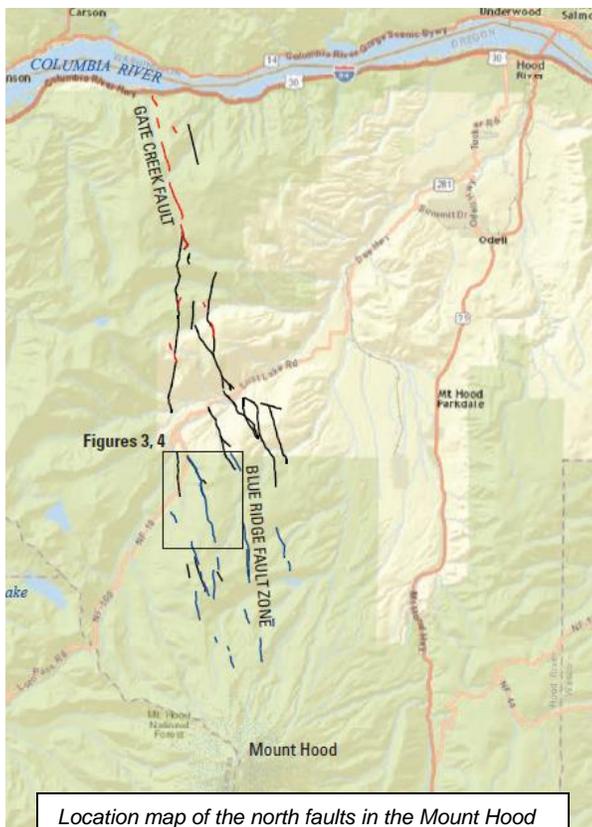
Madin and the Oregon Department of Geology and Mineral Industries (DOGAMI) have embraced LiDAR technology for quite a few years now, and have found multiple uses for this high-resolution technique of mapping terrain, trees and buildings, and other physical features of our state. The 'point cloud' of precise LiDAR data, at a million to one-and-a-half million pings per second, can be used to construct maps of 'bare earth', tree cover, buildings, etc. DOGAMI has used it extensively for landslide mapping and fault mapping.

However useful it may be, LiDAR data is acquired slowly by the state because it is expensive to produce. Luckily, some Oregon industries, especially the forestry industry, produce a lot of LiDAR data for doing tree counts and the like, and their 'poorer cousins' at the state can make their dollars stretch farther by partnering with them to produce the data.

In their search for active faults in Oregon, the DOGAMI geologists are looking for evidence of ground rupture within the last 15,000 years. They scan for fault lines that cut through landscape features in a continuous line, without regard for features older than 15,000 years.

The first area of faults described by Madin are located in the Mt. Hood area, and are referred to as the Mt. Hood Fault Zone. These faults run north to south and are normal faults. Two of the faults, Multorpor Mountain Fault and Twin Lakes Fault, define two sides of a graben that is 10 miles long. They cut through glacial deposits and landslides.

Twin Lakes fault is very well known to the researchers because it has good access from Hwy 35. One section of the fault has a beautiful scarp that is right on the cusp of White River Canyon. In another location the fault produced a wetlands by blocking a stream about 3500 years ago. Yet another area of the fault contains a E-W stepover from one surface expression to a slightly offset one. Frog Lake is also dammed by the fault. Slippage on the fault is moving fast enough to keep Frog Lake dammed.

