



The 16th Annual
**EVERGREEN
SCIENCE CARNIVAL**

MAY 31 FRIDAY
10 a.m.
to 3 p.m.

**Lab 1, Lab 2
and Purce Hall**

evergreen.edu/sciencecarnival

FREE AND OPEN TO THE PUBLIC
No registration required



 the
evergreen
state college

**Participating Evergreen Programs, Courses,
Contracts and Organizations (Faculty)**

Culture, Self, and Healing (Toska Olson, Erik Stein)
Ecological Agriculture (Martha Rosemeyer)
Environmental Analysis (Robin Bond)
Food Chemistry (Melissa Nivala, Rebecca Sunderman)
Integrated Natural Science (John Kirkpatrick, Nancy Murray)
Matter and Motion (Dharshi Bopegedera, John Caraher)
Modeling Biological Systems (Jim Neitzel, Richard Weiss)
Physical Systems and Applied Mathematics (John Caraher, Krishna Chowdary)
Riding the Carbon Cycle (Gerardo Chin-Leo, Erin Martin, Nate May)
Unruly Bodies (Julie Russo, Carolyn Prouty)

Individual Learning Contracts, Research, and Internships
(Robin Bond, Betty Kutter, Mike Paros, Sara Rose, Rebecca Sunderman, Erik Thuesen)

CHemistry and Other Sciences Club
(Dharshi Bopegedera and Rebecca Sunderman)

Science Support Center,
Science Instructional Technicians,
& Instrument Aides

**NO FOOD OR DRINK
ALLOWED IN ANY LAB ROOM**

WASH HANDS AFTER ALL LAB ACTIVITIES

Acknowledgements

We deeply appreciate the efforts of science students, faculty, and staff at The Evergreen State College who contributed this year (and year after year) to make the Science Carnival a success. We are very proud of our students' investment of time and effort in this showcase of science and education for the benefit of our greater community.

Many members of the greater Evergreen community supported this carnival. Thank you for your help! We could not do this without your support.

Thank you to the Evergreen State College Chemistry and other Sciences Club for hosting the welcome table again this year.

A special Thank You to our visitors for spending time with us and sharing in our students' energy, enthusiasm and creativity!

We hope you will return next year! We invite you to check out our science curriculum at The Evergreen State College – it is truly one of a kind!

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WASH HANDS AFTER ALL LAB ACTIVITIES

Thermite—How Hot Can It Get? by Jonah Arnold & Tamara Koledin

Evergreen Program: Chemistry and Other Sciences Club with Dharshi Bopegedera

Target Audience: all ages

Location and Time: Red Square

Abstract: Some chemical reactions release so much heat, they can melt solid metal (WOAH). Come on over and learn the hidden secrets about what thermite is and how we can use it to create energy (WOWZERS). We will be showing how simple materials can come together to make awesome phenomena happen.

Urban Karsts in the Pacific Northwest—Geochemistry of Built Environments by Joseph Thayer

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: middle & high school

Location and Time: 10:00 in Purce LH3 & 12:00 in Purce Classroom 8

Abstract: Have you ever drunk filtered water? As humans build cities we create an environment full of concrete and asphalt; an artificial ecosystem full of rocks and minerals that behave differently than native geology. Climate, geology, and land use each leave their signature in water as it moves through the water cycle. Different amounts of dissolved carbon, salts, and metals can affect water quality in streams, groundwater, and coastal waters as water interacts with the environment. This project compares chemicals dissolved in water from storm drains and shallow groundwater as well as water from lab experiments with soil and concrete samples. In addition to flooding, oils and heavy metals, urban environments generally contribute to salinity and alter the pH to unusual levels. Stresses like these can contribute to unhealthy ecosystems. With careful study and insightful planning, we can build better urban environments that reduce environmental stresses.

What the Frack are We Doing? by Cameron Moore, Abbey Myrick, and Robyn Steveley

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: all ages

Location and Time: 12:30 in Lab II 3209 & 2:30 in Lab II 3221

Abstract: Fracking, more formally known as hydraulic fracturing, is the process by which natural gas is harvested from shale by pumping fluids at high pressures deep underground. The fractures that form are propped open by particulates in the fluids and natural gas within the rock is then drained and processed, making up 67% of the nation's natural gas. Our presentation will provide an overview into the science behind the fracking process and a discussion into the industry, the environmental impacts, and what might be done to reduce such impacts. This will be followed by a demonstration illustrating how fractures are formed by the injection process. As our nation becomes more dependent on natural gas as a fuel source, it is important for us to understand the associated risks so we can learn how to mitigate them.

Poster Sessions

Food Chemistry Poster Session

10:00 – 1:00 in Purce LH2

Everyone eats, and our bodies need many vitamins and minerals. Do you know why your body needs each one? Do you know where and how we get each one? Do you know what happens if you don't have enough? Do you know of the social justice implications around these vitamins and minerals? We would love to share what we've learned with you. Come by and join us for a lively discussion.

