100th ANNUAL MEETING PROGRAM with ABSTRACTS

Southern Oregon University
18 - 22 June 2018

Think Globally, Organize Regionally, Act Locally
100th Annual Meeting Program at a Glance
Tuesday, 18 June

4:00 p.m. – 6:00 p.m. Registration Center Open
Schneider Museum of Art, SOU Campus

4:00 p.m. – 6:00 p.m. Opening Reception
Schneider Museum of Art, SOU Campus

6:00 p.m. Public Plenary Talk:

“Undamming the Klamath River – The path to Restoration”
Meese Auditorium SOU campus

Wednesday, 19 June

7:00 a.m. – 4:00 p.m. Registration Center Open
Science Building, SOU campus

8:00 a.m. Presidential Breakfast
SOU Music Hall

8:30 a.m. Meeting Opening and Day’s Announcements
SOU Music Hall

8:45 a.m. Plenary Speaker
Dr. Phillip Mote,
Dean of Graduate Studies, Oregon State University
“Coping with Climate Hazards in the 21st Century”
SOU Music Hall

9:30 a.m. – 4:00 p.m. Symposia, Workshops, Town Hall Meetings
All in the Science Building on the SOU Campus

9:30 a.m. – 4:00 p.m. Symposium: Influencing Local and Regional Public Policy on Climate Change
Room 161

9:30 a.m. – 5:00 p.m. Symposium: The History and Philosophy of Science
Room 233

9:30 a.m. – 4:00 p.m. Symposium: Boise Extravaganza in Set Theory (BEST)
Room 173

9:30 p.m. – 3:30 p.m. Contributed Oral Presentations:
Earth Sciences Section
Room 210

9:45 a.m. – noon Symposium: Opportunities and Challenges for Large Data Sets and their Analysis in Contemporary and Future Science
Room 162

9:30 a.m. – noon Symposium: Active Learning in the Sciences: What really works and how to implement it.
Room 375

9:30 a.m. – 12:30 p.m. Symposium: Advances in Corrosion and Surface Modification
Room 236

9:30 a.m. – noon Symposium: Puttin’ the Public to Work – Community Science around the world!
Room 207

9:30 a.m. – noon Symposium: Interventions in Aging
Room 122

1:30 p.m. – 4:00 p.m. Symposium: How Core Equipment Facilities are Changing the Nature of Scientific Investigations in Universities
Room 110

1:30 p.m. – 4:00 p.m. Symposium: Transforming agriculture in the Rogue Valley: Moving from Mono-culture to “Agra-diversity”
Room 108

1:30 p.m. – 4:00 p.m. Symposium: Engaging the Public in Science: Where Are They and How Do We Get There
Room 236

1:30 p.m. – 4:00 p.m. Symposium: Artists and Scientists Respond to Climate Change with Science-Themed Works in Art, Literature, and the Humanities
Room 207

1:30 p.m. – 2:10 p.m. Contributed Oral Presentations: Evolution, Organismal Biology, and Biodiversity Section
Room 123

1:30 p.m. – 3:45 p.m. Contributed Oral Presentations: General and Interdisciplinary Section
Room 373

2:10 p.m. – 3:50 p.m. Contributed Oral Presentations Ecology, Environmental Sciences, and Sustainability Section
Room 123

1:30 p.m. – 1:50 p.m. Contributed Oral Presentations: Psychology Section
Room 218

1:50 p.m. – 2:10 p.m. Contributed Oral Presentations: Social, Economic and Political Sciences Section (including Health Services)
Room 218

3:50 p.m. – 4:10 p.m. Contributed Oral Presentations Mathematics Section
Room 123

2:00 p.m. – 4:00 p.m. Town Hall Meeting: Advancing STEM: Increasing Diversity in Academia and Industry
Room 122

2:00 p.m. – 4:00 p.m. Town Hall Meeting: What can Scientific Societies do for you?
Room 162

2:00 p.m. – 4:00 p.m. Workshop: Learn Calculus in 90 minutes with 3D prints
Room 220

4:00 p.m. – 6:00 pm Contributed Poster Session
CVA Galleries Schneider Museum of Art

6:00 p.m. Presidential Address: Meese Auditorium
Crystal Goldman
“Open Libraries, Open Science”

Thursday, 20 June

7:00 – whenever. Science Pub Crawl
Downtown Ashland Square

7:30 a.m. – 4:00 p.m. Registration Center Open
Science Building, SOU campus

8:00 a.m. Coffee
Science Building SOU

8:30 a.m. Meeting Opening and Day’s Announcements
SOU Music Hall

8:45 a.m. Plenary Speaker
Dr. Brian Smith
Inaugural Trustee Professor and Associate Dean of the Graduate College, Arizona State University
“The Honey Bee as a Model for Reverse Engineering a Brain”
SOU Music Hall
9:30 a.m. – 4:00 p.m. Symposia, Workshops, Town Hall Meetings
All in the Science Building on the SOU Campus

9:30 a.m. – 4:00 p.m. Symposium: Boise Extravaganza in Set Theory (BEST)
Room 173

9:30 a.m. – 4:00 p.m. Symposium: Pollinators, Buzzways, Private Gardens and Creative Education: An Activated Grassroots Effort to Save Pollinators in the Rogue Valley Through Political Advocacy and Touching Hearts.
Room 108

9:30 a.m. – 3:00 p.m. Symposium: Environmental and agricultural measuring and monitoring in the Rogue Valley
Room 122

9:30 a.m. – noon Symposium: The Future of Precision Medicine
Room 161

9:30 a.m. – noon Symposium: Seeing with New Eyes: The Role of New Scientific Techniques and Perspective in Revolutionizing the Search for the First Americans
Room 207

9:30 a.m. – noon Symposium: Strategies for Active Learning in Undergraduate Education
Room 373

9:30 a.m. – 10:50 p.m. Contributed Oral Presentations: Agriculture, Food, and Renewable Resources Section
Room 220

9:30 a.m. – noon Contributed Oral Presentations: Cell and Molecular Biology Section
Room 233

9:30 a.m. – 10:30 a.m. Contributed Oral Presentations: Pharmaceutical Sciences Section
Room 218

9:30 a.m. – 11:15 a.m. Contributed Oral Presentations: Materials Science Section
Room 236

10:00 a.m. – 11:30 p.m. Town Hall Meeting: Character, Illusion, Lighting, Sound and Madness as Viewed by the Oregon Shakespeare Festival
Room 162

10:30 a.m. – 10:50 p.m. Contributed Oral Presentations: Chemistry and Biochemistry Section
Room 220

10:30 a.m. – 10:50 a.m. Contributed Oral Presentations: Science and the Arts and Humanities Section
Room 218

10:50 a.m. – 11:30 a.m. Contributed Oral Presentations: Engineering, Technology and Applied Sciences Section
Room 218

11:30 a.m. – 12:10 p.m. Contributed Oral Presentations: Physics Section
Room 218

1:30 a.m. – 4:00 p.m. Town Hall Meeting: Different Styles, Different Insights, Different Science: Using Maker Tech to Teach STEM
Room 162

1:30 p.m. – 4:00 p.m. Town Hall Meeting: Citizen Science, Climate Change and Fire in Western North America.
Room 122

4:00 p.m. – 6:00 p.m. Town Hall Meeting: A Glimpse into the Possible Climate Future of Oregon Wineries
Room 207

7:00 – 9:20 Annual Banquet
Science Works Hands on Science Museum
Friday, 21 June

7:30 a.m. – noon Registration Center Open
Science Building, SOU campus

8:00 a.m. Coffee
Science Building SOU

8:30 a.m. Meeting Opening and Day’s Announcements
Room 151 Science Building

9:00 a.m. – 11:30 Symposium: The Social, Economic and Political Impacts of Climate Change
Room 108

9:00 a.m. – 11:30 Symposium: FIRES!!
Room 161

9:00 a.m. – 11:30 Symposium: The Opioid Epidemic: Up close and Personal
Room 162

9:00 a.m. – 11:30 Symposium: West Coast Fairs: China and Chinese American Participation, Indigenous Americans at the Fair, and United States Attitudes and Immigration Policies.”.
Room 233

9:00 a.m. – 11:30 Symposium: Reduce, Reuse, recycle: SUSTAIN!!!’
Room 236

11:45 – 12:15 Pacific Division Closing Review and Celebration
Room 151
Meeting Agenda

100th meeting of the Pacific Division of the American Association for the Advancement of Science

Southern Oregon University
Ashland Oregon
June 18-22

Tuesday June 18th

8:30 a.m. Radio Interview, Jefferson Public Radio

9:30 a.m. Closed workshop AAAS National Meeting on Influencing Climate Policy

11:00 a.m. Executive committee Pacific Division lunch (Science Works)
12:00 p.m. Farmers market
1:00 – 3:00 p.m. meeting of executive committee (Science Works)

3:00 p.m. registration opens at Schneider Museum of Art

4:00 – 6:00 p.m. Opening Reception Schneider Museum of Art

“Inspired by Art” exhibit opening
Schneider Museum of Art

“STEAMy Relationships
CVA Gallery

6:00 p.m. opening plenary talk, Meese Auditorium

Frankie Myers, Vice Chairman, Yurok Tribe
Dave Meurer, Community Liaison, Klamath River Renewal Corporation
Dr. Mark Bransom, CEO Klamath River Renewal Corporation

“Undamming the Klamath River – the Path to Restoration”

The Klamath River Renewal Corporation (KRRC) is a private, independent nonprofit 501(c)(3) organization tasked with implementing the largest dam removal and river restoration effort ever performed in the United States – and possibly the world. KRRC is part of a cooperative effort to re-establish the natural vitality of the Klamath River so that it can support all communities in the basin. This presentation is broken into two parts: the What and the How.

Part one – the How – will summarize how decades of often bitter conflict over water allocation, ecosystem health, tribal trust issues, lawsuits, and several other complex matters turned into discussion, compromise, and political action leading to an historic and carefully balanced pact known as the Klamath Hydroelectric Settlement Agreement (KHSA). The session will outline how the States of California and Oregon, local governments, Tribal nations, dam owner PacifiCorp, irrigators, and several conservation and fishing groups, appointed KRRC to take ownership of the Lower Klamath Hydroelectric Project and oversee removal of four hydroelectric dams on the river. Part two – the What -- provides an overview of the dam removal program, the current status of the project, obstacles remaining, sources of the $450 million funding pool, how river restoration will be accomplished, and the desired/expected outcome for endangered fish, native peoples, river communities, and the regional economy.