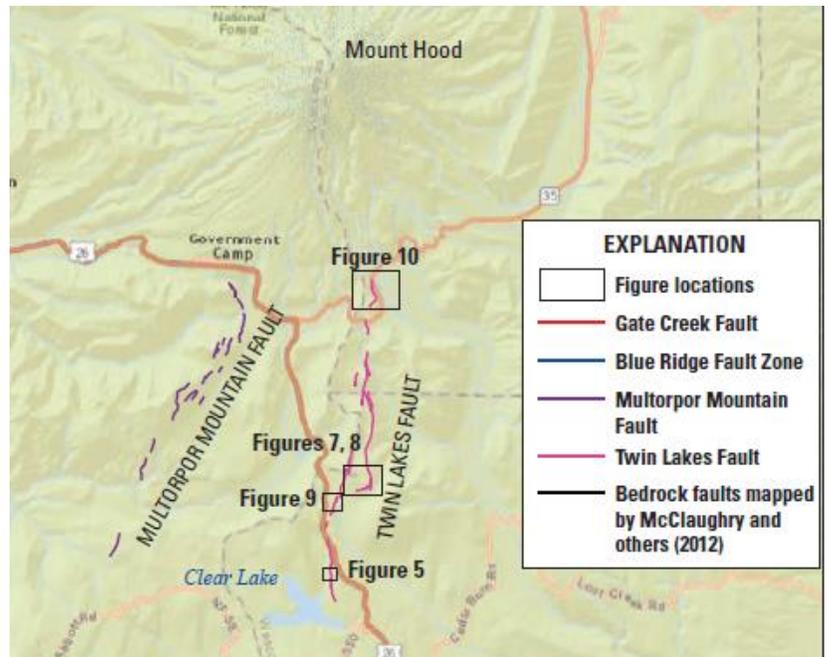


Location map of the north faults in the Mount Hood Fault Zone. Lidar-mapped fault features shown in color, black rectangles show locations of other figures in this paper, and heavy black lines are bedrock faults from recent geologic mapping by McCloughy and others (2012).

Sources: ESRI, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community. Compilation from DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.

Madin and company trenched through the Blue Ridge Fault on the northern slopes of Mt. Hood, which was more difficult to spot on the LiDAR images due to some very busy terrain. The trench revealed various soil types in a sequence in the area. At the fault, there is a funnel shaped area where the fault opened and material fell in and filled up the crack.

Madin also analyzed the potential earthquake hazards represented by the faults. These calculations are based upon the length of rupture and the amount of slip. He calculated that earthquakes between M6.4 and M7.4 could be generated depending on how many of the faults rupture at the same time.



The second active fault zone identified by DOGAMI is the White Branch Fault Zone, which Madin described as being located south of the moraines of the Suttle Range near Sims Butte, in the North Sister area. A pair of north-south trending faults describe the boundaries of a graben, or down-dropped block, that is 5 miles wide and 15 miles long. An interesting effect of one of the faults is to dam a stream (Boulder Creek). There has been a movement of up to 40 feet on the faults in the last 20,000 years. This amount of slip may produce an earthquake strong enough to do damage in Sisters.