Evergreen Program: Food Chemistry with Rebecca Sunderman & Melissa Nivala

Target Audience: All ages

Poster Topics:

- Boost Me Up With Vitamin B-12
- Calcium, it's not Just for Bones
- Give it to me. Potassium me up.
- Give me Fat, Give me Omega 3 Fat
- Magnesium me, Magnesium me not
- Most Things Taste Better with Salt
- Pump me up, give me Iron
- Vitamin of the Sun
- Water me Healthy
- What the Folic Acid are you Talking About?
- Zinc your Cold

Resilience and the Social Body Poster Session

10:00 – 11:30 and 12:30- 2:00 in Purce Classroom 5

All* are welcome to engage with our collective inquiry into how bodies and health are socially constituted. Two guiding questions have inspired our work: How are bodies and health social? How can these frameworks support practices of well-being and resilience? Students from “Culture, Self and Healing” and “Unruly Bodies: Health, Media, Biology and Power” have created posters and short, informal presentations that explore such topics as trans reproductive health, drug addiction and resilience, disabilities, sex education, internalized oppression and women, queer identities in media, debunking sex myths, and much more.

*Poster topics listed below should prompt consideration and discretion about what constitutes age-appropriate material.

Evergreen Programs:

Culture, Self, and Healing with Toska Olson & Erik Stein;
Unruly Bodies with Carolyn Prouty & Julie Russo

Target Audience: college

Poster Topics:

- [Abortion](#)
- [Analyzing the New Normal: “Queer” Identities in Modern Media](#)
- [Biopsychosocial Effects of Food Insecurity](#)
- [Disabilities and Eugenics](#)
- [Dissociative Identity Disorder](#)
- [Drug Addiction and Resilience](#)
- [Health and Love](#)
- [How to Interrupt or Unlearn Internalized Messaging](#)
- [Identity in Gaming: The Effect of Gatekeeping on Community](#)
- [Incarceration](#)
- [Inclusive Sex Ed](#)
- [Instamodels and Body Image](#)
- [LGBTQ+ Topics in Education](#)
- [Light Up: Physiological Effects of Light](#)
- [Low Budget Antics: AIDS Activist Counter Media](#)
- [Religious Trauma and the LGBTQ Community](#)
- [The Sex Ed We Wish We Had](#)
- [Under Pressure](#)
- [Who Can Have Babies? \(Reproductive Health + Rights of Trans People\)](#)

Stomata Slam by Sophia Borgen, Charlie McDaniel, and Logan Lancaster

Evergreen Program: Chemistry and Other Sciences Club with Dharshi Bopegedera

Target Audience: all ages

Location and Time: 1:30 pm in Lab I 1037

Abstract: Do plants breathe? Have you ever wondered how plants intake carbon dioxide and release oxygen so us humans can breathe too? In this fun interactive demonstration you'll be able to learn how the stomata of plants open and intake carbon dioxide from and is diffused for photosynthesis by throwing bean bags that represent carbon dioxide and oxygen molecules through a cutout of a leaf.

Super-Duper Superconductor Synthesis by Forest Davis

Evergreen Program: Independent Learning Contract with Rebecca Sunderman

Target Audience: all ages

Location and Time: 1:00 & 2:30 in Lab II 2238

Abstract: Superconductors are exciting materials which exhibit zero electrical resistance when cooled to their critical temperature, which is around -269 degrees Celsius. In the 80's, high temperature superconductors containing copper were found to achieve this effect at around -195 Celsius. Join me as I talk about how I synthesized a high-temperature superconductor, as well as some of the exciting properties of superconductors, including magnetic levitation!

Sediment Transport in the Wynoochee River by Kyle Hontz

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: all ages

Location and Time: 10:30-11:30 in the Purce Hall Rotunda

Abstract: As water flows down a river, it carries sediment. Addition of a dam on a river accumulates sediment behind it that may contain trace metals like lead and arsenic that are harmful to water quality for humans. Depending on chemical and physical conditions, trace metals may dissolve from sediment into the river, affecting water quality. I analyzed water samples above the Wynoochee Reservoir as well as below the dam to determine what changes in the form of trace metals occur with additional time in the reservoir before being transported past the dam. Come see a very hands-on demonstration of sediment transport!

Phytoplankton of Puget Sound by Jeanne Shepherd

Evergreen Program: Ecological Agriculture with Martha Rosemeyer

Target Audience: all ages

Location and Time: 1:00 and 2:00 in Lab I 1050

Abstract: This presentation will demonstrate the complexity of microbial phytoplankton and zooplankton in the Puget Sound, particularly the Hood Canal. Microscopes will be set up to showcase different water samples and people will have an opportunity to draw what they see and try and identify plankton observed. We will also describe the trophic interactions that occur and what we may learn about the whole ecosystem at that point through observing the microbial ecosystem.