In the summary, the audience will be given a few “take away” tips on how to navigate the political arena, employ activism, build consensus and pursue what can appear to be impossible objectives.
Wednesday, 19th June 2019

7:30 a.m. – 4:30 pm  registration SOU Science Building

8:00 a.m.  SOU President’s Breakfast Reception SOU Music Hall

8:30 a.m.  Meeting opening and the day’s announcements

8:45 a.m.  Plenary speaker:

Dr. Phillip Mote, Dean of the Graduate School, Oregon State University

“Coping with Climate Hazards in the 21st Century”

Humans are fundamentally and dramatically altering the composition of the atmosphere, leading directly to changes in the planet’s energy budget. In the western US, manifestations of these changes are becoming obvious: heat waves, floods, droughts, fires, coastal change, and other hazards. Formal attribution studies have demonstrated the role of human interference in the climate system on these hazards. Despite growing evidence that these hazards will become more frequent and/or intense, few proactive “adaptation” actions have been taken. Institutional barriers are only part of the reason for inaction on climate adaptation. Minimizing future climate disruption will require both reducing emissions of heat-trapping gases, and taking vigorous action to reduce exposure to these hazards.

I.  All Day Wednesday Symposia

(SOU Science Building)

Symposium: Influencing Local and Regional Public Policy on Climate Change
Room 161
Wednesday
9:30 a.m. – 4:00 p.m.

The overwhelming consensus in the scientific community is that climate change is not only happening, but it is already here. While more global questions about how to address the factors contributing to climate change are important, many believe that the cutting edge of both climate research and climate policy has to do with understanding, adjusting to, and even mitigating the regional and local effects of climate change by affecting public policy.

The presenters in this symposium are all involved directly in the process of influencing public policy with respect to climate change. Each will describe their current efforts as well as ‘lessons learned’ in the process and current challenges and opportunities. They will also address their efforts to engage the larger community in this effort.

Symposium organizer: Dan Barry, Director of Local and State Advocacy, AAAS; dbarry@aaas.org

9:00  Welcome to the symposium.

9:45  Engaging the membership of AAAS as effective advocates for the inclusion of scientific evidence in public policy decisions at state and local levels in the United States. DAN BARRY, Director of Local and State Advocacy, AAAS.

This presentation will describe a major new initiative by the AAAS national office to develop and amplify opportunities for scientists to participate in public discussion and decision-making in their communities about local responses to climate change impacts. Recognizing that those impacts differ by region across the country, this project is based on the premise that there is a growing national need for stronger and diverse voices for science at all levels of decision-making while at the same time many scientists have deep connections in their communities. This program is designed to help them become more successful advocates on public issues.
10:15  Effective Legislation as a Collective Effort, Dr. ALAN JOURNET, Co-Facilitator, Southern Oregon Climate Action Now (SOCAN).

Since Oregon’s purely voluntary greenhouse gas emissions program established in 2007 has proven ineffective, a coalition of concerned Oregonians has been working with equally concerned legislators to develop an effective program to place Oregon on a reasonable emissions reduction trajectory. As the urgency has grown, the required trajectory to achieve meaningful reductions has steepened, and recognition of the need for broad community buy-in has become more obvious, the coalition has broadened to include labor and social justice representatives. Since 2014 a series of bills has failed to reach the floor of either chamber. The latest effort is HB2020 working its way through the legislature currently. This results from ongoing discussions and efforts to develop a program that promises greenhouse gas emissions reduction that are meaningful. The bill also promises investments that will address the concerns of dislocated workers and the years of environmental injustice experienced by communities most impacted by climate change and potentially impacted by the transition to a clean energy economy. This presentation will explore the growing awareness in the Oregon environmental community of the need for engaging a broad coalition of Oregonians in developing the bill and the parallel between that and my somewhat belated growing awareness of such a need. I will also outline some of the wrinkles along the road.

10:45  The European lessons from the JRC PESETA projects on climate impacts and adaptation, Dr. JUAN-CARLOS CISCAR, Joint Research Center for the European Commission.

The JRC PESETA series of studies on the impacts of climate change in Europe have assessed for over a decade the possible consequences of climate change in a broad set of sectors or impact areas, ranging from agriculture to heat-related mortality. The PESETA studies rely on a wide range of scientific disciplines. The studies main output has mainly consisted of technical reports and summary for policymakers notes, in addition to a non-technical description of the project main elements and results in the project web page (https://ec.europa.eu/jrc/en/peseta-iii).

The PESETA projects main purpose has been to support pan-European policymakers, mainly the European Commission directorates working on climate-related issues, such as DG Climate Action, which actually coordinates the EU adaptation policy. This presentation will summarise the JRC PESETA experience in supporting the policy process and the related main lessons. Possible plans for improving the connection to local and regional policymakers will be also discussed, in the context of the current JRC PESETA IV project. The perspective of regional governments and cities seems of major importance, with potential value added leveraging on this kind of multi-disciplinary, multi-sector project, but adds considerable challengers in terms of data resolution and analytical tools.

11:15  The making of history in Southern Oregon: Protecting seeds and the future of local agriculture in the Rogue Valley, CHRIS HARDY, Rogue Valley Farmer

Chris will share his experience working on his family’s diversified midwest farm, later traveling to farm communities as far away as Nepal. He will recount the history of two counties in the Rogue Valley to ban GE/GMO crops when it was apparent they were likely contaminating local seed crops. It was clear to him that this would ultimately ruin the markets and future of family farmers in the valley, which grew into a movement across the state. Both ballot initiatives in two counties of the Rogue Valley were overwhelmingly supported by voters in 2014, banning the cultivation of GE crops and seeds. Much of the awareness to this issue has been put forward into creating positive change as related to minimizing exposure to pesticides and holding the makers of GE crops accountable for their irresponsible technology when they trespass onto a farm or enter into a farmer’s seed crops. As global awareness grows around the importance of returning local seed diversity to the food system, Oregon’s only GE-free seed zone will grow as an important resource to protecting the future of heirloom and traditional seeds.

12:00 – 1:30 LUNCH

1:30  Not New York City? Influencing climate change resilience policies in smaller communities and at the national level, TONYA GRAHAM, Executive Director, GEOS Institute, Ashland Oregon.

Most Americans live in communities with fewer than 250,000 people, yet many climate resilience efforts focus only on the major metropolitan areas, such as Chicago, New York, and Los Angeles. At the same time, most of America’s climate denial lives in these same areas and that denial is what is blocking national policy efforts to address climate change and meet our international commitments. Small communities across the nation face both the impacts of the climate change crisis as well as technical and financial capacity constraints that often leave them without the resources to hire consultants or the staff capacity to lead essential planning and implementation processes. This situation is often compounded by the level of polarization that has happened around the issue of climate change. Without that ability to assess vulnerabilities and develop scientifically sound resilience solutions, it is very difficult for local leaders to move the policy needle at the local level. In this session, participants will learn about the challenges experienced by local leaders in small cities and towns and the connection between those challenges and the difficulty we experience when trying to move national policy. They will also be introduced to an innovative new program, Climate Ready Communities, designed to overcome the financial and technical barriers that often prevent smaller communities from putting in place policies necessary to build climate resilience at the local level. This program strives to put actionable, credible science in the hands of local leaders to help them create the policies and programs necessary at the local level to address climate change impacts and spur policy action at a national level.
We live in deeply polarized times, and bipartisanship seems like a distant memory of a bygone era. Are bipartisan solutions still possible? Former congressional staff member Dave Meurer describes two significant cases where he “watched peace break out, and watched it get translated into public policy.” In both cases, the key was having formerly polarized local groups come together to fashion a solution that came from the bottom up, and then enlisting the aid of senior elected officials. The first example is the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG). After years of bitter disputes, lawsuits, demonstrations and activism over federal forest policy, former adversaries decided to try something new: cooperation. Representatives of the environmental community, commercial logging interests and local government developed a Community Stability Proposal that recommended a suite of forest restoration treatments to be implemented across 1.53 million acres of land within the national forests: to improve local economic stability of the local communities, reduce the size and severity of wildfires, protect the California spotted owl population, and improve the condition of water resources. Republican Congressman Wally Herger and Democratic Senator Dianne Feinstein shepherded the bill into law and it passed 429-1 in the House, and unanimously in the Senate. The second example is the pending removal of all four dams on the Klamath River. After years of bitter disputes, lawsuits, demonstrations and activism over federal water policy, former adversaries decided to try something new: cooperation. Environmentalists, tribes, farmers, fishermen, local government, and a broad set of stakeholders crafted two measures. One failed, but one continues. This effort began under the Bush Administration, continued under the Obama Administration, and continues under the Trump Administration. But it started with former adversaries working together, and bringing public officials along.

The construct of the investor-owned, electric utility monopoly was established over 100 years ago. And this model has met its goals - safe, reliable and affordable electric energy for pretty much everyone. However, with the need to address climate change, economic disparity and grid resilience this approach may have outgrown its usefulness. The Investor Owned Utility (IOU) model necessarily places the interest of shareholders above those of the communities they purport to serve. And the one-size-fits-all Public Utility Commission (PUC) structure places process and uniformity above innovation and transformation. Combined, these two dynamics stifle the evolution in the grid that will be needed – and that technology is making possible. But is there another way? A form of public power, Community Choice Aggregation expands the IOU-PUC construct shifting an amount of decision and economic power from IOUs and the PUC to communities, creating local control, lower energy bills and rapid deployment of clean energy. We will discuss how this model differs from other consumer- and investor-owned utility models – and how this model is remaking the electric grid.

Does legislation make a difference? We don’t know if we don’t try. Nationally, the Grange Movement, founded in the 19th Century, has tended to focus on agriculture, food, and animal husbandry. But since its inception, the Grange has been a place for lively, open-hearted discussion of many issues relating to sustainability and regenerative economies, from contour plowing to soil conservation and today’s debates about genetically-modified and genetically-engineered crops. In this interactive session, Paul Sheldon will present three examples of recent resolutions passed by the Ashland’s local Bellview Grange Legislative Resolution Process, Does Legislation Help? Paul Sheldon, M.A., Author and Private Development Consultant.

Today’s talk will explore the history and current status of Ashland’s Climate and Energy Action Plan, associated ordinances, plan content, Ashland’s Greenhouse Gas Inventory. The Ashland Greenhouse Gas Inventory was prepared in advance of the approval of the Climate and Energy Action Plan by the “Good Company” in 2016. The inventory covers a 5-year period between 2011 and 2015. Ashland’s Climate and Energy Action Plan was approved unanimously by City Council in early 2017. The plan is the culmination of 18 months of work from the Mayor appointed Climate and Energy Action Plan (CEAP) ad-hoc committee, City staff and the project consultant team. The plan contains a strategy for reaching defined goals and targets to reduce carbon emissions and plan and adapt the community for anticipated local climate changes. Further, the plan is organized into six core focus areas, each with their own set of identified actions to meet the goals and targets set in the plan. The Ashland Climate Recovery Ordinance spells out need for the City to actively encourage community entities and individuals to achieve the Community Climate Recovery Goals, for City to achieve the climate recovery goals for City.
Operations, and the need for Plan updates to ensure that we meet our GHG reduction targets, how we measure, account, and report the achievement of these targets. We will also explore the roles of the City Council, City Staff, the Conservation and Climate Outreach and Climate Policy Action Commissions, citizens, NGOs, grassroots organizations, businesses, our hospital, schools, and SOU, and talk about the critical need for all of these entities to work closely together to achieve our targets spelled out in the plan.