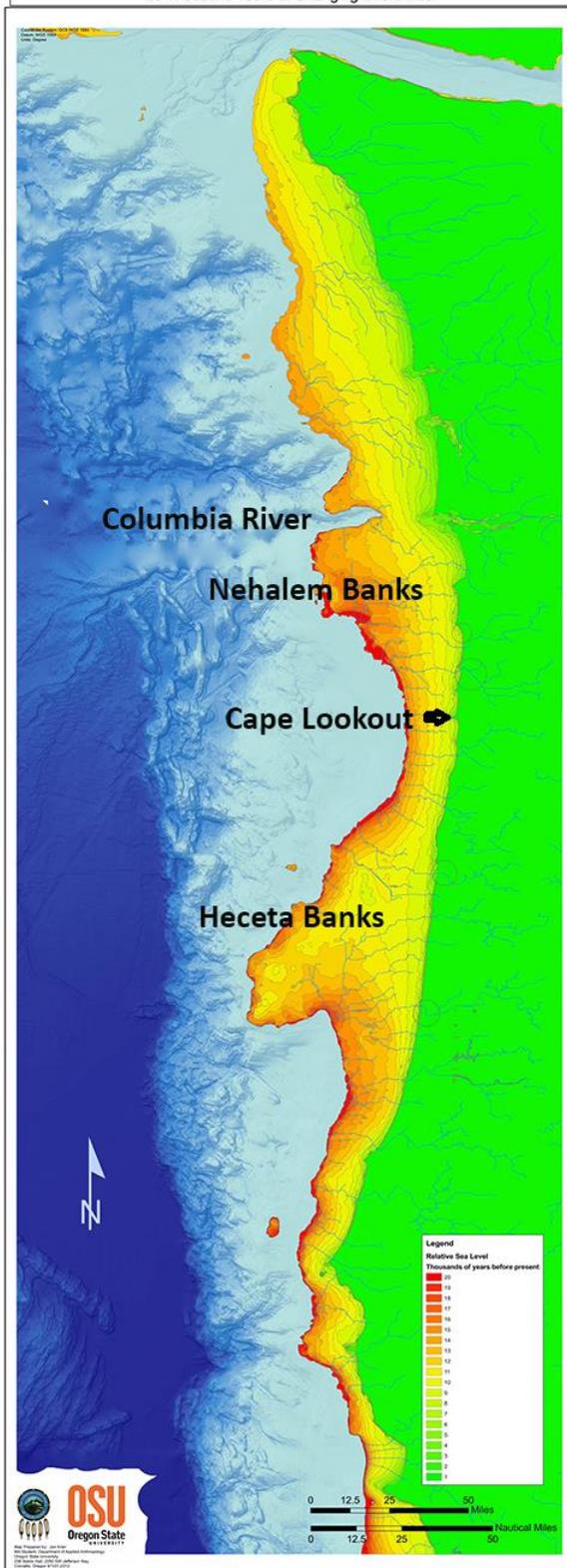
The last group of active faults reported by Madin are in the Strawberry Mountain Range by John Day. These faults contain the youngest feature Madin has seen in Oregon. He cannot wait for the snow to melt so a DOGAMI team can go out there and inspect them. The fault zone contains a 3 mile and a 5-1/2 mile segment that are continuous up and over ridges and other features in steep terrain. They cut through modern alluvium.

Madin reported that in addition to these fault zones, faults have been recognized in several places and will be seen on future DOGAMI publications. Eventually their analysis will be added to future earthquake hazard maps.

Location map of the south faults in the Mount Hood Fault Zone. Lidar-mapped fault features shown in color, black rectangles show locations of other figures in this paper, and heavy black lines are bedrock faults from recent geologic mapping by McClaughry and others (2012).

Sources: ESRI, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community. Compilation from DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.

Isostatically Adjusted Paleoshorelines for Washington and Oregon:
20 Thousand Years of Changing Shorelines



Predicting Submerged Archaeology Sites in the Pacific NW

Synopsis of the GSOC Friday night lecture given on April 12, 2019, with speaker Jon Krier, MS from OSU.

By Carol Hasenberg

Jon Krier's work seeks to conduct ancient shoreline mapping in order to find possible locations of submerged archaeology sites along the western coast of North America. He combines modern bathymetry and other technological techniques to assess underwater contours with the oral traditions of indigenous tribes in his work.

His work has evolved from several studies done in Denmark to evaluate archaeology and shipwreck sites. The Danish model differs from that done in the Americas by the difference in historical records and traditions. In Denmark the researchers first ask people for stories of what the land was like in the past. These can be oral or written accounts of past events. Then the researchers model the bathymetry and compare.

In the New World written history began with arrival of European settlers in the 1800's. However, indigenous tribesmen in Alaska and the Pacific Northwest have mostly stayed in the same geographical areas since the first American people crossed the Bering Land Bridge and began the process of settling the continent. Their oral traditions stretch back over a history of several thousand years, or "time immemorial".