See Your DNA! by Allie Huska, Mahalia Mata, Trinity Walsh, and Kayla Craddock

Evergreen Program: Integrated Natural Science with John Kirkpatrick, Nancy Murray, and Ken Tabbutt

Target Audience: all ages

Location and Time: 10:30, 11:00, 12:30, 1:00 in Lab I 1037

Abstract: Participants will have the opportunity to extract and look at their own DNA.

Solving the Mystery of Coho Salmon Die-offs by Camille Goodale and Rian Plastow

Evergreen Program: Environmental Analysis with Abir Robin Bond

Target Audience: middle school

Location and Time: 10:30, 11:30, & 12:30 in Lab I 1050

Abstract: Restoring salmon runs in the Puget Sound has been an environmental and cultural priority in recent decades. However, coho salmon have been observed to die within hours of entering urban streams, before they can lay their eggs. Evidence suggests that polluted stormwater draining into streams is the cause of these die-offs. To determine why stormwater has such a negative effect on this species, we are looking for signs of stress in various organs from coho salmon. We will accomplish this by measuring fluorescent stress products within the heart, gills, liver, and brain. We think that coho that are exposed to toxic stormwater will show higher stress levels in these tissues than fish that swim in uncontaminated water.

Environmental Analysis Poster Session

10:00-12:00 and 12:30-2:00 in Purce Classroom 6

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: All ages

Poster Topics:

Bioavailable Pools of Phosphorus in Mount St. Helens Andisols

On May the 18th, of 1980, Mt. St. Helens erupted. Forest systems surrounding the eruption were covered by tephra, a glassy, amorphous mineral that falls from a volcanic plume. These soils are believed to have high Phosphorus (P). 12 soil cores were collected in old growth and clear cut sites just beyond the blast zone of Mt. St Helens. We used multiple extractions that are analogous to different biotic strategies for phosphorus acquisition in soil to gain a better understanding of P bioavailability in different forest systems after a volcanic disturbance.

Central Washington Lakes as Ancient Martian Analogs

Have you ever found yourself wondering if Mars was once like Earth or if Mars ever had water? By identifying if Earth's lakes have similar composition to martian soil we can use these lakes as an substitute, or analog, for Mars. We tested two lakes in central Washington lakes to see if they have the potential to be martian analogs.

Could Your Day at The Beach Turn Deadly?

Eastern Softshell clams are one of the most sought-after and easily found shellfish in Washington State . Because they are filter feeders, they can absorb a toxic substance called Domoic Acid (further referred to as DA) from an algae blooms in the water they live in. DA can cause severe harm in humans if eaten and can even be fatal. I tested Eastern Soft-Shell clams in Thurston County to check the levels of DA with an original method.

Fish, Green Beans, and Rice Walk Into a Lab...

Did you know mercury is spread naturally around the world? Did you know that people have dramatically increased how much mercury there is in our air, water, and soil? Some food, like salmon, happen to be really good at collecting mercury, which can be bad for people's health! The Evergreen State College has an awesome machine that allowed me to look at how much mercury is in salmon, green beans, and rice. My research shows that Pacific Northwest Indigenous communities might be at risk for eating more mercury than is safe.

Is there metal in your juice?

Exposure limits for arsenic and lead in drinking water have long been established by the U. S Environmental Protection Agency, but no comparable exposure limits or regulations are available for juices and juice concentrates. The contents of Pb, Cd, and As in fresh fruit juices and juice concentrates were determined using Inductively coupled plasma mass spectrometry (ICP-MS) to determine the safety of juices available in Washington markets.

Mercury in your salmon, muscle vs. skin

Salmon, a keystone species to the Pacific Northwest, are highly sought after by fishermen. Salmon can offer important human health benefits but are also known to bioaccumulate the toxic form of mercury, methylmercury, given their respective position on the food chain. This study aims to examine total mercury concentrations found in the muscle tissue and skin of Coho and Steelhead caught in Grays Harbor and Pacific County. **The data acquired will be compared to the EPA and FDA standard on safe methylmercury concentrations based on recommended serving size and amount per week.**

The Captivating Life of Fungi: How Fungi Can Help Restore the Planet

Have you ever wondered what happens to a plant or animal after its demise? Fungi are vital for disassembling dead and dying organisms and preparing ecosystems for the next phase: Life. Fungi have the capacity to not only help organisms grow, but also facilitate the breakdown of environmental pollution, a process known as mycoremediation. To test the ability of fungi to mine for heavy metals, two fungal cultures were grown in a toxic climate. The amount of lead, cadmium, and copper that was taken up by both fungal species was then measured.

Thurston County Clamming... Good or Bad?