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**Symposium: The History and Philosophy of Science**

Room 233  
Wednesday  
9:30 a.m. – 5:00 p.m.

To more fully understand science, we must know something about its history, its central concepts, and its methods – the domain of the history and philosophy of science. This session will examine topics in the biological sciences, the medical sciences, and more, from historical and philosophical perspectives, in order to enrich our understanding of these areas as well as serve as a springboard for broader contextual knowledge about science. We seek to promote dialogue among scientists, philosophers, and historians to work toward an interdisciplinary understanding of these sciences and science more generally. Topics include: The history of scientific and medical advancements and contemporary implications: Aldo Leopold’s ecological thinking; Medical imaging and uncertainty; Notions of biodiversity; and Ecology and ecological functioning.

Symposium organizers: **Dr. Roberta L. Milstein**, Department of Philosophy, University of California - Davis: rlmilstein@ucdavis.edu and **Dr. Sarah Roe**, Philosophy Department, Southern Connecticut State University: roes1@southernct.edu

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**Morning Session**

*The History and Philosophy of Science*  
9:30 a.m. – 12:30 p.m.

Ecology, applications, and lessons from the history of medicine and medical imaging

Session chair: Marco Nathan

**8:20**  
*Introductory Comments:* Dr. Marco Nathan

**8:30**  
**Where in the World is Aldo Leopold?: An Examination of “The Land Ethic” in Relation to the Animal Liberationists and the Environmentalists of the Late 20th Century,** **DENISE REGINA PERCEQUILLO HOSSOM** (University of California Davis, 1 Shields Avenue Davis, CA 95616; drhossom@ucdavis.edu). (STUDENT PRESENTER)

Mark Sagoff’s “Animal Liberation and Environmental Ethics: Bad Marriage, Quick Divorce” (1984), provides a crucial historical framing of two discourses in environmental ethics; Animal Liberation (see Singer 1974; Regan 1983) and Environmentalism. The question I raise as a matter of History and Philosophy of Biology (HPB), is whether Sagoff’s representation of the ‘environmentalist’ group accurately characterizes the figures he claims to be a part of this ‘faction’. I argue that Sagoff’s representation of Aldo Leopold, an early 20th century American forester and conservationist, misinterprets Leopold’s “The Land Ethic” (1949), and consequentially, his place as an ‘environmentalist’ in the great divide depicted between these two discourses.

I argue two main points; 1) Leopold conformed neither to a holist nor individualist framework alone (Millstein 2015; 2017), and 2) that unlike the “environmentalists”, Leopold placed little to no difference in ethical concern on whether an animal was classified as wild or domestic (Leopold 1944; 1949). Finally, as a matter of historical import, Leopold was not an environmental ethicist, but a scientist – in many ways a proto-ecologist. When we move towards an ecological interpretation of Leopold’s view, we shift from a “Land Ethic” understood as canonical to environmental ethics, back to broader research questions best suited to an HPB framework. One insight I hope to draw is that the HPB framework allows us to ask questions from a “Science and Values” perspective, reinstating Leopold’s primary position as a scientist, thus bettering our ability to evaluate the values he expressed in “The Land Ethic”.

**9:00**  
**Functions and Functioning in Aldo Leopold’s Land Ethic and in Ecology,** **ROBERTA L. MILLSTEIN** (Department of Philosophy, University of California, Davis, One Shields Avenue, Davis, CA, 95616; RLMillstein@UCDavis.edu).

I examine the use of the term function in ecologist Aldo Leopold’s land ethic, invoked in two ways: 1) the healthy functioning of the land community, which is dependent on 2) the maintenance of the characteristic functions of populations
that are parts of the land community. I argue that Leopold’s second use of function, similar to what Dussault and Bouchard (2015) call “functional types”, can be understood as referring to interactions between species that are the products of coevolution (such as parasite-host, predator-prey, etc.), and thus, in terms of the so-called “selected effect account” of function. I further argue that the performance of these functions under certain conditions maintain what Leopold took to be healthy functioning and persistence of a land community.

9:30  
**Remembering Abandoned Places: The Human-Landscape Relation**, **SARAH M. ROE**¹ and **ELYSE ZAVAR**²  
(¹Philosophy Department, Southern Connecticut State University, New Haven CT, roes1@southernct.edu; ²Department of Emergency Management and Disaster Science, University of North Texas, Denton, TX, elyse.zavar@unt.edu)

Following catastrophic events, some landscapes are left uninhabitable. In these extreme cases, the risk to future exposure is best mitigated through property acquisition and relocation, also known as buyouts. Buyouts can result from environmental disasters like severe floods or technological disasters such as the release of toxic chemicals. Whichever the cause, buyouts permanently remove people from hazardous landscapes. Following the relocation of people, the built environment is dismantled, leaving landscapes that range from ghost towns to open space. Yet for some of these disbanded communities, residents have found a way to maintain a connectedness to their former home and neighbors through commemoration.

By examining buyout sites generated by anthropogenic forces we seek to understand how community culture continues through commemoration despite the loss of physical location. We consider how sense of place and belonging is constructed through commemoration as well as whose narratives are included in these commemorations and comparatively, whose are excluded. This research focuses on the experiences of three communities awarded federal buyouts due to technological disasters: Picher, Oklahoma; Times Beach, Missouri; and Ponca City, Oklahoma. By utilizing land ethics and ecofeminism, we analyze how commemoration recreates community and a sense of belonging to a place that no longer exists physically on the landscape while considering the spatial politics that influence the commemorative narrative.

10:00  
**Wildfire in the West: A Philosophical Exploration**, **JAY ODENBAUGH** (Department of Philosophy, Lewis & Clark College, Portland, OR; jay@lclark.edu)

In California, fourteen of the twenty largest wildﬁres have occurred over the last fifteen years, which also are the fifteen warmest years in Western United States. Wildfires are burning more than twice the area than what occurred in the 1980s and 1990s. Approximately 40% of area burned is correlated with temperature changes alone. Thus, the American West is facing a perilous period of wildfires and even “mega-fires” when coupled with climate change.

Wildfires are only made worse by the twentieth century policy of fire suppression. After the “Big Burn”, foresters prevented 90 – 95% of fires from happening. However, this has radically changed the fire cycles we see in our forests. For example, a stand in the Pacific Northwest is no longer of mixed age, multiple species, and grow with little or no space between them. Given the amount of fuel, the contiguity and homogeneity of these forests, epic blazes will occur – it is only a matter of when and how many.

In this talk, I explore conceptual and ethical issues raised by wildfires. First, I outline the ethical issues raised by wildfires. For example, what means should we use to prevent megafires (i.e. controlled burns, selective thinning, controlling of housing developments) and whose interests count (e.g. human, non-human animals, species) in our decisions? Second, a “healthy” forest is a patchy forest, but patchy forests look very little like those celebrated by conservationists and environmentalists. How do we change the public’s image of what a Western forest is “supposed to” look like? Third, the prevention of megafires requires active and anticipatory management and challenge our notions of responsibility where almost all wildfires involve human activity. We must view our forests as socioecological systems for which we are partially responsible.

10:30  
**BREAK**

11:00  
**Uncertainty and Medical Imaging**, **MEGAN DELEHANTY** (Department of Philosophy, University of Calgary, Calgary, AB, Canada; mdelehan@ucalgary.ca).

Medical practitioners often tend to think of the data acquired via imaging modalities such as CT, PET, fMRI, and EEG as objective and reproducible. This is not to say that they are unaware of potential difficulties with acquiring, analyzing, and interpreting the data, but that the focus is on ruling out a small set of potential problems and proceeding as if there were not many more layers of uncertainty. In fact, of course, there are uncertainties all along the chain from questions about how to define or identify phenomena of interest (e.g. disease states), to the relationship between a phenomenon and the property or properties that are measured, to methods of data acquisition and analysis. In this paper, I will focus on the role that “gold standards” play in attempting to reduce or remove uncertainty.

11:30  
**The Anti-vaccine Movement**, **EDWARD J MOTICKA** (Emeritus Professor, AT Still University School of Osteopathic Medicine, Scottsdale, AZ; emoticka@cox.net).

Lady Mary Worley Montagu introduced smallpox variolation to Great Britain in 1717 while Sir Edward Jenner developed smallpox vaccination in 1798. Public resistance to vaccination emerged almost immediately. The Vaccination Act of 1853 mandated vaccination to prevent smallpox for all infants; failure to have their children vaccinated resulted in fines or imprisonment for parents. Public defiance of this law lead to riots in several English towns and the formation of the Anti-Vaccination League. Similar enforcement laws enacted in the mid-1800s in New England resulted in the formation of an Anti-
Vaccination Society of America. Initially opposition focused on infringement of personal liberty and choice. Subsequent arguments against vaccination included claims that vaccination: (1) causes other diseases; (2) enriches physicians and the pharmaceutical industry; (3) introduces poisons into the body; (4) is an abridgment of an individual’s autonomy; and (5) is a violation of the constitution. Finally some opponents felt that (6) natural infection provided better protection against future disease. Contemporary arguments mirror these claims and also include concerns about (7) antigenic overload and (8) suspected induction of autoimmune diseases.

Public health officials are concerned that an unimmunized population increases the risk of epidemics and the likelihood of a successful bioterrorist attack. Numerous scientific studies debunked the clinically relevant arguments against vaccination, while court decisions ruled against the legal arguments. Despite this, the public’s refusal to vaccinate remains and is increasing. One reason may be the easy dissemination of unfounded opinions and false narratives as facts on the internet by ‘experts’ including celebrities with no scientific background. Consequently, many states adopted policies allowing parents to opt-out of mandatory vaccination based on philosophical or personal belief; some states (i.e. California) recently reversed this policy following a measles outbreak in Disneyland. Approaches to overcoming opposition to vaccination include legislative elimination of personal/philosophical exemptions, restricting where unvaccinated individuals may patronize, and education. Since much of the population lacks first-hand knowledge of the pre-vaccine era and the morbidity and mortality associated with many vaccine preventable diseases, new approaches to assure compliance with vaccine requirements remain to be devised.

