

Student Scholarship Recognition Day

Poster Abstracts

April 24, 2019, Noon – 2 pm

University Center, 2nd and 3rd floors

Barela, Alexis *Biology*

In Pursuit of Arboretum Status: Mapping the Tree Biodiversity Around Campus

This report focuses on the progress students, faculty and staff are making in having Willamette University gain recognition on the Morton Register of Arboreta. The international registry is a comprehensive list and database of arboreta and public gardens that have a substantial focus on woody plants. In 2015, Annette Marinello proposed the idea of an arboretum after she reviewed historical notes of campus trees and developed a detailed protocol and an initial mapped inventory of many trees on campus. In 2019 Alexis Barella and Renee Bruning have done a comprehensive revisiting of Marinello's survey data and advanced the inventory of trees to new areas of campus. It is expected the tree inventory will be completed by Fall 2019 and we may be officially recognized in Spring 2020.

Bless, Alexandra *Chemistry*

The Chemistry of Beer: A Guide to Brewing the World's Favorite Drink

Since its invention 7,000 years ago in Mesopotamia, beer has been the most consumed alcoholic beverage. The process of brewing is meticulous, using four ingredients to produce a wide assortment of flavors: hop, barley malt, yeast, and water. Barley malt is first degraded into sugars and dextrin, and fatty acids are oxidized. Specific temperatures and pH ranges influence alcoholic percentage and mouthfeel. Conditioning produces specific recipes with their own signature taste and experience. In this last step before bottling, diacetyl and 2-3-pentanedione is reduced, thus softening flavors that would be too strong to taste.

Bolle, Joshua *Psychology*

Interactions of Gender and Race/Ethnicity in Substantiation of Child Physical and Sexual Abuse Cases

This study examines the effects of gender and race on the determination of child sexual abuse (CSA) and child physical abuse (CPA). The sample consists of 399 males and 387 females, with 377 white and 224 non-white children. Binary logistic regression was used to assess how gender and race predicted substantiation. In cases of CPA, females are .37 less likely to have cases substantiated compared to males. Additionally, non-white children are .21 less likely to have cases substantiated compared to their white counterparts. In CSA, non-white children are .56 less likely to have cases substantiated compared to their white counterparts. These results indicate the potential need for bias prevention programs in child welfare, child abuse assessment centers, and law enforcement agencies.

Brounstein, Noah *Chemistry*

Ocean Acidification

An entire quarter of all carbon emissions created by humans are absorbed by the world's oceans, resulting in seawater with increased acidity levels. Ocean acidification has had many negative impacts on Earth, reducing the quality of living conditions for marine organisms. When carbon dioxide is absorbed by the ocean and reacts with water molecules and carbonate ions necessary to the functioning of many organisms, bicarbonate ions are created that dissociate in water and yield protons, raising the pH of seawater. Recent estimates predict this change will have drastic effects on our Earth and environment. If we do not do something to reduce our carbon emissions, the whole planet will pay the price.

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Bulloch, Drew *Biology*

Amphibians around the Willamette Campus

Changing environmental conditions threaten the status of animal populations across the world but resources are limited so it's important to know which groups are more sensitive to these changes and require more conservation attention. As a starting step, this project focuses on observing and cataloging the various species of amphibians that may be found around the Willamette campus and Pringle Creek in Bush Park. Documentation of locally present species may aid future efforts to determine how amphibian diversity in the Salem area has changed.

Callan, Trent with Miyoshiro, Dyoan

iHSi Research Project: Examining Effects of Attachment Orientation on Women's Sexual Experience and Relationship Quality

Attachment theory suggests that individuals have stable internal models of themselves and others that shape their emotions and behaviors in romantic relationships. Through our study, we explore daily diary data concerning the relational satisfaction, sexual satisfaction, and sexual difficulties of 100 women from Texas. We perform analysis to see if there are any (lagged) relationships between the daily-reported variables, and if those relationships are moderated by a person's level of attachment anxiety and attachment avoidance. Using a combination of Python and R, the data was cleaned, reformatted, and analyzed using linear mixed-effects models.