Clamming in the PNW is a family affair and enjoyed by many, possibly over a million people in Washington alone. Because clams are filter feeders they have a high probability of retaining high level of toxic mercury. I will be looking at the amounts of Mercury in various clams from Thurston County. **From this study we will be able to tell if there is a level of mercury that would cause mercury poisoning.**

Modeling for Change by Frank Scott Brooks

Evergreen Program: Independent Learning Contract with Sara Rose

Target Audience: all ages

Location and Time: 12 pm in Purce LH 4

Abstract: This presentation will engage your cognitive senses, highlight surprising simulations, and increase your appreciation for applied mathematics and computational thinking. By analyzing patterns across the fields of biology, chemistry, ecology, and physics, scientists build mathematical models that capture key interrelationships and expand our understanding of complex issues: the effects of rapid climate change and ecosystem destruction; the rising death toll from flu and reemergence of virulent diseases; and the unrests resulting from educational costs, fiscal instability, and political deceit. Such challenging and chaotic problems fester cynicism while prompting the need for systems thinking—a holistic paradigm integrating ideas, models, and theories for understanding the feedback processes of complex dynamical behaviors.

Ocean Acidification: The Other CO₂ Problem by Dr. Nate May

Evergreen Program: Riding the Carbon Cycle with Gerardo Chin-Leo, Erin Martin, and Nate May

Target Audience: all ages

Location and Time: 1:30 and 2:00 in Lab II 3209

Abstract: When we burn oil, coal, or gas, we produce carbon dioxide (CO₂) that accumulates in the atmosphere, where it causes global warming. But it also affects our oceans. As CO₂ enters the ocean, it reacts with sea water to form carbonic acid, leading to ocean acidification. This activity will visually demonstrate the acidification of ocean water, and corresponding effects on organisms, due to increase in atmospheric CO₂. This activity will also test the effects of acidification from CO₂ on eggshells to show firsthand the effects ocean acidification can have on calcifying organisms, such as mussels, oysters, and geoducks.

Perfect Predator by John Gunther, Amanda Pratt, and Alex Kroupa

Evergreen Program: Phage Lab with Betty Kutter

Target Audience: middle and high school

Location and Time: 11:30 & 12:30 in Purce Rotunda

Abstract: Ever wonder what the most abundant organism on earth is? Did you know that some viruses and bacteria are at war with each other and have co-evolved unique mechanisms to defend or attack against the other? At this presentation you will learn why viruses, specifically bacteriophage are used in place of antibiotics to kill bacteria causing infections. You will learn about where this therapy originated and why it may be a long time before this technique is used in place of antibiotics in the U.S.

Martian Analogues in the Pacific Northwest by Merid Schwartz

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: all ages

Location and Time: 11 am in Purce LH 3

Abstract: The plan of NASA's Mars Exploration Program is to "Seek Signs of Life." One way of doing this is by looking closely at rocks and soil. To understand Mars, we look for places on Earth that are like Mars (called analogues). This study sampled soil from three different lake areas, and then used instruments to find out how much of certain elements there were in the samples. By comparing our measurements to what is known about each planet, we hope to find a geologic analogue. For example, Mars has more magnesium than Earth, and we think that there will be more magnesium in our samples than the Earth average. That is, the soils we sampled will be a little bit more like Mars than the rest of the Earth; so we can use these areas to understand the past on Mars, when it had more surface water.

Mercury in Salmon: Effects of Chum Carcass Deposition on a Stream Ecosystem by Mackenzie Kleiva

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: all ages

Location and Time: 10:00 and 11:00 in Lab II 2238

Abstract: Did you know that salmon play a crucial role in supporting the health of stream ecosystems? Salmon, while important for the transport of nutrients from ocean to stream, also move toxins, such as mercury (Hg). The green or brown slippery grime growing on rocks and sediments in streams, periphyton, represents the base of the food web in streams. Periphyton may serve as an indicator of mercury remaining in a stream ecosystem following salmon spawning, when salmon die and rot. Come learn how salmon spawning may have an influence on the retention and subsequent movement of mercury through stream ecosystems.

Mercury in Smoked Salmon by James Duffy

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: all ages

Location and Time: 1:30 in Lab II 2238

Abstract: Smoked salmon is perhaps the greatest food ever made. With increasing concentrations of mercury in our oceans and our atmosphere, the mercury content of both salmon and trees has increased. Wood is used to smoke salmon. It is for this reason we ask: is smoking salmon increasing its mercury content? We are using a mercury analyzer and samples of smoked salmon we found the mercury content of smoked salmon and non-smoked salmon to discern if there is a difference in mercury content.

Presentations and Hands-on Demonstrations

Antibiotic Resistance: The End of an Era? by B!

Evergreen Program: Individual Learning Contract with Sara Rose

Target Audience: college

Location and Time: Purce LH 4, 1 pm & 2 pm

Abstract: The discovery of broad-spectrum antibiotics revolutionized modern medicine and may have saved billions of lives over the last century, but due to rampant misuse, multi-drug resistant pathogenic bacteria strains are spreading globally. We will explore the history of antibiotics, what went wrong, and some potential steps that can be taken to ensure that we will have viable treatments for infectious disease in the future.