**Keywords:** vaccines, vaccine resistance, vaccination policies; infectious diseases

**12:00 Opening Pandora's Box at the Roof of the World: Migrating Wild Birds and Influenza, BARBARA C. CANAVAN**
(Independent Scholar; bcanavan@post.harvard.edu).

The history of influenza reveals an interconnected viral web among birds, swine, horses, and people. For much of human history, there was little understanding of the kinship between animal and human flu viruses. By the 1970s, evidence emerged that flu viruses in aquatic birds were the primordial source of all influenza viruses. By 1997, a major outbreak of bird flu in Hong Kong revealed that a bird virus could transmit directly to humans with deadly results. In 2005, researchers discovered that migrating aquatic birds could carry pathogenic flu avian viruses over long distances. Specifically, the unprecedented emergence of a flu virus among wild birds at Qinghai Lake on the Tibetan Plateau (known as the Roof of the World) was a key moment in the spread of a bird flu strain across three continents threatening the health of both poultry and humans. This paper examines the actors in the Qinghai case: the warming permafrost landscape of the plateau; a high-altitude railway that traverses the plateau into Tibet; a wild goose that migrates over the Himalayas; and an avian flu virus. The Qinghai events stimulated an interdisciplinary approach, accelerating the use of technological tools to track the avian virus along bird migration flyways. Exponential increases in bird flu outbreaks globally are not merely a matter of chance mutations in flu viruses but can emerge because of antecedent social and environmental factors. The Qinghai case can serve as a model for future investigations of the human-animal-environment interface in the twenty-first century.

**Afternoon Session**

*The History and Philosophy of Science*

1:50 p.m. – 5:00 p.m.

Scientific concepts, tools, and their applications

**Session chair:** Dr. Sarah M. Roe

**1:50 Introductory Comments, Dr. Sarah M. Roe**

**2:00 Biomarkers, MARCO J. NATHAN**
(Department of Philosophy, University of Denver, Denver, CO; marco.nathan@du.edu).

Biomarkers are among the most important conceptual tools in contemporary biological and biomedical science. Yet, their nature and structure have been neglected by philosophers and theoretically-minded practitioners. This essay begins by providing a general analysis of this prominent construct. What are biomarkers and what is their role in actual scientific research? The second part argues that biomarkers are hard to incorporate into extant causal–mechanistic approaches, currently dominating philosophy of science. This calls for revisions—or non-trivial expansions—of foundational notions, such as frameworks for modeling causation, prediction, and explanation.

**Keywords:** Biomarkers, biomedical science, causation, prediction, explanation

**2:30 Lessons from Embedding in Animal Behavior Science, TIERNAN ARMSTRONG-INGRAM**
(Philosophy Department, University of California, Davis, Davis, CA; tingram@ucdavis.edu).

Biology is filled with amazing diversity and complexity. Yet much philosophy of biology has focused narrowly on what is thought most ‘fundamental’ to life and the life sciences: genetics and evolution. Have philosophers of biology been
considering a caricature of the life sciences? Certainly not: No more than a geneticist considers a ‘caricature’ of life in their focused field of study. However, an adequate philosophy of biology cannot be just the philosophy of genetics and evolution. It is time to broaden our focus. One way to expand our field of view is to take a cue from the life sciences. Philosophy of biology can explore the diversity within its subject matter. Relatively recent enthusiasm for philosophy of ecology is a welcome addition, but there are still many fields of biology that are largely unexplored by philosophers. My view that it is time for philosophy of biology to diversify is informed by a year spent embedded among biologists in animal behavior sciences. This diverse collection of biological fields includes behavioral ecology, ethology, behavioral genomics, animal welfare, comparative cognition, animal communication, and more. Animal behavior sciences draw upon and inform anthropology, conservation, ecology, neurobiology, psychology, physiology, veterinary science, wildlife biology, and zoology. The theories, models, and practices within animal behavior sciences include categories, concepts, and methods largely unexplored by philosophers. The interconnections and reliance between these sciences suggests that considering a broader range of the life sciences may also shed light on our understanding of science more generally. The diversity within the animal behavior sciences is just one untapped resource to increase philosophical understanding of biology and its subject matter. I suspect that other overlooked fields will be equally fertile. It is time for philosophy of biology to grow.

Keywords: philosophy of biology, embedded philosophy, philosophy of scientific practice, animal behavior

3:00 Public Science Writing, Public Trust, and Communication Ethics, SARAH TINKER PERRAULT (University Writing Program, University of California Davis, Davis, CA; sperrault@ucdavis.edu).

Scientists are interested in public science communication, particularly in how public science communication can help develop stronger trust relationships between scientific communities and publics. At the same time, scholars in Science and Technology Studies are deeply concerned with the roles of scientific authority in democratic societies; with the ways technocracy can undermine civic discourse; and with how we can make good collective decisions in situations characterized by technical uncertainty, by heterogeneous value systems, or by both. This talk will explore both sets of interests in terms of communication ethics, using the rhetorical concept of ethos. Frequently translated as “authority,” ethos actually refers to trust that speakers can engender by signaling their alignment with a particular community’s norms, values, and interests. To explain how a writer can develop a trustworthy ethos in communicating with non-specialist audiences, the talk will have three parts. Part one will address common myths about publics’ understanding of and attitudes toward science, and will use current social science research to explain the contexts in which public science communication actually happens. Part two will describe three dimensions of public trust in science: scientific knowledge (including what is uncertain or unknown), integrity in scientific practice, and respect for non-specialist audiences. For each trust dimension, it will explain common mistakes people make in public science writing and describe how writers can avoid those mistakes. Examples will be drawn from both controversial and non-controversial topics. Part three will briefly introduce some ongoing research questions in rhetoric of science and how scholars in this area are working to further our knowledge about effective, ethical public science communication.

Keywords: rhetoric of science; public science writing; engaging publics in science; trust

3:30 Three Lives: Biological, Internal, and Rational, LUCAS J MIX (Department of Organismic and Evolutionary Biology, Harvard University, and Ronin Institute, Redmond, WA; lucasmix@gmail.com).

Psychological subjects do not map neatly onto physiological organisms. Many authors take for granted that consciousness, interiority, and reason arise as adaptive traits for particular organisms. Historical theories of vegetable, animal, and rational life heavily influence modern theories, both within and beyond science. Their nested relationship in Aristotelian and Thomistic thought led to a belief that one rises from within another. And yet, the opposition of mind and matter in the Enlightenment drove a wedge between physiology and psychology, preventing meaningful discussion of intermediaries. Recent research reveals incredible diversity in traits such as individuality, response to stimuli, and information processing. This allows a more sophisticated understanding of the relationship between subject and organism.

The distinction shapes research in astrobiology and computer science. In astrobiology, it affects theories about the origin, extent, and future of life and intelligence in the universe. The Drake Equation along with most discussions of the Fermi Paradox, the Great Filter, and the Anthropic principle treat intelligence as an irreversible adaptation arising within a particular species. In computer science, the distinction reveals ambiguities in what we seek from “artificial life,” “artificial consciousness,” and “artificial intelligence.” A clearer statement of life concepts (e.g., life, consciousness, and reason) reveals the extent of historical influences and the importance of reimagining the relationship between individuality in biology and psychology.

Keywords: life, consciousness, intelligence, astrobiology, artificial intelligence

4:00 Geometric Configuration in Design and in Nature: Is There a Connection? SUSAN G. STERRETT (Department of Philosophy, Wichita State University, Wichita, KS; susangsterrett@gmail.com).

Some geometrical configurations recur in nature in living biological (biotic) systems. This is neither new nor controversial. Some of the same geometrical configurations also arise in nonliving (abiotic) systems in nature. Strikingly, some of these same geometrical configurations also arise in the design of engineered artefacts even though they are not designed with an intention to mimic biology. The geometrical configuration in the artefact results from iterated improvements on the design to produce better and better performance (in a certain specified respect).

This empirical observation has given rise to interesting and valuable studies on the physics and mechanical principles involved in structural configuration in biology (e.g., K. Niklas; S. Vogel). The question of the existence of a common principle
that accounts for the same geometrical configurations arising not only in widely varying contexts in living organisms in nature (e.g., lungs of animals, vascular botanical structures) but also in naturally-occurring and dynamically developing structures (e.g., river basins, deltas, snowflakes), as well as highly engineered artefacts (e.g., transportation and distribution systems, counterflow heat exchangers) can likewise be raised, as evidenced most notably in works by A. Bejan and S. Lorente. A principle developed from thermodynamics, (here thermodynamics is understood broadly in a way that includes mechanics), has been proposed, called the Constructal Law.

I will briefly describe this proposed principle, the Constructal Law, and the associated "Constructal theory of generation of configuration in design and nature", and provide a critique of its philosophical significance and its status as a scientific principle.

4:30 Representing the Natural World: A Coordinated Process between Artistic Design and Science, HANNAH HOWLAND¹ and VADIM KEYSER² (¹Pyatok, Oakland, CA, hhowland@pyatok.com; ²Department of Philosophy, California State University, Fresno, Fresno, CA, vkeyser@csufresno.edu).

The focus of this paper is on the relation between scientific art/design and scientific theory and measurement. By proposing a feedback loop between art/design representations and scientific measurement and theory development, we explore the iterative, coordinated process of representing the natural world. Our focus is on three aspects of this process:

First, we explore the complicated issue of what it means to improve accuracy and precision in representing a natural system, artistically and scientifically. We pay particular attention to 'misrepresentation' of natural systems in both scientific drawings and scientific models.

Second, we explore 'evolving' representations of nature by discussing themes in scientific art and data gathering—such as reductionism vs. emergentism; and natural study vs. technological artifacts. Our discussion culminates in the analysis of process-oriented representations in ecology.

Third, in analyzing the iterative process, we address the distinction between the scientific artist/designer vs. the scientist. We argue that this distinction is inadequate, and we propose a continuity of roles between the scientific artist and the scientist. By exploring a case study of women in scientific art and science, we discuss the complex relations between creating artistic representations, scientific measurement and theory, and society. For example, we discuss Maria Sibylla Merian’s visual representations of the concept of “metamorphosis” in relation to scientific measurement and modeling.

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Symposium: Boise Extravaganza in Set Theory (BEST)
(two-day symposium)
Room 173
Wednesday and Thursday
9:30 a.m. – 4:00 p.m.

This symposium is a continuation of the well-known Boise Extravaganza in Set Theory (BEST) conference. BEST focuses on the mathematical discipline called Set Theory, and its applications in other disciplines in Mathematics. BEST has been a symposium of the AAAS Pacific Division since 2013; previously it was hosted at Boise State University in Boise, Idaho.

Symposium organizers: Liljana Babinkostova, (liljanababinkostova@boisestate.edu) John Clemens, Samuel Coskey (scoskey@boisestate.edu), and Marion Scheepers, Department of Mathematics, Boise State University, Boise, Idaho.