Canniff, Megan *Biology*

Willamette Valley Bumble Bees: critical pollinators of plants and landscape history

The western bumble bee is presumed extinct in the Willamette Valley, the same area where it was once the most common native Pacific Northwest pollinator. The honeybee (*Apis mellifera*) is a naturalized insect which is often the focus of pollinator population decline, but there are thousands of native bumble bees at risk (Genus *Bombus*). Sixteen native bumble bee species in the Willamette Valley are threatened by climate change, habitat loss, and pesticide use. Pacific Northwest bumble bees have not been extensively documented, but citizen science is gaining momentum, helping to shed light on the serious ecological consequences of native bee population decline. This project focuses on using citizen science platforms (EOL, iNaturalist, Bumble Bee Watch, etc) to document and map bumble bees in the Willamette Valley and understand how climate and urbanization may impact native bee populations.

Charlton, Patrick *Other*

Streamlining Oregon's Online Public Transportation Services with GTFS-ride

General Transit Feed Specification (GTFS) is an open standard format for exchanging information regarding public transportation schedules, geography and fares. GTFS originated from the Portland TriMet area and was developed by Google. GTFS-ride is an updated, and at this point specific to Oregon, variant of the GTFS system. It adds additional files to the specifications of GTFS to allow for a detailed collection of ridership data within a defined transit system. Our project's main overarching goal is to create a more efficient and user friendly GTFS-ride environment for the state of Oregon. Specifically, our tasks include writing documentation for the existing GTFS validator and merge utility created by Google, and developing our own GTFS-ride specific utilities, including a GTFS-ride merge utility, a finder for gaps and

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overlaps in GTFS-ride feeds, and a GTFS-ride editor. These utilities use the feed validator to organize and sift through all data contained within the feeds regarding route, trip, vehicle, timing, ridership, and any other relevant information.

Cheney, John *Biology*

Native Species vital to Native Peoples

A description of different species found on campus or native to the Willamette Valley that hold a very special significance to indigenous peoples who call the Willamette Valley their home. Indigenous peoples utilized and contributed to the natural history and hold a more valuable, longstanding technical ecological knowledge than their more recently-arrived Euro-centric counterparts. Through learning of these native species, John hopes to glimpse the world that existed before, and share the meaningfulness of our home that is less represented but essential to the understanding of our natural history.

Cheng, Miles *Biology*

Planting Riparian Plants to the Side of Willamette Library

Grazing by mallard ducks has left the location to the North side of the library relatively free of plants. I am proposing plans on planting riparian native plants back to this location in hopes of making this location more pleasing to the eyes. The soil is constantly wet, is constantly in the shade. I also hope to provide more food and habitat to native animals in hopes of helping combat the expected shrinking of habitat.

Charlton, Patrick *Computer Science*

Building a Unit Testing Utility for GTFS-ride

Chiappisi-Livermore, Oakley *Biology*

Bioremediation and Diversification of the Mill Race

Currently the Willamette University Mill Race serves more aesthetic purposes than that of an ecosystem. In Oregon, riparian ecosystems are teeming with life and flowing high with water. The Mill Race is home to a few aquatic species, but its vigor and habitability does not compare to these nearby ecosystems. Our mission is to increase aquatic diversity by introduction of bioremediative vegetation to create habitat for introduced native aquatic species and to reimagine the purpose of the Mill Race and its future. We plan to create 20-50 cm depressions in the streambed to harbor newly introduced aquatic plants and animals.

Cortez, Samantha *Chemistry*

The Chemistry of Heavy Metal Poisoning and its Relevance Today

Heavy metals can be essential to the human body, but can also cause life-threatening health conditions. Some metals, like zinc, are essential to the body, but dangerous if consumed in large quantities. However, other metals, like lead, are dangerous regardless of quantity. Created inside of supernovas, heavy metals are present in Earth's crust and are extracted by humans for use in construction, energy, and agriculture. The heavy metals are absorbed into our environment through contaminated food, water, and surroundings due to human activity. In order to protect ourselves from heavy metals, it is important to know their dangers and uses.