Advanced Physics Projects Lab at Evergreen (APPLE)

Evergreen Program: Physical Systems and Applied Mathematics with Krishna Chowdary and John Caraher

Target Audience: all ages

Location and Time: 10-12 am and 1-3 pm in Lab I 054

Abstract: Come join students studying advanced physics and applied math in interactive, HANDS-ON explorations of some of the cool physics experiments and equipment Evergreen students are able to work with. Visitors will get a chance to see Fourier transformations with oscilloscopes and spectrum analyzers; view magnetic domains; visualize and hear acoustical analogs to quantum mechanical wave forms; and play with gyroscopes.

Advanced Physics Projects Lab at Evergreen (APPLE)—Quantum Optics Lab Tour

Evergreen Program: Physical Systems and Applied Mathematics with Krishna Chowdary and John Caraher

Target Audience: all ages

Location and Time: 10-12 am and 1-3 pm in Lab I 0219

Abstract: Come join students studying advanced physics and applied math in interactive, HANDS-ON explorations of some of the cool physics experiments and equipment Evergreen students are able to work with. In this room you can tour our state-of-the-art quantum optics lab.

Beginning & End of Plastics: Environmental Remediation and the Chemistry of Plastics by Logan Lancaster & Charlie McDaniel

Evergreen Program: Chemistry and Other Sciences Club with Dharshi Bopegedera

Target Audience: all ages

Location and Time: 12:00 and 2:30 in Lab I 1037

Abstract: Plastics are one of the most recognizable chemical discovery of our time doing incredible good and incredible harm. We will be creating a plastic to demonstrate the chemistry that goes into plastic products and discussing the process through which plastics are eventually broken down in the environment.

Charged by Crystals: The Piezoelectric Effect by Corwin Ries, Celsey Price, Zach Medici

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: all ages

Location and Time: 12 pm in Lab 3209 & 2 pm in Lab II 3221

Abstract: Did you know that crystals can create electricity? When crystals and other materials create electricity in response to pressure, it is called the piezoelectric effect. This is possible due to the chemical structure in these materials. This effect is present in a variety of things in our daily lives, including our bodies, sonar, and musical instruments! This presentation will include a live demonstration of the piezoelectric effect using a ceramic disk to light up an LED bulb. Come explore this alternative way to produce and use electricity.

Clamming for Mercury by Robin Bazan

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: all ages

Location and Time: 10:30 in Purce LH 1

Abstract: Mercury is a naturally occurring element that collects in aquatic systems such as streams, lakes, and oceans, where it undergoes a chemical reaction to form the organic compound methylmercury. Nearly all seafood contains traces of methylmercury due to their feeding ways which make them likely to accumulate heavy metals. I am using Manila Clams found along the Hood Canal as an indicator for mercury pollution to determine whether clams are safe to eat.

Life 2.0 by Paul Morris

Evergreen Program: Bond Astrobiology Lab with Robin Bond

Target Audience: all ages

Location and Time: 11:30 in Purce LH 1, 1:30 in Purce LH 2

Abstract: Scientists have detected an ocean of water beneath the surface of Jupiter's moon Europa, and hypothesize that it's oxygen-rich. Where does the oxygen come from? Europa has an icy surface that's constantly bombarded with radiation from Jupiter; bombarding ice with radiation produces hydrogen peroxide (H₂O₂) which decays into water and dissolved oxygen. However, there's more to the story. Europa's rocky core is likely rich in iron which consumes dissolved oxygen. You could think of this as a tug of war between oxygen production by H₂O₂ and consumption by iron, and the outcome determines whether there is enough oxygen for life. By creating an automation system that controls a flow injection and fiber optic spectrometer, we can detect dissolved oxygen and better understand these rates of oxygen production and consumption. Our goal is to shed some light on the hypothesis that Europa's ocean has all the necessary ingredients for life.

Magnetism and Ocean Worlds: How We Find Salty Space Oceans by Lily Robenthal and Oliver Sheufelt

Evergreen Program: Matter and Motion

Target Audience: all ages

Location and Time: 1 pm in Lab II 3221

Abstract: How can we tell when planetary bodies contain salty oceans? Ganymede, Europa, and Enceladus are moons of Jupiter and Saturn that contain such oceans. It turns out that magnetic fields interact with saltwater solutions in noticeable ways. Saltwater can both be affected by magnetic fields, and even create its own fields. During our presentation, we will demonstrate some of these effects, and participants will have the opportunity to test them for themselves. We will then make connections between how scientists measure these magnetic effects and interactions and how they use them to make conclusions about the compositions of planetary interiors. This research is important because where there is water, there could be life...

How Micro is Micro? Britannah Foster

Evergreen Program: Program

Target Audience: middle school

Location and Time: 10:00, 11:00, & 12:00 in Lab I 1050

Abstract: Do you like to eat seafood? So do I! Do you like to eat plastic? I'm not a fan! If you like seafood, you might be eating plastic and not realize it. Come find out how microplastics are affecting our ocean ecosystem as well as our Food Web! Come have some hands on fun with plastics, and get a closer look under the microscope to see how micro, micro can be!