9:30 Ramsey Theoretic Methods in Dynamics of Topological Groups, DANA BARTOŠOVÁ (University of Florida, Gainesville, FL; dbartosova@ufl.edu).

In recent decades, certain combinatorial principles of Ramsey theoretic nature have turned out to be equivalent to dynamical properties of topological groups. We will recall both ends of this beautiful connection, discuss recent developments and open problems.

10:30 Combinatorics at the First Uncountable Cardinal under AD, WILLIAM CHAN* and STEPHEN JACKSON (University of North Texas, Denton, TX; William.Chan@unt.edu).

This talk will survey some recent results on combinatorics at the first uncountable cardinal under the axiom of determinacy. Continuity results on functions from the power set of the first uncountable cardinal into the set of countable ordinals will be discussed. The talk will mention some uniformization results concerning club subsets of the first uncountable cardinal. Result on definable cardinality and definable combinatorics of subsets of the power set of the first uncountable cardinal assuming AD will be shown as well.
11:00  Representation of Functions and Total Antisymmetric Relations in Monadic Third Order Logic, M. RANDALL HOLMES (Boise State University).

We analyze the representation of binary relations in general, and in particular of functions and of total antisymmetric relations, in monadic third order logic, that is, the simple typed theory of sets with three types. We show that there is no general representation of functions or of total antisymmetric relations in this theory. We present partial representations of functions and of total antisymmetric relations which work for large classes of these relations, and show that there is an adequate representation of cardinality in this theory (a result already shown in a somewhat different way by Henrard in unpublished work, but our approach differs from his in providing representations of bijections between sets in a stronger sense). The relation of our work to similar work by Henrard (to whom we are indebted) and Allen Hazen (who arrived at related results independently) is discussed. This work can be understood as part of a program of assessing the capabilities of (relatively) weak logical frameworks: our results are applicable for example, to the framework in David Lewis’s Parts of Classes.

11:30  Formally Verifying Peano Arithmetic, MORGAN SINCLAIRE* and RANDALL HOLMES (Boise State University, Boise, ID; morgansinclaire@boisestate.edu). (STUDENT PRESENTER)

Gentzen's consistency proof is a central result in proof theory that demonstrates the consistency of Peano arithmetic (PA) using a technique known as Cut-elimination. The proof can be carried out in the weaker finitist system of primitive recursive arithmetic (PRA), if one extends that system with the principle of transfinite induction over the ordinal ε₀. In our work, we have implemented a version of this proof as a computer program in the Coq theorem prover. Consequently, the proof has been computer verified, and many of the interesting constructions in the proof-such as Cantor normal form ordinals and infinitary proof trees-have been built as constructive, finitistic objects.

12:00 – 1:30  LUNCH

1:30  Borel Reducibility and Symmetric Models, ASSAF SHANI (University of California, Los Angeles, Los Angeles, CA; assafshani@ucla.edu). (STUDENT PRESENTATION)

We develop a correspondence between the study of Borel equivalence relations induced by closed subgroups of S∞, and the study of weak choice principles, and apply it to prove a conjecture of Hjorth-Kechris-Louveau (1998). For example, we show that the equivalence relation ≅ω₁⁺,₀ is strictly below ≅ω₁ in Borel reducibility. By results of Hjorth-Kechris-Louveau, ≅ω₁⁺,₀ corresponds to Σ₀ω₁ actions of S∞, e.g., abelian groups. For these proofs we analyze the models Mn, n < ω, developed by Monro (1973), and extend his construction past ω, through all countable ordinals. This answers a question of Karagila (2016).

2:30  Applications of the Gandy-Harrington Topology, SHAUN ALLISON (Carnegie Mellon University). (STUDENT PRESENTER)

We will define the Gandy-Harrington topology of an arbitrary (recursively presented) Polish space and isolate several important properties. Then we will give a recipe which can be used to prove dichotomy theorems concerning Borel orbit equivalence relations. We will briefly sketch a proof of the Harrington-Kechris-Louveau E₀ dichotomy in the special case of orbit equivalence relations, and explain how the proof can be modified to prove two other dichotomies due to Hjorth.

3:00 – 3:25  BREAK

3:30  Realizations of countable Borel equivalence relations, FORTE SHINKO and ALEXANDER KECHRIS (California Institute of Technology) (STUDENT PRESENTER)

By a classical result of Feldman and Moore, it is known that every countable Borel equivalence relation can be realized as the orbit equivalence relation of a continuous action of a countable group on a Polish space. However, if we impose further conditions, such as requiring the action to be minimal, then it is no longer clear if such a realization exists. We will detail the progress on characterizing when realizations exist under various conditions, including a complete description in the hyperfinite case. This is joint work with Alexander Kechris.
II. Wednesday Morning Symposia

(SOU Science Building)

Symposium: Opportunities and Challenges for Large Data Sets and their Analysis in Contemporary and Future Science
Room 162
Wednesday
9:45 a.m. – noon

Symposium organizer: Dr. Pierre Baldi, Distinguished Professor, School of Information and Computer Science, University of California - Irvine: pfbaldi@ics.uci.edu.

It is easy to argue that the growth of computational power combined with the ability to acquire and store massive amounts of data has turned all fields of science into a branch of data science. This symposium will explore the role of data and its analysis across a range of scientific and technology applications, while also considering current data related challenges and limitations in each. From analysis of complex biological systems, to the technical challenge presented by building truly autonomous vehicles, the symposium will consider commonalities and differences in the role of data and its analysis. The symposium will also consider likely future trends in data analysis, including machine learning and AI, being driven by these applications. Finally, we will consider how the human nervous system itself may manage its own big data challenges.

9:45 Introductory remarks, Dr. PIERRE BALDI, Chancellors Professor of Computer Science at University of California Irvine and the Director of the Institute for Genomics and Bioinformatics, and Dr. JAMES BOWER, Executive Director Pacific Division AAAS.

10:00 A Glance at Newfound Promises and Challenges Within Big Data -Omics Exploring Pancreatic Islets, ALEX M. MAWLA (Integrative & Genomics PhD Candidate, University of California, Davis) and MARK HUISING (Department of Neurobiology, University of California, Davis). (STUDENT PRESENTATION)

The advent of cheap, high-throughput next generation sequencing has granted the scientific community new promises to elucidate complex topics within biology, such as spatial and functional heterogeneity, regulatory networks, and cell fate plasticity and maintenance. However, such a wealth of big data -omics brings its own questions and challenges to the table. Islet gene expression has been widely studied to better understand the transcriptional features that define a healthy beta cell. Transcriptomes of FACS-purified alpha, beta, and delta cells using bulk RNA-sequencing have facilitated our understanding of the complex network of crosstalk between islet cells and its effects on beta cell function. However, these approaches were by design not intended to resolve heterogeneity between individual cells. Several recent studies have used a relatively newer approach within big data -omics, single cell RNA-sequencing (scRNA-Seq), to report considerable heterogeneity within mouse and human beta cells. We explore how this newfound ability to assess gene expression at single cell resolution has enhanced our understanding of beta cell heterogeneity, and how these data have been successfully used, or show promise, within the field to answer other questions, such as cell development and exploring rarer cell populations. We also illustrate the impact of the inevitable limitations of working at or below the limit of detection of gene expression at single cell resolution and their consequences for the quality of single islet cell transcriptome big data. Finally, we offer some guidance on when to opt for scRNA-Seq and when bulk sequencing approaches may be better suited and discuss the challenges of utilizing and integrated big data -omics within the field of biology.

10:30 Data Handling Challenges in the Cores World, ANDREW CHITTY (Director of University Shared Resources at Oregon Health and Science University (OHSU) and current President of The Association of Biomolecular Resource Facilities (ABRF).

Data handling in the cores world faces a number of challenges as such cores/shared resources attempt to keep up with the ever growing and evolving needs of the academic research community. NIH guidelines that regulate the way shared resources are funded make it difficult for cores in bioinformatics, biostatistics, and other data centered services to operate sustainably. Like most institutions, OHSU is attempting to navigate the waters of emerging data science needs on campus. Data generation cores do an excellent job of producing quality information, but downstream data handling poses significant challenges. While grant applicants are used to budgeting for and paying for data generation, they often overlook the amount of work associated with downstream activities. Frequently, they underestimate the need for specific and costly expertise associated with this step. Microsoft Excel may no longer meet the laboratories’ needs in this respect, and skilled specialists in these disciplines are in high demand. This presentation will explore some of OHSU’s early attempts to work with the data handling needs of the research enterprise from the perspective of its University Shared Resources Program. Delivering a core/shared resource model open to the OHSU research community is a work in process, and continues to be a challenge.
Artificial Intelligence in Medicine, Hype or Hope? Dr. PETER HALT, Department of Radiology, Y

Slick ads, aggressive marketing and massive amounts of funding for projects with AI in the name doesn’t make it real. For 20 years, we have heard promises and seen great examples of “AI” in patient management, order entry, lab analysis, and the making of medical diagnoses themselves, including diabetic retinopathy, breast CA, lung CA, ACL tears, multiple sclerosis and many more. Robotic surgery has been around is some form for decades. A google search of any disease and the words AI yields at least one interesting headline and an article in NY Times, Forbes, and/or countless medical journals and online articles. Search a little deeper and see the term used as a product description, a label to market a smart piece of software with a deep learning algorithm and the ability to solve a specific problem given a massive amount of data to process, just as it was programmed to do by an intelligent human. The speed and accuracy are faster than human, but there is no reasoning, intuition, or any other skill of association that even closely resembles human intelligence. Deep learning is a wonderful tool and the potential for adding to the physician tool belt is awe inspiring. It is neither artificial nor intelligent. The reality on the ground is a few years behind the hype. Most physicians use some form of “AI” technology. For many of our less tech savvy MDs , it’s another software package that adds to the complexity of their job but generally does the singular task it was designed for, after a large installation cost and expensive yearly contracts. Much of what we see currently is not widely available in smaller institutions, is cost prohibitive, or still vaporware. Even worse, it is not FDA approved and not paid for by Medicare. A hundred years from now, if we survive the Robopocalypse, deep learning will have progressed wildly in a linear or even logarithmic fashion, but not towards sentient holographic physicians. Systems will be integrated because countless IT teams wrote great code to allow software applications to talk to each other, regardless of vendor, and integrated diagnostic devices will seem intelligent because they can solve more complex tasks, with more data they collect themselves. And the marketing of AI will make a lot of tech billionaires, but it won’t make it real.

AI: Present and Future, Dr. PIERRE BALDI (Distinguished Professor of Computer Science at University of California Irvine and the Director of the Institute for Genomics and Bioinformatics).

Through some specific examples, we will first delineate the boundary between what AI can do today, and what it cannot do. We will then discuss how we got to this point and, more importantly, some of the future directions for building better AI systems.