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Culcasi, Brandon *Chemistry*

The Effect of Acid Rain on Ecosystems in North America

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Cummins, Anthony *Biology*

Conserving Hummingbirds One Nectar Plant at a Time

Anthony is currently working on a project to create a more suitable environment for the hummingbirds that frequent the Willamette campus. Hummingbirds, including the year-long resident Anna's hummingbird, are essential contributors to the pollination cycle that allow the plants and flowers in the Willamette Valley to thrive. However, the hummingbirds and flowering plants could be threatened by climate change in coming years. In an effort to promote a greater population of these hummingbirds and provide more opportunity for them to flourish, Anthony is aiming to document the nectar plants utilized by hummingbirds on the Willamette campus and of the projected climate analog.

Davies, Allison

When the Levee Breaks: Pre-Contact Artifacts in the Northeast Quadrant of the Salem Police Facility Archeological Site

Archeological excavations at the Salem Police Facility site in downtown Salem uncovered pre-contact artifacts from the Kalapuya tribe in elevated levee deposits along the southern bank of Mill Creek. Due to its compact nature, the levee—historically used for flood mitigation and land drainage—likely provided an optimal environment for the preservation of these artifacts. For this reason, there is a question regarding the potential for additional cultural material in the area. Synthesis of historical sources, archeological records, geophysical processes, and field work comprised of soil augering yielded data showing the extent of the sediment depositions of the levee.

Dews, Joe *Chemistry*

The Implications of the Maillard Reaction

Chemical reactions occur all around us in our daily lives, yet they often go unrecognized. One such reaction is the Maillard reaction, which can occur in many of the foods we cook and bake. The main focus among these processes lies with the searing of steaks and the browning of baked goods, and how this reaction yields products that give these foods such a delicious taste and smell. In essence, our research on this reaction will provide many with an understanding behind its chemistry and its various cooking applications in the modern world.

Eklund, Alyssa *Chemistry*

Oxygen on Earth

This presentation will address the importance of the stability of oxygen in its dioxygen form, as well as how it arose on Earth. The development of cyanobacteria allowed the atmosphere to become oxygen dominate, allowing the rise of

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multicellular life. Through the analyzation of the effects of anoxia in the atmosphere and oceans, we will explore its impacts on life. Not only will we discuss oxygen's engagement in major life processes such as cellular respiration and photosynthesis, in addition we will evaluate the impacts humans have on the Earth's oxygen cycle in relation to the atmosphere and ocean concentrations.

Espinoza, Angel *Chemistry*

The Effect of Acid Rain on Ecosystems in North America

Acid Rain, also known as acid deposition, has greatly affected ecosystems in North America. Acid deposition changes the pH in water and soil due to the burning of fossil fuels which causes the emission of SO₂ and NO_x into the atmosphere which falls back to Earth in the form of acid rain. Changes in legislation and increased awareness to the detrimental effects of acid rain are crucial to stop the acidification of North America's ecosystems. In these affected areas, acid rain has depleted the soil and water of base cations killing fish and trees which harms ecosystems.

Familetto, Elena

Reconstructing Downtown Salem's Landscape: A Paleogeographic and Paleohydrologic Analysis of the Police Facility Archaeological Site

Understanding past geographic and hydrologic environments is key to interpreting the development of archeological sites. To understand the anthropologically and ecologically induced landscape change at the Salem Police Facility site and surrounding area along Mill Creek, a reconstruction of the paleogeographic and paleohydrologic environment was performed using historic and geoarchaeologic analyses. Evaluation of maps, newspapers, and excavation material including stratigraphic profile drawings, hydrometer tests on soil samples, and soil augering provided data to produce a comprehensive picture of processes that shaped the landscape.

Fang, Daniel *Chemistry*

Nd:YAG Lasers and their Applications

This project will be taking a look at Nd:YAG lasers and their many applications. First, we will examine the components, Neodymium and Yttrium and how they exist together in aluminum in a crystal. The project will also examine how the energy diagrams for the pure state and excited state looks and what implications that holds for the laser. It will also explore the different types of laser cutting techniques that it is used for. Finally, this project will review the various harmonics at which this lasers normally emits and what the applications of these different types are.

Faust, Lila *Biology*

A Window into Local Ecology: Campus Ecology Recognition Project

There is a diverse range of organisms outside the windows on Willamette's campus, which go unnoticed by a vast majority of the university's populus. In this project, we will identify a number of plants and animals found in specific areas on and around the Willamette campus, and post fact sheets about them in the places that they can be found and observed, specifically in student gathering areas with large windows. This will help bring local ecological awareness to not only those who live on campus, but those who spend any amount of time in Willamette's public spaces.