“I like to Moo-ve It, Moo-ve It”: Cows and Coding by Faith Rasmussen and Marissa Campbell

Evergreen Program: Individual Learning Contract with Sara Rose

Target Audience: middle school

Location and Time: Purce LH 4, 1 pm & 2 pm

Abstract: Animal behavior can be an important indicator of animal welfare. Using data generated at a mega-dairy down in Oregon and a variety of Python data analysis libraries, we attempted to quantify stereotypic tongue rolling in dairy cattle and explore potential correlations to feeding routine, age, and genetics.

Is Gravity Bringing You Down?: The Mystery of Superconductivity and Levitation by Adam Smith, Marie Smith, & Justin Bennett

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: middle school

Location and Time: 11 am in Lab II 3209

Abstract: Superconductivity is a mystery that no one expected and is still not completely understood. When a superconducting material is super-cooled, two startling properties appear: FIRST: the material now has exactly ZERO electrical resistance, so electricity will flow in a loop forever! SECOND: the material now pushes away magnetic fields, causing magnets to levitate or float above the material. When magnets are put into trains, the trains float above the tracks, and move very fast, as in Japan's flying trains! Our demonstration will show you a floating magnet. Two hands-on projects will model zero electromagnetic resistance, and magnetic interplay with gravity.

Cracking the Mercury Code by Jeremie Countryman

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: middle school and high school

Location and Time: 11:30, 12:30, 1:30, and 2:30 in Purce LH 3

Abstract: Mercury (Hg) is a global pollutant that is transported over long distances. Although it occurs naturally, its concentration in the world has increased dramatically over the past 200 years as a result of industrial activities. By measuring the amount of inorganic mercury and the other harmful elements that are required for Sulphur reducing bacteria to thrive we can see what will happen if an area is disturbed by humans. It was determined that as a forest grows it collects elements from the air and water that falls on it and stores these elements within the trees and the ground. By releasing these elements, it creates an ideal environment for the Sulphur reducing bacteria to produce the poisonous methylmercury. This will assist us in determining the best way to manage our the forests around us.

Create/Meditate by Emiliano Monchilov

Evergreen Program: Student Originated Study: Printmaking with Lisa Sweet

Target Audience: all ages

Location and Time: 10 am, 11 am, 1 pm, & 2 pm in Purce Classroom 8

Abstract: My presentation seeks to "dig deeper" into the feeling of "flow" or a unique focus typically associated with a multitude of physical movements and practices. I have had the privilege to be exposed to visual art and the resources to create visual art for most of my life—thus I have wanted to explore the therapeutic feelings associated with the creative process. I have dedicated much of my work during my time here at Evergreen to explore transcendental states of consciousness (meditation) through direct application techniques and mediums that are typically associated with visual art or iconography. For my presentation, the medium used is monotype printmaking, utilizing direct movements and manipulation of ink on plexiglass with a putty knife.

Curious Comb Jellies by Tiffany Bachtel, Nick Leonardi, & Jojo Froehlich

Evergreen Program: Ecophysiology Lab with Erik Thuesen

Target Audience: all ages

Location and Time: 10 am, 11 am, and 1 pm in Lab I 043

Abstract: Comb jellies, also known as ctenophores, are gelatinous marine organisms that are known for their beautiful displays of light. They are found locally here in the Puget Sound, and throughout the world's oceans. Ctenophores are voracious predators and are more abundant in the seas than previously thought. Student researchers at Evergreen have been busy working on better understanding their ecology, physiology, and biodiversity. Please join us to discover more about this phylum of beautiful and delicate organisms and tour Evergreen's science aquarium lab.

Egg Drop! Sophia Borgen, Mischa Montgomery, and Casey Ware

Evergreen Program: Chemistry and Other Sciences Club with Dharshi Bopegedera

Target Audience: all ages

Location and Time: 11:30 & 12:30 at the Clock Tower on Red Square

Abstract: Want to see what it takes to make an egg not explode on impact after falling from the top of the clock tower? Come test your cushioning skills with egg cartons, pipe cleaners, parachutes made from plastic bags and so, so much more! Try your hand at defying gravity and do your best to save your egg from total destruction!

Elephant Toothpaste by Miranda Pearce

Evergreen Program: Chemistry and Other Sciences Club with Dharshi Bopegedera

Target Audience: all ages

Location and Time: 10 am in Lab I 1037

Abstract: This will be both a demonstration and semi-interactive experiment with a reaction that creates foam! We will learn about exothermic reactions, and how yeast is involved. There will be one hands off foam explosion to see, and several hands on foamy reaction to do!