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Symposium: Active Learning in the Sciences: What really works and how to implement it.
Room 375
Wednesday
9:30 a.m. – noon

This symposium explores different practices for actively engaging undergraduates in their science education, from small non-majors courses to large majors courses. Join us for a candid conversation about innovative techniques to improve the engagement of all undergraduates in science and ultimately improve their science quotient. The symposia speakers will also provide specific examples of techniques they use in their courses that can realistically be implemented in small and large college-level science courses. A demonstration of specific techniques will follow the formal presentations.

Symposium Organizer: Dr. Carol Ferguson, Department of Biology, Southern Oregon University: ferguson@sou.edu

9:30  Active Learning and Group Work in “Very” Large Introductory Biology Classes, LORI J. KAYES, DEVON QUICK, and NATHAN KIRK (Department of Integrative Biology, Oregon State University, Corvallis, OR; lori.kayes@oregonstate.edu, Devon.quick@oregonstate.edu; Nathan.kirk@oregonstate.edu).

Active learning has been shown to decrease failure rate and increase exam scores across different types and sized of science classrooms. However, large class sizes may inhibit or intimidate faculty from attempting to use active learning. We will share and discuss strategies and ideas for team building and increasing participation in large (or small) classrooms in order to find success with active learning. We will share way to utilize undergraduate learning assistants (LAs) to help organize students and provide feedback. We will share how we keep students working in groups and hold them accountable to their groups such as group concept check sheets, group contracts and group norming activities. If time allows, we will share data on how students respond to group work based on these strategies.

10:00 How to make Introductory Biology Active: Activities and Course Design, NATHAN KIRK and LORI J. KAYES (Department of Integrative Biology, Oregon State University, Corvallis, OR; Nathan.kirk@oregonstate.edu, lori.kayes@oregonstate.edu).

Over the last 5 years, we have worked together to transition our introductory biology sequence from a traditional lecture-based, instructor-centered model to a student-centered model of learning. This approach was predicated on backwards design where we meet as a teaching team to discuss course level and daily learning objectives collaboratively. The general structure
of our approach is three pronged and centered on our daily learning objectives: 1) Daily reading, 2) brief lectures and small-group activities facilitated by peer learning assistants (LAs) followed by 3) frequent formative assessment. All of the activities and formative assessments are similar in content and complexity to the summative assessment. To facilitate the in class group work, we spend a day forming groups and building trust among members culminating in a group contract. To help create the content, we evaluated our lectures and cut content that did not align while building our more difficult concepts into group activities generally based on questions on worksheets. Students are encouraged to work together on these problems and ask their peer LAs or instructors for clarifications, guiding questions and confirmation of ideas. These group activities are punctuated by questions that are posed in an online response system (Learning Catalytics) and further instruction and clarifications can be provided based on the real-time responses to this formative assessment. At the end of a week, students will take a short group quiz that reinforces the concepts. As these courses are largely collaborative in nature, we use a two-stage exam with a group portion as summative assessment. Our approach is frequently evaluated and modified based on feedback from the assessments (both formative and summative), student LAs, and timing.

10:30 Giving Our All to All Our Students: A “Capstone” Biology Experience for Non-Majors, ERIN BAUMGARTNER (Department of Biology, Director of General Education, Interim Associate Provost, Western Oregon University, Monmouth, OR; baumgare@wou.edu).

Changing our thinking about how we approach biology courses for non-majors from an introductory experience to a capstone experience has been a gradual paradigm shift at Western Oregon University. When we consider that for the majority of our students, this is likely to be their last experience with biology (and very possibly natural science), emphasis on scientific literacy via the Vision & Change Core Competencies, building scientific skills through the context of the Core Concepts, and engaging in active learning that is student-centered and inclusive. Our shift from a content-heavy, lecture-based course to a skills-focused, student has taken place via a series of small steps and interventions and is ongoing. While we have found that the student perceptions of Biology and Science improve through this experience, gains in Scientific Literacy remain modest – pointing our way to needed course adjustments.

11:00 Implementing Studio-style Teaching in Non-Majors Biology Courses at Lane Community College, JENEVA ANDERSON (Science Division, Lane Community College, Eugene, OR; andersonje@laneccc.edu).

Among the many challenges to teaching includes the ability to implement different teaching styles within the constraints of the classroom, whether it be a small liberal arts college or a large lecture at a university. This presentation will highlight experiences from an early-career educator at small liberal arts college, large state university, and community college classrooms from the student’s and instructor’s perspective. Many biology instructors at Lane Community College implement studio-style teaching as a way to engage students in combined lecture/lab courses. We will discuss the benefits and challenges that come with this teaching method and how aspects of studio-style teaching can be applied to other types of classroom environments.

11:30 The Lithia Water Springs Project: Active Learning for Analytical Chemists Using a Community Resource, STEVE PETROVIC (Department of Chemistry, Southern Oregon University, Ashland, OR; petrovis@sou.edu).

A century ago, civic leaders in Ashland, Oregon championed the development a “spa economy” based on the availability of Lithia water from local mineral water springs. Although this spa economy never truly materialized, the Ashland community pays homage to the role of Lithia water in its economic development by maintaining access to Lithia water in downtown Ashland. The Analytical Chemistry course at Southern Oregon University benefits from Ashland’s largesse through The Lithia Water Springs Project (LWSP). The LWSP, which is part of the Analytical Sciences Digital Library (ASDL) online collection of active learning materials (https://community.asdl.org/activelearningmaterials/), is a term-long project with the goal of determining the most prevalent inorganic ions in Ashland’s Lithia water. Beginning with a 1915 analysis of the local Lithia water spring, groups of analytical chemistry students apply their knowledge of concentration and stoichiometry to choose an appropriate analytical technique for each ion of interest. Focusing their choice of techniques on those covered during the term (titrimetry, potentiometry, and visible spectroscopy), students work collaboratively to identify, adapt, and conduct analytical methods in the determination of these ions. In order to complete the LWSP, students are expected to apply their knowledge of equilibrium chemistry to develop an effective sampling plan, and their knowledge of statistics and charge balance equations to ascertain whether their group had reliably determined all of the prevalent inorganic ions in Lithia water. In this presentation, the range and structure of formative and summative assessments used and insights gained in conducting and refining the LWSP.
The corrosion of metallic materials affects almost every conceivable industrial sector and is a matter of major economic concern. This symposium will provide an overview of the work on corrosion and protective coverings/surface modification, from the Principle Investigators and students in several laboratories working on this problem on the west coast.

Program organized by Vilupanur Ravi (Department of Chemical and Materials Engineering, Cal Poly Pomona) and Michael F. Hurley (Boise State University).

Program sponsored by the Pacific Division section on Materials Science.

The corrosion of metallic materials affects almost every conceivable industrial sector and is a matter of major economic concern. This symposium brings together researchers addressing different areas of corrosion and protective coatings/surface modification.

Session chairs: Vilupanur Ravi and Michael F. Hurley.

9:30 Introductory Comments

9:35 Nanoscale Corrosion Characterization of Surface Hardened Martensitic Stainless Steel: Resolving Local Contributions to Bulk Materials Performance, MICHAEL HURLEY*, COREY EFAW, PAUL DAVIS, ARмен КВРЯН, БРИЭЛЛЕ ИБЕ, and NICK CARTER (Micron School of Materials Science & Engineering, Boise State University, Boise, ID, 83725, mikehurley@boisestate.edu, coreyefaw@u.boisestate.edu, pauldavis2@boisestate.edu, armenkovryan@u.boisestate.edu, brielleibe@u.boisestate.edu, nickcarter@u.boisestate.edu).

Martensitic stainless steels are attractive for bearing applications due to their high corrosion resistance and ability to be surface hardened via carburizing heat treatments. Here three different carburizing heat treatments were applied to UNS S42670: a high-temperature temper (HTT), a low-temperature temper (LTT), and carbo-nitriding (CN). Recent advances in characterization tools have progressed the means to resolve features that control corrosion mechanisms. However, many localized techniques do not provide sub-micron spatial resolution or non-destructive analysis. Scanning Kelvin probe force microscopy (SKPFM) has presented a non-destructive alternative to better understand corrosion mechanisms on the micro to nano-scale. SKPFM maps the Volta potential difference (VPD) between Kelvin probe and surface. VPD has been directly correlated to corrosion potentials, and thus provides strong predictability of corrosion mechanisms. When co-localized with SEM/EDS, Volta potentials can be correlated to elemental composition and thus galvanic-driven initiation phases. For martensitic stainless steels, the VPD between the matrix and carbides, revealed a 90–200 mV difference between the two phases. Corrosion progression was monitored on the nanoscale via SKPFM and in situ atomic force microscopy (AFM), revealing different corrosion modes among heat treatments that predicted bulk corrosion behavior in electrochemical testing. HTT outperforms LTT and CN in wear testing and thus is recommended for non-corrosive aerospace applications, whereas CN is recommended for corrosion-prone applications as it exhibits exceptional corrosion resistance. The results reported here support the use of scanning probe microscopy for predicting bulk corrosion behavior by measuring nanoscale surface differences in properties between carbides and the surrounding matrix.

10:05 Electrochemical Characterization of Titanium Alloys Subjected to an Atmospheric Pressure Plasma Treatment, KEVIN ROBLES*, SARA MARGALA, NINA ABRAMZON, and VILUPANUR RAVI1 (1Department of Chemical and Materials Engineering, 2Department of Physics and Astronomy, California State Polytechnic University, Pomona, Pomona, CA, 91768; krobles@cpp.edu, sgmargala@cpp.edu, nabramzon@cpp.edu, vravi@cpp.edu). (STUDENT PRESENTER)

Titanium and its alloys are used in various industries ranging from aerospace components to biomedical implants. Ti-6Al-4V (UNS R56400; Ti64) has been used as a structural biomaterial due to its excellent corrosion resistance, biocompatibility, high strength and low Young’s modulus. A known issue with Ti64 is the release of harmful metal cations that negatively impact surrounding tissue and cause adverse health effects. Previous research found that Ti64 with boron additions, 0.01 to 1.09 weight percent, improved the corrosion resistance; however, surface modification techniques, such as atmospheric radio frequency generated cold plasma, was also considered in order to further improve the corrosion resistance of these titanium alloys. In this study, Ti64 with low levels of boron additions were plasma treated and characterized using electrochemical methods. Test coupons of three different titanium alloys, i.e., Ti6Al4V, Ti6Al4V-0.1B and Ti6Al4V 1.09B (all in mass%), were polished to a mirror-like finish using standard metallographic procedures. These alloy coupons were exposed to an atmospheric pressure plasma containing a mixture of helium and oxygen for 5 seconds. Electrochemical characterization of the pre and post plasma treated alloys were carried out in deaerated 3.5 wt% sodium chloride solution. The electrochemical tests included three distinct stages: (i) a 1 h open circuit exposure during which voltage vs time data (OCV) were obtained (ii) a linear polarization scan from -30 mV to +30 mV relative to the OCV to obtain the linear polarization resistance (LPR) and (iii) a Tafel plot from -400mV to +400 mV relative to the OCV. Localized corrosion testing, utilizing a scanning droplet cell, was performed to characterize the change in the corrosion behavior of the plasma treated materials over time.
Corrosion is a complex phenomenon involving (predominantly) metallic alloys and the surrounding environment. The various forms of corrosion suffered by metallic materials in aqueous environments have been studied extensively and codified. In contrast, corrosion at high temperatures involves gaseous environments and/or electrolytes like molten salts. Studies in this area are more limited in comparison to the literature in aqueous environments. There is, however, a need for continued studies in this area due to the needs of a broad range of industries including the chemical process, petrochemical refining, waste incineration and power generation industries. Some examples of high temperature corrosion phenomena are: high temperature oxidation in air, carbon dioxide, steam, etc., sulfidation in atmospheres containing sulfur dioxide, hydrogen sulfide, sulfur vapor, etc., carburization, metal dusting, halogen attack, hot corrosion, i.e., accelerated corrosion under thin molten salt films and molten salt corrosion or corrosion in bulk molten salt – full immersion, etc. In this talk, I will discuss some of these forms of corrosion and potential methods to defend against them.