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Ginsburg, Siena *Chemistry*

Ocean Acidification

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Gray, Tanner *Biology*

Year-Round Hummingbird Habitat Enhancement and Promotion at Willamette University

Anthony Cummins, Ben Newman and Tanner Gray are currently working on a project to improve the habitat for the hummingbirds that visit and inhabit the Willamette University campus. Through their combined efforts, they hope to plant more native nectar plants for hummingbirds as well as erect heated hummingbird feeders that will aid the bouquets of hummingbirds in flourishing even during the winter. Their talk is titled "Year-Round Hummingbird Habitat Enhancement and Promotion at Willamette University."

Hamilton, Dana *Chemistry*

The Chemistry behind Delicious Culinary Caramelization

In this poster presentation we will discuss caramelization, which is the process of oxidizing sugars to create a sweet flavor and brown color. By removing water from sugar (sucrose or glucose), the polysaccharides are isomerized and polymerised. This browning process is used in many foods including pears, onions, and candy. In caramelized onions, large sugar molecules break down into smaller molecules, which results in the chemical compound containing allyl methyl sulfide. Candy and pears go through a similar reaction but contain fructose, glucose, and sucrose, and additionally pears contain sorbitol. Caramelization shows how chemistry is used in everyday life.

Hickman, Tara *Chemistry*

The Chemistry of Beer: A Guide to Brewing the World's Favorite Drink

Since its invention 7,000 years ago in Mesopotamia, beer has been the most consumed alcoholic beverage. The process of brewing is meticulous, using four ingredients to produce a wide assortment of flavors: hop, barley malt, yeast, and water. Barley malt is first degraded into sugars and dextrin, and fatty acids are oxidized. Specific temperatures and pH ranges influence alcoholic percentage and mouthfeel. Conditioning produces specific recipes with their own signature taste and experience. In this last step before bottling, diacetyl and 2-3-pentanedione is reduced, thus softening flavors that would be too strong to taste.

Hook, Meghan *Chemistry*

The Chemistry and Physiology of Cocaine

Cocaine, or benzoyl-methyl-ecgonine, is a highly addictive drug accompanied by numerous negative side effects. Cocaine affects the body at the neurochemical level by being similar in chemical structure to other alkaloids, therefore giving it

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the ability to disrupt normal functions of the brain by binding with important proteins. The sense of euphoria that results from taking the drug inhibits control over aspects such as reasoning and motivation, making it rapidly habit-forming and a growing societal issue. Studying how cocaine affects the chemical balance of the body is useful in helping us explain its addictive properties and negative side-effects.

Horn, Mattie *Biology*

Rejuvenating Depleted Soils

Lauren Haky and Mattie Horn are collaborating on a tentative project that aims to restore nutrients into the Belknap garden plots on campus. The project would include a soil sample test to analyze the current levels of nutrients. Moving forward, we would add new plants and decomposers to supply essential nutrients into the soil. This would provide a nutrient rich environment for the next round of crops and to recycle nutrients within the garden plots themselves rather than bringing them from external sources.

Huang, Emily *Chemistry*

Oxygen on Earth

This presentation will address the importance of the stability of oxygen in its dioxygen form, as well as how it arose on Earth. The development of cyanobacteria allowed the atmosphere to become oxygen dominate, allowing the rise of multicellular life. Through the analyzation of the effects of anoxia in the atmosphere and oceans, we will explore its impacts on life. Not only will we discuss oxygen's engagement in major life processes such as cellular respiration and photosynthesis, in addition we will evaluate the impacts humans have on the Earth's oxygen cycle in relation to the atmosphere and ocean concentrations.

Inglis, Desmond *Chemistry*

The Effect of Hydrolysis on Lactose in the Digestive System

As humans age, their production of lactase decreases which inhibits their ability to digest lactose. Lactose is the disaccharide that is present in all animal produced milk. Those who are lactose intolerant are lactase deficient which contributes to their inability to digest the sugars that are found in milk. This project aims to analyze the relationship between these two compounds in order to better understand the break down of lactose. Deficiency of lactase in human bodies alters this relationship; this correlates to consequences from milk consumption on the health of those who suffer from lactose intolerance.