Engineering Colors: A Better White Light by Julia Santoyo, Devynn Stodola, and Sylvia Ramon

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: all ages

Location and Time: 11 am in Lab I 3221

Abstract: White light is comprised of all of the wavelengths of the visible spectrum. We call this type of seemingly colorless light "white light". This type of light is very difficult for us to produce! You may notice that many light bulbs appear to have a yellow or blue hue, which can distort the color of objects lit by them. Today, a better white light is in high demand. Industrial applications for white light continue to increase. Unfortunately, the most common and commercialized light bulbs such as fluorescent and incandescent bulbs, waste energy, resources, and have a short lifespan. LED (light-emitting diodes) bulbs are playing a leading role in the search for a better white light. LED bulbs use significantly less energy, and are being designed to require less environmentally and economically taxing resources. Come learn about the exciting new research being done by many teams of scientists from all over the world and explore how engineers are developing a better white light! We welcome you to join us for a short presentation followed by hands on activities, including a take home craft.

Gold Panning by Kyle Hontz

Evergreen Program: Environmental Analysis with Abir Biswas and Robin Bond

Target Audience: all ages

Location and Time: 1:30-3:00 (drop in) on Red Square

Abstract: Use principles of sediment transport to possibly discover real gold! (Also see Kyle's presentation on sediment transport in the Wynoochee River)

H2 Oh Yeah!: How Many Electric Eels Does It Take to Get To Wild Waves? by Casey Botts, Kat Dyer, Richard Gumbel

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: all ages

Location and Time: 10:30 in Lab II 3221 and 1:00 in Lab II 3209

Abstract: The first law of thermodynamics states that energy can neither be created, nor destroyed...but it can be turned into fun! Electrolysis, using electricity to power a chemical reaction, is one of the most important industrial processes today. It does everything from gold plating to hair and rust removal. One of the most exciting applications of electrolysis is the breakdown of water to produce hydrogen gas, which is more than twice as powerful as gasoline as a fuel and does not produce greenhouse gases. Currently, solar power is being used to produce hydrogen gas through electrolysis of water, but it's not very efficient yet. In our presentation we will discuss how much energy it takes to power a hydrogen fuel cell car using electrolysis and compare it to conventional energy sources. We'll also talk about what's *currently* happening with research into improving hydrogen fuel cells and sustainable hydrogen production. Try out a hands-on experiment to separate water into hydrogen and oxygen gas - it will be a *shockingly* good time!

Heavy Metals in the Yauger Park Regional Stormwater Complex by Oliver Lyons-Kuster

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: middle school & high school

Location and Time: 12:00, 1:00, & 2:00 in Purce LH 3

Abstract: As impermeable surfaces such as concrete and asphalt cover more and more land, stormwater runoff volumes and its contaminants increase. As rainwater runs over these surfaces, it acquires toxic pollutants from industrial waste and vehicle emissions. Heavy metals often attach to suspended sediment in runoff; therefore treatment practices often target the removal of these solids. The Yauger Park Regional Treatment Facility in Olympia, Washington treats stormwater that eventually reaches aquatic ecosystems, and its efficiency at removing heavy metals has never been analysed... until now! This presentation is a great opportunity to acquaint yourself with how Olympia deals with stormwater runoff!

Finding Life in the Solar System (& Beyond) by Dr. Robin Bond

Evergreen Program: Bond Astrobiology Lab

Target Audience: all ages

Location and Time: 11 am in Purce LH 1 & 1 pm in Purce LH 2

Abstract: Is there life on other planets? If so, it might be very different from what we're familiar with and we might not know what to look for. Luckily, understanding principles of chemistry and biology help us predict what sorts of life can exist in a particular environment! Come find out how in this short talk—and then stick around for Life 2.0, in which Paul Morris discusses the modeling work done in the Bond Lab.

Fireworks: Stories of Light by Iris Garthwaite, Chiyeon Park, and Sophia Waite

Evergreen Program: Matter and Motion with Dharshi Bopegedera and John Caraher

Target Audience: all ages

Location and Time: 12 pm in Lab II 3221

Abstract: Fireworks have brought metals and minerals into recipes of explosions for thousands of years. Did you know that the fantastical fireworks shows you see in the sky were made possible by early Chinese alchemists and 16th century chemists in Europe? Those brave individuals endeavored to create a scene so magnificent it would scare away evil mountain spirits or celebrate the marriage of Renaissance-era Kings and Queens. In this demonstration we will explore the link between fireworks, earthy minerals, emission spectra and story-telling. Activities include exploring the environment to find materials used in fireworks, emission spectra demo, and a lab-safe firework dragon battle. Participants will learn how to safely engage with simple pyrotechnic materials while also gaining insights into the history and process of fireworks displays.

Forest Bird Walk by Erin Sherrer and Maya Nabipoor

Evergreen Program: Modeling Biological Systems with Jim Neitzel and Richard Weiss

Target Audience: all ages

Location and Time: 10 am, 11 am, 1 pm, 2 pm at the 1st floor junction between Lab I & Lab II

Abstract: We plan to provide easy field guides, explain how to use binoculars, and take groups on the Organic Farm Trail to look and listen for birds.