Krier's first work grew from an early fascination with the Bering Land Bridge, which included his childhood home in Nome, Alaska. Jon moved to Oregon in 2010 to begin undergraduate studies at UO. In 2018 Jon graduated from OSU with an MA in anthropology. His masters project focused on predictive modeling of submerged sites on the Beringia Land Bridge (BLB), a very large swath of land.

Krier also referred to other findings in which indigenous oral histories were confirmed with natural or human historic events. Studies have compared oral histories for natural events like the eruption of Mt. Mazama and the existence of the Bridge of the Gods. A more recent example is the finding of the wreckage of the HMS Terror and HMS Erebus, British explorer ships that set out in 1845 to find a Northwest Passage through Canada's Arctic. Inuit

oral history recorded the correct location of the sunken ships, more than 60 miles from the expected locations.

Other reports of the natural world of the past can be sifted from ancient creation legends from the oral traditions. On what English speakers refer to as the Queen Charlotte Islands, Haida Gwaii history says they came to the islands to escape advancing ice. The Nehalem Tillamook talk about ice and south wind, and the timing of the formation of the Clatsop Plains. Krier discovered the legend in an older book that was written about their tales. The Clatsop plains formed after the final retreat of the ice ages and this is also confirmed from geological studies.

On Triquet Island along the central British Columbia coast, a Heiltsuk village site was found where traditional tales said it would be. This site was inhabited 14,000 years ago because it escaped inundation by the Cordilleran Ice Sheet, which covered much on British Columbia. On nearby Calvert Island, 13,000-year-old footprints were found on a beach reported by the Heiltsuk to be stable for many years.

Krier has recently been involved in a project along the Oregon coast for the Confederated Tribes of the Grand Ronde. The tribes' objective in hiring the study was to determine where ancient settlements may be located on the submerged coast in anticipation of energy companies coming in to the area. They are having Krier predict where cultural resource assessments need to be done prior to any disturbances.

NOAA provided the sonar data used in modeling the coastlines of the past. It was a bit of a challenge to make the ancient shoreline models because there are a lot of variables. For instance, silt and glacial deposits cover up land exposed in ancient times. One of the trickiest of the variables was to determine the glacial isostasy position of the ancient landforms. The continental glaciers represented a large mass of material, causing the land under them to depress, and the land around them to bulge upward. This bulge was greatest in the location of 150-180 kms from the edge of the ice sheet.

The final product of the study included a 15,000-year baseline coast map, which roughly coincides with oldest known settlements in the area. The bathymetry data helps



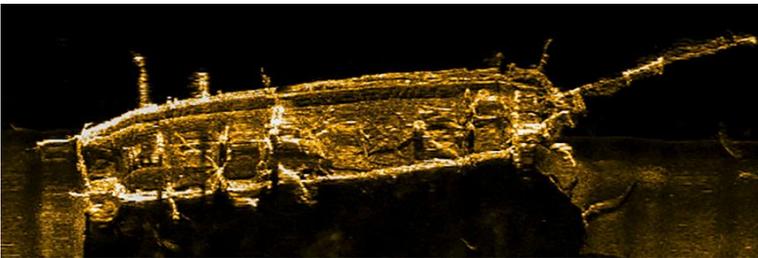
Photograph of a human footprint (center) impressed into a 13,000-year-old paleosol at the Meay Channel I archaeology site on Calvert Island.

*Source: [Sci News, March 29, 2018](#)
Image credit: Duncan McLaren.*

In 1845, explorer Sir John Franklin set sail from England with two ships, HMS Erebus and HMS Terror, in search of a Northwest Passage across what is now Canada's Arctic. The ships and crew were last seen by Inuit on King William Island and never returned to England. Their apparent disappearance prompted a massive search that continued unsuccessfully for nearly 170 years.

In September 2014, an expedition led by Parks Canada discovered the wreck of HMS Erebus in an area that had been identified by Inuit. Two years later the wreck of HMS Terror was located. Historical research, Inuit knowledge and the support of many partners made these discoveries possible. Now Inuit and Parks Canada are working together to jointly manage this fascinating National Historic Site.