Jones, Anna *Chemistry*

Nd:YAG Lasers and their Applications

This project will be taking a look at Nd:YAG lasers and their many applications. First, we will examine the components, Neodymium and Yttrium and how they exist together in aluminum in a crystal. The project will also examine how the energy diagrams for the pure state and excited state looks and what implications that holds for the laser. It will also explore the different types of laser cutting techniques that it is used for. Finally, this project will review the various harmonics at which this lasers normally emits and what the applications of these different types are.

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Jorgensen, Claire *Biology*

Spring Phenology on Willamette University's Campus

Claire is working on documenting and mapping the spring phenology of forbs and shrubs on Willamette University's main campus in order to establish a baseline for further monitoring in an effort to understand the ways in which phenology has and will change in response to shifting global climate.

Krebs, Véronique *2018 Summer Research*

Revisiting Hemp: The re-establishment of research and industrial uses of Cannabis sativa L. in New York State

The Agricultural Act of 2014, or "Farm Bill," raised the opportunity to grow non-psychoactive cultivars of Cannabis sativa L. (industrial hemp) for the first time in nearly a century. Industrial hemp is already of interest to growers and consumers for its potential use in food (e.g. hemp protein powder), fiber and health. The NYS Industrial Hemp Research Pilot Program was established in partnership with Cornell University to delve into the most economical methods of creating ideal conditions for the industrial production of hemp. This project has two objectives: 1) to gain a better understanding of the C. sativa microbiome and 2) to produce a new episode on Cornell's Food + Science podcast platform. An initial microbiome study was performed in 2017, and one unique yet little-known microbe was potentially detected in the root microbiome. We developed a detection method for this microbe and found that the sequence amplified from all hemp tissues, therefore it is likely part of the hemp genome rather than a unique microbe. The bulk of the podcast is being constructed from 7 interviews conducted locally – of 2 Cornell researchers, an extension/outreach coordinator, grower, producer, and 2 customers at the downtown farmer's market – to ultimately publicize an indirect dialogue between differing perspectives of hemp production in NYS.

Lawson, Peter

Of Pots and People: Interpreting Grooved Ware in Neolithic Orkney

The Neolithic site of the Ness of Brodgar in Orkney, Scotland exists within a context of major sociocultural changes that occurred between c. 5200 BP - 4500 BP. Associated with these changes is the development and widespread use of Grooved Ware pottery. This project interprets the Grooved Ware assemblage from the Ness of Brodgar's structure 14. Statistical analysis of pottery finds between both contexts and phases are interpreted through a lens of material culture studies. The study assesses the sociocultural features/interpretations of the assemblage and evaluates their fit with existing interpretive models.

Lau, Mark *Chemistry*

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Lee, Shannon *Environmental Science*

Geoarchaeological Analysis of Materials from the Salem Public Safety Facility Site

This poster presentation analyses the context of historical Salem through the archaeological materials recovered from the new Public Safety Facility construction site in downtown Salem, Oregon. The research utilizes XRF and typology cross-comparison techniques to identify glass and ceramic fragments collected as inadvertent discoveries by the City of Salem. The glass artifacts range from milk glass to a fragment of a telephone pole insulator. Four out of five of the glass fragments contain Pb (lead). The research uses the elemental makeup of materials to place artifacts on the timeline of historic glass and ceramic production.

Little, Sean *Chemistry*

The Chemical Effects of Adderall on the Brain

Adderall is an amphetamine that increases the amount of dopamine and norepinephrine in the synapses of your brain. Its effects include higher levels of focus and increased cognitive stamina, but these benefits do not come without risk, especially for those who are not prescribed. We aim to find the reasons why Adderall is able to affect the neurotransmitters in the brain, and how these interactions have the ability to cause complications such as addiction, cardiovascular weakness, and increased risk of mental illness. Due to the increasing prevalence of Adderall in university settings, understanding its effects can promote awareness for students.

Mandala, Devyn *Chemistry*

The Effect of Acid Rain on Ecosystems in North America

Acid Rain, also known as acid deposition, has greatly affected ecosystems in North America. Acid deposition changes the pH in water and soil due to the burning of fossil fuels which causes the emission of SO₂ and NO_x into the atmosphere which falls back to Earth in the form of acid rain. Changes in legislation and increased awareness to the detrimental effects of acid rain are crucial to stop the acidification of North America's ecosystems. In these affected areas, acid rain has depleted the soil and water of base cations killing fish and trees which harms ecosystems.