**11:05 BREAK**

### 11:15 Aluminizing Co-base Superalloys

**KALEY HANAN**

Aluminizing Co-base Superalloys

**ANNETTE WAGNER**

Aluminizing Co-base Superalloys

**PRAFULL PANDEY**

Aluminizing Co-base Superalloys

**KAMANIO CHATTOPADHYAY**

Aluminizing Co-base Superalloys

**VILUPANUR RAVI**

Aluminizing Co-base Superalloys

(Co-base superalloys are used in applications requiring strength and corrosion resistance at high temperatures, e.g., in turbine hot section stationary components, such as the vanes. While the materials selection for this application is based on the physical and mechanical properties of the alloys, their resistance to the local environment is a different issue and more specifically, it is a surface issue. Modifying the surface of these alloys without altering their bulk properties is an effective approach to defending them against the hostile environments in which they need to function. In this study, novel cobalt-based superalloys were surface-modified using the halide-activated pack cementation (HAPC) method. This technique is a modified chemical vapor deposition process that deposits the desired element on the surface of the metallic alloy through a series of processes including chemical reactions and mass transport of halide vapor species that occur in the pack surrounding the material to be surface-modified. Once deposited, the coating element subsequently diffuses into the substrate transforming the surface into a different material with distinct microstructural changes. Under oxidizing conditions, the surface-modified alloy forms an oxide layer that acts as a barrier to diffusion and protects the underlying alloy. The objective of this work was to compare the differences in the morphology of the coating produced on two Co-Ni-Al-Mo-Ti alloys. Both alloys had similar compositions, with one series containing ~2 at% tantalum, and the other containing ~2 at% niobium. The substrates were ground to a 600 grit finish prior to the HAPC treatment at 850°C for 9 hours. Coating morphologies were compared using optical microscopy, polarized light microscopy, X-ray diffraction, and scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS). Results thus far indicate that the additions of Ta and Nb influence the coating morphology significantly. The results will be presented and their significance discussed. Preliminary results of cyclic oxidation studies will be reported.)

**11:45 Early Stage Oxidation of UNS N06230 and UNS N07214 in Dry and Humid Conditions

**NICHOLAS URY**

Early Stage Oxidation of UNS N06230 and UNS N07214 in Dry and Humid Conditions

**ANNETTE WAGNER**

Early Stage Oxidation of UNS N06230 and UNS N07214 in Dry and Humid Conditions

**VINAY DEODESHMUKH**

Early Stage Oxidation of UNS N06230 and UNS N07214 in Dry and Humid Conditions

**VILUPANUR RAVI**

Early Stage Oxidation of UNS N06230 and UNS N07214 in Dry and Humid Conditions

(Corrosion is a complex phenomenon involving (predominantly) metallic alloys and the surrounding environment. The various forms of corrosion suffered by metallic materials in aqueous environments have been studied extensively and codified. In contrast, corrosion at high temperatures involves gaseous environments and/or electrolytes like molten salts. Studies in this area are more limited in comparison to the literature in aqueous environments. There is, however, a need for continued studies in this area due to the needs of a broad range of industries including the chemical process, petrochemical refining, waste incineration and power generation industries. Some examples of high temperature corrosion phenomena are: high temperature oxidation in air, carbon dioxide, steam, etc., sulfidation in atmospheres containing sulfur dioxide, hydrogen sulfide, sulfur vapor, etc., carburization, metal dusting, halogen attack, hot corrosion, i.e., accelerated corrosion under thin molten salt films and molten salt corrosion or corrosion in bulk molten salt – full immersion, etc. In this talk, I will discuss some of these forms of corrosion and potential methods to defend against them.

Nickel base alloys are widely used in industry for high temperature applications. Chromium and aluminum are added to these alloys to form protective layers of chromium oxide (chromia) or aluminum oxide (alumina). In dry air, the behavior of chromia- and alumina-forming alloys can be predictable. However, in atmospheres containing a significant amount of water vapor, these predications are not applicable. Therefore, a comparative study was conducted on the oxidation behavior of a chromia- and an alumina-former in dry and wet air to better understand the effects of water vapor in the oxidative atmosphere. UNS N06230, a chromia-former, and UNS N07214, an alumina former, were oxidized at 1000°C in dry and wet air (15 volume% H₂O) for 1 minute, 10 minutes; and 1, 5, 10 and 100 hours, in a thermogravimetric analyzer. The oxidized coupons were characterized using X-ray diffraction and scanning electron microscopy. In these early stage oxidation experiments, the UNS N07214 (alumina former) had a lower oxidation rate relative to the UNS N06230 (chromia former). The alumina former showed a more complex behavior in these early stages of oxidation relative to the chromia former. The results will be presented and their significance discussed.)

**12:15 Concluding Remarks**
Citizen Science Leads to the Creation of Marine Parks in Western Australia, ROBERT HICKEY (Department of Geography, Central Washington University, Ellensburg, WA; rhickey@cwu.edu).

Doing the research that ultimately leads to areas being designated Marine Parks (Australia) requires not only considerable work, but the involvement of many individuals in multiple arenas. This presentation describes an epic collaboration between science and community that resulted in the 2016 creation of two new Australian Marine Parks at Roebuck Bay and Eighty Mile Beach. This presentation will track the joint history of 20+ years of scientific expeditions and the involvements in community/management that took this region from almost complete obscurity to national/international recognition and protection. Eighty Mile Beach and Roebuck Bay are world-renowned as non-breeding sites for migratory shorebirds. These small to medium-sized birds – sandpipers, plovers, curlews, knots, and the like – nest in the far northern hemisphere, in habitats ranging from Mongolian steppes to high arctic tundra. In the non-breeding season, they inhabit a very different world, depending on Australian intertidal mudflats where they feed on benthic invertebrates.

Keywords: citizen science, Australia, mudflats, birds, benthos

CoCoRaHS—Citizen Scientists Measuring Precipitation in the Western Hemisphere, HENRY REGES (CoCoRaHS, Colorado State University, Fort Collins, CO; hreges@atmos.colostate.edu).

The Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) is Citizen-Science at work. Over 20,000 volunteers across the US, Canada, Puerto Rico, the U.S. Virgin Islands and the Bahamas actively measure and track precipitation at their locations each day. (http://www.cocorahs.org). Since its inception in 1998 the network has come to play a critical role in our nation’s monitoring of precipitation and drought. Recognized by the World Meteorological Organization (WMO), CoCoRaHS plays an important role in supplementing rainfall observations across countries with limited meteorological networks and resources. Besides providing high quality data, CoCoRaHS is an educational program as well. By providing daily messages, monthly e-newsletters, informational webinars and data analysis tools, CoCoRaHS is increasing weather and climate literacy among its volunteers. Today's presentation will discuss how the network operates, the data which is collected and will explore the many uses of that data by today's scientists, municipalities, government agencies, educators and the public in general.

Keywords: meteorology, precipitation, Citizen-Science, climate, drought

Scientific Literacy Through Cross-cultural Competency: The Student Opportunities for Biological Research En Mexico Program (SOBRE Mexico), SAMUEL GUTIERREZ* and DANIEL BECK (Department of Biology, Central Washington University, Ellensburg, WA; Samuel.Gutierrez@cwu.edu, BeckD@cwu.edu). (STUDENT PRESENTER)

Expanding upon 20+ years of work in the area, the NSF funded SOBRE Mexico project takes 5-7 Central Washington University (CWU) students to live and conduct independent biological, ecological, parasitological, and/or anthropological research projects in the seasonally dry tropical forest (SDTF) of coastal Jalisco every summer for the past three years (2016-2019). A main goal of the SOBRE Mexico program is to foster a highly collaborative scientific atmosphere with an emphasis on international cultural competency and cultural immersion for students. Research projects were established state-side, facilitated by video-network correspondence with Mexican researchers from the Universidad Nacional Autonomos de Mexico’s (UNAM) Biological Field Station in Chamela, Jalisco, MX. Upon arrival, collaborative research was heightened by the inclusion of Mexican research correspondents, graduate students, field station staff, community members, and traveling citizen scientists from across the world who all helped CWU students adapt to and learn in an entirely new cultural and environmental setting. Community members acted as cultural liaisons in all aspects of everyday life and research, adding meaning and context to our time there. For example, field station workers and other community members such as carpenters also aided in the procurement of samples and in the construction of holding chambers/research apparatus’ for later experimentation at the laboratory. Knowledge gained and skills learned were disseminated to local elementary school children through interactive reptile and amphibian exhibits, field station tours, and the establishment of an annual project painting a naturalist mural to raise awareness amongst younger generations.

Keywords: intercultural, ecology, collaboration, scientific literacy
10:30  Citizen Scientist Collaborations in Pacific Northwest Lepidoptery, DAVID LEE MYERS (Author of Wings in the Light: Wild Butterflies in North America, Yale University Press, 2019; david@DavidLeeMyersPhoto.com).

Pacific Northwest professional PhD lepidopterists have a strong tradition of collaboration with citizen scientists whose education was in other fields. Such collaboration has added significantly to specimen collections, occurrence data, and publications. The Oregon State Arthropod Collection (OSAC) at Oregon State University has been an effective catalyst and beneficiary of these activities. Examples will be discussed and illustrated.