Source: [Parks Canada website](#)



Krier to delineate the drainage systems on submerged areas, which is an important part of determining potential ancient habitation sites. Krier also noted that the modern coastline dates from about 4000 years.

Looking at a map produced by Krier's study of the Pacific Northwest coast over time, we see that far from being a relatively straight line, there were large "banks," or portions protruding from the continental body. Krier modeled these submerged peninsulas looking for headland areas in the 10,000+ years range. West of Newport was a large peninsula now known as Heceta Banks. Loren Davis at OSU is another archaeologist doing some offshore exploration on the coast, and in 2001 a mussel shell was recovered 140 m down, in what was the Heceta Banks paleo shoreline.

The modern fishing ground now called the Nehalem Banks lies further to the north. Nehalem Banks was much more affected by the ice sheet than the Heceta Banks area. It was located on the forebulge and so even though it is deeper today than the Heceta Banks it also was exposed in earliest habitation times.

Another set of possible sites are offshore of Cape Meares and Cape Lookout, capes situated between the two banks. These rocky outcrops of Columbia River Basalt protrude out into the ocean and would have been much larger in the past.

There is some work to be done to increase the information to be evaluated. Current maps are not very accurate at large scales for close up work. This is because they are based on side-scan sonar surveys. This same technique was used in the 1980's for sea floor mapping (see the previous issue of *The Geological Newsletter*).

Additional Reading

[Wrecks of HMS Erebus and HMS Terror National Historic Site](#)

["Ship found in Arctic 168 years after doomed Northwest Passage attempt," *The Guardian*, Paul Watson in Vancouver, Mon 12 Sep 2016. Great maps and pictures.](#)

Some history of NW Indigenous Tribes:

[Haida and Tlingit history](#)

[Legends of the Old Massett Haida](#)

First Nations Oral Traditions (Haida Gwaii)

“Archeological find affirms Heiltsuk Nation's oral history: Settlement on B.C.'s Central Coast dated back to 14,000 years,” *CBC News*, Roshini Nair, Mar 30, 2017

“13,000-Year-Old Human Footprints Found on Canada’s Calvert Island,” *Sci News*, Mar 29, 2018

[Dr. Loren Davis’ homepage](#) at OSU

The Marine Coaledo Formation

June 14, 2019, 7:30 to 9:00 pm, Cramer Hall

The Middle to Late Eocene Coaledo Formation and underlying Beds of Sacchi Beach record a marine history of forearc sedimentation. The sediments aggrade from slope turbidites to shoreface deltaic sandstone encased in deep-water silty mudstone. This talk is a progress report on a multiyear, multidiscipline research program, testing the hypothesis that the Sacchi Beach-Coaledo succession represents a shelf-margin lowstand of sealevel deltaic system. A team of 12 geoscientists is collecting an interdisciplinary database for reassessing the depositional history of the rocks exposed along the Cape Arago, Shore Acres and Sunset Bay State Parks.

John Armentrout is a native Oregonian, and graduate of the University of Oregon and the University of Washington. He was OMSI Outdoor Education Director from 1967 to 1970 (including at Camp Hancock). He focused on Petroleum Geology as a Mobil Oil Exploration geologist (1973-2000), Consulting Geologist (2000-2016), and University of Oregon Instructor for Petroleum Geology (2014-2018).



WELCOME NEW MEMBERS!

- | | |
|----------------------------|-----------------|
| Gretchen Baller | John Adams |
| Wendy Whitsell | Gary Seitz |
| John & Kathleen Beaulieu | |
| Roger Ley | Laurie Elliott |
| Bruce Castle | Ann Cornely |
| Cynthia Smith | Michael Dunn |
| Alfred & Nina Fleckenstein | |
| Mariah Tilman | Rebecca Bateman |
| Jill Cohen | |