McDevitt, Brady *Chemistry*

The History of Lead (Pb)

In its many forms, lead has had a wide variety of uses and functions for humanity over the past two thousand years. It has found a place in manufacturing plastics, in paint, glazes, cosmetics, toys, and even plumbing systems. Some practices have fallen to disuse due to the toxicity of lead or a more effective option, as with lead-containing cosmetics and art supplies, but others such as the use of lead compounds in the manufacture of plastics and in piping and water systems are still used. Our examination of the many historical uses of this element can explain phenomena and inform on the progression of new inventions, technology, and scientific discovery.

Meirose, Taylor *Chemistry*

The Effect of Hydrolysis on Lactose in the Digestive System

As humans age, their production of lactase decreases which inhibits their ability to digest lactose. Lactose is the disaccharide that is present in all animal produced milk. Those who are lactose intolerant are lactase deficient which

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contributes to their inability to digest the sugars that are found in milk. This project aims to analyze the relationship between these two compounds in order to better understand the break down of lactose. Deficiency of lactase in human bodies alters this relationship; this correlates to consequences from milk consumption on the health of those who suffer from lactose intolerance.

Miyoshiro, Dyoan, see **Callan, Trent** *Computer Science*

iHSi Research Project: Examining Effects of Attachment Orientation on Women's Sexual Experience and Relationship Quality

Mochizuki, Shione *Chemistry*

Copper Culture

Copper has numerous useful properties and applications that has made it one of the most commonly used metals currently and historically. Some of these notable characteristics include high tensile strength, corrosion resistance, conductivity, and antimicrobial effects. This project explains why copper exhibits such properties from a chemical aspect and how it is beneficial to society. We will investigate alloys, orbitals, redox reactions, and electron configuration, with further biological considerations of transmembrane potential and oxidative damage. Due to its innumerable and diverse applications, copper boasts a rich history and is still deeply integrated in our society today.

Morel, Alex *Chemistry*

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Murphy, Carter *Chemistry*

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Na, Yewon *Chemistry*

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Nelson, Kelsey *Chemistry*

Environmental and Social Impacts of Hormonal Birth Control

Hormonal birth control is a widely used form of contraception, yet few know how to properly dispose of it. A US Geological Survey between 1999-2000 found traceable amounts of medications in 80% of water sampled from 139 streams in the US (Harvard Health Publishing). Improper disposal of hormones has been found to feminize male fish in polluted bodies of water, as it is an endocrine disruptor that mimics naturally occurring hormones. In addition to harming aquatic life, there is an indirect impact on human populations, which is why the proper education of disposal is a necessary component.

Newman, Ben *Biology*

A History of the Willamette University eBird Hot Spot with Photography

Since 2001 Professor David P. Craig has been recording data on the presence and abundance of birds on the Willamette University campus using a phone app called eBird. eBird is a global database of bird records coordinated by the Cornell Lab of Ornithology. The app uses crowdsourcing, so every new report improves its ability to predict a species' location which is useful for birders and conservation in general. Starting in 2016 Craig has coordinated weekly morning walks and encouraged photography of birds on campus. As of April 2019 at least 105 species have been detected and of those 62 have been photographed. The aim of this project is present a rich image resource of the history of this birding hotspot and to encourage the submission of historical and newly photographed images of birds on campus.

Oaks, Peter *Psychology*

Determination of Risk in Cases of Child Abuse

Utilizing data gathered from Child Welfare, this study investigated the relationships between Child Protective Services' response times (used as a proxy for risk) in cases of suspected neglect and variables including: gender of victim, age of victim, age of perpetrator, and perpetrator's criminal history. It was hypothesized that response times in cases of female victims would be shorter than those with male victims, it was further hypothesized that there would be significant correlations between all previously mentioned variables. Results of this study will be discussed.