From Goat Mouth to Goat Milk: A Biogeochemistry Adventure by Melinda Dauley

Evergreen Program: Modeling Biological Systems with Jim Neitzel and Richard Weiss

Target Audience: all ages

Location and Time: 1 pm & 2 pm in Purce Classroom 7

Abstract: Dairy goat populations are on the rise all across the United States as the popularity of goat milk and concern over where our food comes rises. As this new approach to nutrition surfaces, our society has the challenge of a steep learning curve as we learn how to adjust our mindsets to more of a systems scientist orientation. Merely milking a goat seems to be a redundant task and regulated to the rural subculture but what really goes into this fellow biological entity of "the goat"? In this demonstration, the presenter will utilize all facets of dairy science, from biochemistry to goat husbandry. Attendees will leave with a better knowledge of exactly where their food is coming from.

Geochemical Analysis of Cascade Thermal Mountain Springs by Myles Kautsky

Evergreen Program: Environmental Analysis with Robin Bond

Target Audience: middle & high school

Location and Time: 10:30 & 11:30 in Lab II 2238

Abstract: Did you know Fluoride, a common ingredient in toothpaste, is brought to the surface of the earth by volcanoes? Fluoride in small amounts is important to the health of humans and animals. However, in larger amounts fluoride can greatly damage the teeth of humans and animals. Fluoride exists in low levels on the surface of the planet, but high amounts of fluoride exist in the earth molten interior, the mantle. Volcanoes, a bridge between the mantle and the surface of the earth, bring up an abundance of chemicals (including fluoride) to the surface. One way volcanoes carry fluoride to the surface is through hot springs. Since fluoride in high levels can be dangerous to wildlife and human beings, it is important to know if volcanoes in our region are adding harmful levels of fluoride to water sources that humans and animals drink from. This study will examine multiple hot springs across the state and note if these volcanoes are contributing dangerous amounts of fluoride to our watersheds.

		10:00	10:30	11:00	11:30	12:00	12:30	1:00	1:30	2:00	2:30	
Lab I	Lobby	~~~ Science Carnival Welcome Center ~~~										
	043	Curious Comb Jellies		Curious Comb Jellies				Curious Comb Jellies				
	054A	Advanced Physics Projects Lab at Evergreen (APPLE)—drop in					Advanced Physics Projects Lab at Evergreen (APPLE)—drop in					
	1037	Elephant Toothpaste	See Your DNA	See Your DNA		Beginning & End of Plastics	See Your DNA	See Your DNA	Stomata Slam		Beginning & End of Plastics	
	1050	How Micro is Micro?	Solving Mystery Salmon Die-offs	How Micro is Micro?	Solving Mystery Salmon Die-offs	How Micro is Micro?	Solving Mystery Salmon Die-offs	Phytoplankton of Puget Sound		Phytoplankton of Puget Sound		
Lab II	0219	Quantum Optics Lab—drop in						Quantum Optics Lab—drop in				
	2238	Mercury:Salmon + Ecosystem	Geochemistry Thermal Springs	Mercury:Salmon + Ecosystem	Geochemistry Thermal Springs			Mercury Smoked Salmon	Super-Duper Superconductor	Super-Duper Superconductor		
	3209			Is Gravity Bringing You Down?		Charged by Crystals	What the Frack?	H2 Oh Yeah!	Ocean Acidification	Ocean Acidification		
	3221		H2 Oh Yeah!	Engineering Colors		Fireworks		Magnetism Ocean Worlds		Charged by Crystals	What the Frack?	
Purce Hall	Rotunda		Sediment Transport Wynoochee		Perfect Predator		Perfect Predator					
	LH 1		Clamming for Mercury	Finding Life in Solar System	Life 2.0: Europa							
	LH 2	Food Chemistry Poster Session						Finding Life Solar System	Life 2.0: Europa	I Like to Moo-ve it: Cows & Coding		
	LH 3	Urban Karsts		Martian Analogues	Cracking Mercury Code	Heavy Metals Yaeger Park	Cracking Mercury Code	Heavy Metals Yaeger Park	Cracking Mercury Code	Heavy Metals Yaeger Park	Cracking Mercury Code	
	LH 4	Modeling for Change		I Like to Moo-ve it: Cows & Coding		Modeling for Change		Antibiotic Resistance		Antibiotic Resistance		
	Classroom 5	Resilience and the Social Body Poster Session					Resilience and the Social Body Poster Session					
	Classroom 6	Environmental Analysis Poster Session						Environmental Analysis Poster Session				
	Classroom 7							From Goat's Mouth to Goat's Milk		From Goat's Mouth to Goat's Milk		
	Classroom 8	Create/Meditate		Create/Meditate		Urban Karsts		Create/Meditate		Create/Meditate		
Outside	Red Square					Thermite		Gold Panning				
	Clock Tower				Egg Drop		Egg Drop					
	Junction—Lab I & Lab II	Forest Bird Walk		Forest Bird Walk				Forest Bird Walk		Forest Bird Walk		