O'Donnell, Ty *Biology*

Mallards in the Mill Stream

There are over 30 species of waterfowl in the Willamette Valley with multiple wildlife refuges dedicated to preserving duck biodiversity. The most well-known and easily recognizable duck in the world is the mallard, *Anas platyrhynchos*. If we are in such a hotspot, why are mallards the most abundant duck present in the Mill Stream? We see the occasional goose or merganser, but why don't they stay? This study aims to answer why mallards dominate the stream and why we

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tend not to see other species, while analyzing, comparing, and contrasting sightings at numerous Valley refuges and parks.

Perle-Jones, Gene *Chemistry*

Ocean Acidification

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Polanco, Mayely *Chemistry*

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Quevedo-Ramos, Grasiela *Biology*

The Silent Killer: Mosquitoes

Although they are only a couple of inches in length, mosquitoes are one of the biggest threats to the human race. They have the capability in wiping out populations, considering they bring with them many old and new diseases. As the average temperatures are increasing worldwide, so are the survival rates of mosquitoes. Because they thrive in warmer temperatures, the purpose of this study will be to capture and analyze their development during the spring and into the summer. In addition to looking at what type of mosquito they are, looking at what stage in life they are living in.

Ries, Savannah *Chemistry*

The Chemistry of Heavy Metal Poisoning and its Relevance Today

Heavy metals can be essential to the human body, but can also cause life-threatening health conditions. Some metals, like zinc, are essential to the body, but dangerous if consumed in large quantities. However, other metals, like lead, are dangerous regardless of quantity. Created inside of supernovas, heavy metals are present in Earth's crust and are extracted by humans for use in construction, energy, and agriculture. The heavy metals are absorbed into our environment through contaminated food, water, and surroundings due to human activity. In order to protect ourselves from heavy metals, it is important to know their dangers and uses.

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Rowell, Korie *Environmental Science*

Decoding the Ditch: Determining the Current and Historical Conditions of Salem's North Millrace

Constructed in 1882, the North Millrace ran through Division and Front Street to provide power to the nearby mills until it was deemed a public hazard and shut down in 1924. In 2017, an unfilled portion of the North Millrace was rediscovered underneath the railroads, renewing city interest in the old race. To firmly place the North Millrace back into Salem history, this study conducted historical research and ground penetrating radar surveys to determine the current condition of the Millrace as well as the natural, social, and economic impacts the Millrace had on the communities it once ran through.

Russell, Parker *Biology*

Cataloging Past and Present Mammals of the Willamette Valle

Human settlement and development of the west, as well as increasing disruption of habitats from climate change, drive the need to have comprehensive records of what organisms live in an area to aid conservation efforts. The purpose of this study is to catalog the change in mammal biodiversity in the Willamette Valley. By examining archival records in combination with listings from the Oregon Department of Fish and Wildlife, this study will strive to estimate the arrival, departure, and potential extinction of past and present mammals in the Willamette Valley.

Sato, Jalvin *Biology*

Repurposing Waste as Bird Feed, Less Waste, Happier Birds

This is a preliminary proposal for an ecological conservation project on campus to collect unused animal fats and repurpose them to create suet cakes as bird feed. Established bird feeders on campus will be regularly refilled with suet cakes for the birds to enjoy. This will help reduce our food waste as well as save money on purchasing bird feed. The community of birds on campus will also benefit from the high energy suet being provided. This project will help contribute to Willamette's sustainability practices.

Schneider, Josh *Chemistry*

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Sims, Shari *Chemistry*

Art Restoration: Preserving Stories of the Past

Art restoration enables humanity to experience the past through the lenses of a variety of artists. This practice maintains the intentions that the artist had in designing their work, by keeping the art as close to its original form as possible. This project presents information regarding the partnership that the arts and the sciences partake in when art restoration is

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used. The scientific aspects involve the compounds in the paints that artists use, the substances that damage the art, and the compounds used in art restoration techniques. It also mentions scientific theory involving nanoscience, lasers, and solvents.

Smith, McKenna *Biology*

Medicinal Plants of the Willamette University Campus

Willamette University is known for its beautiful campus with a unique collection of plants and trees. The Martha Springer Botanical Garden in particular is notable for its biodiversity. Many of these plants, both native and non-native, have been used for thousands of years by indigenous peoples as treatments for numerous medical ailments. With the progression of modern medicine, much of this traditional ecological knowledge of medicinal plants is lost. This project aims to catalog at least 30 plants on campus that have medicinal properties, with a special focus on indigenous history.

Snizik, Noah *Biology*

Run of the Mill! / Milling Around

Urban waterways, like Willamette's Mill Race, are subject to a regular amount of debris flow. This debris flow not only includes organic material, but anthropogenic litter and trash as well. A primary focus of the project would be to collect trash from the Mill Race. The data collected would include how much trash was collected (weight), what types of trash were collected (glass, plastic, etc.) and the conditions of the Mill Race at the time of collection. This data would then be used to help better understand urban water system debris flow as well as human impact on ecological systems.

St.Julien, Piper *Chemistry*

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Stacy, Alex *Biology*

Bryophyte diversity in a changing climate

Bryophytes (mosses and liverworts) are important parts of a healthy PNW environment. They provide many benefits such as maintaining soil moisture, providing habitat, and recycling nutrients. Bryophytes are known to be sensitive to air pollutants because they get their nutrients and water from the atmosphere. Important effects of climate change include air pollution and decreased rainfall in the PNW, as they will have negative impacts on bryophytes. It is vital to assess the state of their diversity in the Willamette Valley currently, as well as in the past. I am initiating a survey the different species of bryophytes on Willamette's main campus, Zena Forest, and Bush Pasture Park and compare this data to past collections.

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Tatiana, Assefa *Biology*

Analyzing How Invasive Aquatic Species Has Changed the Willamette Valley

Non-native species do not necessarily disrupt the natural ecosystem into which it has been placed. However, some non-native species are invasive; meaning that they cause or are likely to cause economic and environmental harm, or harm to human health. Invasive species displace native species which disrupts and negatively impacts the natural ecology.

Weinstock, Indy *Chemistry*

The History of Lead (Pb)

In its many forms, lead has had a wide variety of uses and functions for humanity over the past two thousand years. It has found a place in manufacturing plastics, in paint, glazes, cosmetics, toys, and even plumbing systems. Some practices have fallen to disuse due to the toxicity of lead or a more effective option, as with lead-containing cosmetics and art supplies, but others such as the use of lead compounds in the manufacture of plastics and in piping and water systems are still used. Our examination of the many historical uses of this element can explain phenomena and inform on the progression of new inventions, technology, and scientific discovery.

Welch, John Paul

Statistical mediators of the association between mindfulness and sexual experiences in men with impaired sexual function

Recent theoretical reviews suggest potential mediators that may explain the beneficial effects of mindfulness on symptoms of Sexual Dysfunction, including reduced avoidance of sex, reduced distraction during sex, and/or reduced activation of negative sexual schemas. We attempted a statistical test of these factors as mediators of the association between trait mindfulness and sexual outcomes (sexual function, sexual satisfaction, and sexual distress). Sexual avoidance statistically mediated the link between mindfulness and sexual satisfaction, both distraction and activation of negative schemas statistically mediated the link between mindfulness and premature ejaculation. All three factors statistically mediated the link between mindfulness and distress.

Williams, Rachelle *Biology*

Certifying Willamette Campus as a Wildlife Habitat

Urbanization fosters a complex relationship with biodiversity, one that is not always consistent or easy to define. Cities disrupt natural ecosystems while creating distinct microhabitats, often fostering high biodiversity but also introducing invasive species. Considering the accelerating rate of urbanization, it is increasingly important to assess and promote sustainable habitats within cities. College campuses in particular often incorporate green spaces and may serve as critical habitats to wildlife. Additionally, they foster academic spheres and often reconnect people with nature. Willamette University alone has 81 known animal species within its sixty one acre campus. This study works to improve the WU campus to meet various habitat certificate criteria in order to promote conservation and biodiversity within urban environments.

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Wong, Kelsey *Chemistry*

Copper Culture

Copper has numerous useful properties and applications that has made it one of the most commonly used metals currently and historically. Some of these notable characteristics include high tensile strength, corrosion resistance, conductivity, and antimicrobial effects. This project explains why copper exhibits such properties from a chemical aspect and how it is beneficial to society. We will investigate alloys, orbitals, redox reactions, and electron configuration, with further biological considerations of transmembrane potential and oxidative damage. Due to its innumerable and diverse applications, copper boasts a rich history and is still deeply integrated in our society today.