Keywords: butterflies, lepidopterists, citizen science, Oregon

10:50  Go Play Outside! The Gamification of Mobile Citizen Science Apps, ERIC A. GRAHAM (Department of Biology, Central Washington, Ellensburg, WA; eric.graham@cwu.edu).

Advances in mobile applications and technologies and the current proliferation of citizen science programs in the U.S. has resulted in many partnerships between mobile device software developers and outdoor citizen science projects. The early outcomes of such partnerships have enhanced capabilities for informal participants to record GPS location, images and text, and upload and analyze their observations using their mobile devices. In general, such outdoor citizen science projects fall into three categories: “bio-blitz” types of projects where a group of people have been organized to collect data in a short-term effort; education-based projects that usually involve classrooms; and “fan” types of projects that rely on individuals to download an app to collect data themselves.

Although such efforts have resulted in a tremendous amount of data collected, engaging a larger group of participants through GPS-based mobile games has really yet to be achieved. The successes of geocaching and Pokemon Go has inspired us to try our hand at creating outdoor games that engage a wider audience in the collection of plant phenology data. Our current attempt involves locating trees on the CWU campus and having those trees ask players trivia questions. The goal is to engage as many players as possible who may not be interested in plants but will collect plant phenology data because of their enjoyment of the game.

Keywords: plant, phenology, geocaching

11:10  Invasive Species Mapping Tools for Citizen Scientists: EDDMapS and Wild Spotter, REBEKAH D. WALLACE1*, RACHEL CARROLL1, CHARLES BARGERON1, MICHAEL IELMINI2, and PAT CONZEMIUS3 (1Center for Invasive Species and Ecosystem Health, University of Georgia, Tifton, GA, Rachel.Beyke@uga.edu, cbarger@uga.edu, bekahwal@uga.edu; 2USDA Forest Service, National Forest System Headquarters, Washington, D.C., mielmini@fs.fed.us; 3Wildlife Forever, White Bear Lake, MN, pconzemius@wildlifeforever.org).

Citizen scientists serve a vital function in the mapping of invasive species. There are several citizen science efforts to make recording occurrence data easier, two of which are EDDMapS and Wild Spotter. EDDMapS is a program for mapping invasive species across North America, aggregating data from many sources including federal, state, and local agencies, other databases, and citizen scientists to form a complete picture of invasive species distribution. Wild Spotter is a nationwide effort to complete a comprehensive survey, inventory, and mapping of a prioritized set of aquatic and terrestrial invasive species across the United States’ wild places. Wild Spotter aims to empower unique audiences, including individuals or groups, to have a diverse array of the visiting public and local communities to collect invasive species data using the Wild Spotter mobile application, providing resource managers a broad cross section of data. While these two programs differ in key ways, they both seek the same result: educating and empowering the public to collect invasive species data for management, restoration, and research purposes. EDDMapS has succeeded in aspects of volume and quality of data contributed, mobile application downloads, and species reported. Wild Spotter has had successes in marketing, participation, and partnerships.

Keywords: citizen science, invasive species, EDDMapS, Wild Spotter

11:30  Budburst: Observing Plants to Document Global Change and Inspire Conservation Action, JESSAMINE FINCH1,2, CAROLYN MOHR1*, JENNIFER SCHWARZ BALLARD1, and KAY HAVENS3 (1Learning & Engagement and 2Conservation Science, Chicago Botanic Garden, Glencoe, IL; jfinch@chicagobotanic.org, cmohr@chicagobotanic.org, jschwarz@chicagobotanic.org, khavens@chicagobotanic.org).

Budburst brings together researchers, horticulturists, and citizen scientists on a shared journey to uncover the stories of plants affected by human impacts on the environment. These stories are told through data collection, data sharing, education, and personal connections. Budburst was founded in 2007 with the aim of connecting the public with the impacts of climate change by observing plants in their communities. The timing of plant life cycle events, or phenology, is shifting under climate change, with many plants leafing out and flowering earlier in the spring, with potential ecosystem-wide ramifications. Anyone can submit observations for any plant anywhere in the country via the Budburst online platform (budburst.org). Over the last twelve years, Budburst has received >110,660 plant phenology observations from >10,000 participants in all 50 states. Since moving to the Chicago Botanic Garden in 2017, Budburst expanded its mission to encompass human impacts more broadly, with the overall aim of saving plants, inspiring conservation action, and growing a community of plant scientists. In tandem with this broader focus, Budburst is developing a portfolio of question-driven, time-bound research projects that seek to provide clear deliverables on a transparent timeline. The first of such projects is Budburst Nativars, which aims to answer a key question in pollinator conservation: Do cultivated varieties of native plants (nativars) provide the same resources for pollinators as true natives? Research gardens have been installed at botanic gardens, schools, and nature centers. Future projects seek to leverage...
SYMPOSIUM: INTERVENTIONS IN AGING
Wednesday 9:30 a.m. - noon
Room 122

In Act III scene 2 of Richard II, Shakespeare penned: “Woe, destruction, ruin, and decay; The worst is death, and death will have his day.” This symposium will consider the state of development of several modern interventions in aging intended to at least reduce the Woe, destruction, ruin and decay of the process, if not eventually perhaps to deny death its day altogether. The symposium will consider recent developments in drugs that have shown promise in expanding life span, what is known about nutrition and aging, as well as the growing application of technology to mitigate or even reverse the consequences of aging. In reviewing these technologies, the symposium will also consider the overall objectives of research into aging interventions, as well as possible limitations in these interventions.

Symposium organizer: Dr. Carolina Livi, Agilent Technologies: carolina.livi@agilent.com

9:30 Introductory remarks, Dr. Carolina Livi, Agilent Technologies

9:45 Clinical Research in Diseases of the Aging Brain, WALTER G. CARLINI (Medford Neurology - Providence Medical Group, 920 Royal Avenue, Medford, OR 97504).

Diseases of the aging brain are stubbornly resistant to treatment. Three of the most common and devastating diseases of the aging brain - stroke, Alzheimer’s disease, and Parkinson’s disease - have been the focus of clinical research involving patients and physicians in southern Oregon. The rationale for investigating these disorders; distinguishing them from normal aging of the brain; their putative cellular and molecular pathophysiology; and the biochemical underpinnings, scope, methodology, results, and implications of the local clinical trials addressing them are summarized. Synopses of nine clinical trials in Alzheimer’s disease, four clinical trials in Parkinson’s disease, and five clinical trials in stroke - all of which involved older patients in southern Oregon; most of which were or are multicenter, randomized, controlled phase III or phase II studies; and which were conducted over the years 1995 to 2019 - are presented and discussed in context. Eight of these trials met their primary endpoints. Keywords: Brain, Alzheimer’s, Parkinson’s, Stroke, Clinical Trials

10:35 Anti-aging intervention: what do we know and how do we know it? Dr. CAROLINA LIVI (SOU and Agilent Technologies)

We are bombarded with advertisements for special diets and supplements to improve our health with promises of extending our lives. Humans have been in search of the fountain of youth for centuries. In our modern society the search is for a youth pill. With so many health claims in the media, how does one separate the hype from fact? This presentation will cover some of the history of aging research, the Intervention Testing Program of the National Institutes of Health and two scientifically studied interventions: calorie restriction and the drug rapamycin. What do we know about the effects of fasting and a drug that mimics some of its effects? And how do we know it?

10:55 Bioelectronic Medicine, Electroceuticals and other Theranostic Revolutions, Dr. ULRICH HOFMANN (Head of the section for Neuroelectronic Systems of the University Medical Center, Freiburg Germany).

Although it sounds like straight from a science fiction novel, it is the pronounced intention of neuroengineering research to reliably connect living brains to technological devices, comprising brain-machine-interfaces (BMI). The methods developed en route to such noble goal enable a novel class of interventional devices called ELECTROCEUTICALS or bioelectronic medicine. Electroceuticals achieve their therapeutic effect by stimulating particular positions of the nervous system, in the best of all cases closed-loop controlled by signals from the same tissue (thera-nostics).

My presentation will briefly review the field of existing electroceuticals and introduce the components needed for complete systems. Among them are implantable micro-electrodes collecting neuronal signals to be processed in situ in embedded systems capable of determining optimal conditions to trigger therapeutic stimulation utilizing same electrodes.

I will present novel multisite micro-electrode arrays - the flexible ones capable of minimizing tissue scar- ing- as well as wireless, head mounted recording and stimulation hardware for learning experiments with rodents. Exemplary closed-loop
Impact of Tooth Loss on Physical and Cognitive Impairments in the Elderly, Dr. ICHIRO NISHIMURA, DDS, DMSc, DMD, FAP, FAAAS (Professor of Dentistry and Bioengineering, UCLA).

The most recent US National Health Survey of civilian, noninstitutional population identified that total edentulism (complete tooth loss) in 13.7% and 24.1% of the 65-74 and ≥75 age groups, respectively. The rate of edentulism has been evaluated with the socio-economic position and resulting diet and nutritional intake. The loss of dentition can further affect much wider range of health issues. The increasing number of reports has highlighted the effect of edentulism on deglutition, possible cause of aspiration pneumonia, and cognitive impairment. The rate of tooth loss varies among the geopolitical areas. In addition, ethnicity-specific susceptibility to adult periodontitis, a primary cause of edentulism, has been demonstrated. The development of public policy for preventing tooth loss presents an acute importance in maintaining health for geriatric population.

Gender differences in aging, Dr. KEYT FISHER (Former Research Scientist, Barshop Institute for Aging Research, San Antonio, Texas).

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Symposium: How Core Equipment Facilities are Changing the Nature of Scientific Investigations in Universities
Room 110
Wednesday
1:30 p.m. – 4:00 p.m.

Twenty-Five Years ago, the National Science Foundation launched a new funding program for biological science designed to encourage universities to build core equipment facilities that could serve the laboratories of multiple principle investigators. While a large part of the motivation for this program was the impracticality of supporting increasingly complex and expensive equipment in many individual laboratories, the NSF also recognized that core facilities also provided an opportunity for new forms of collaboration and cooperation. Now, 25 years later, core facilities are a central feature of scientific research throughout the world. The speakers in this symposium will consider the current consequences and future opportunities represented by this relatively new form of scientific organization. Topics will include the modern structure and management of core facilities, their impact on the way science is conducted, and the opportunities for collaboration and cooperation provided by core facilities, with a particular focus on the development of new software systems that use core facilities to develop more sophisticated scientific work flows. The symposium will also consider efforts to link data collection to more sophisticated systems of data analysis and ultimately to the construction of models of biological processes, with examples taken from bioinformatics, immunology and computational neuroscience.

Symposium organizer: Andrew Chitty, Director of University Shared Resources at OHSU (the Oregon Health and Science University) and current President The Association of Biomolecular Resource Facilities (ABRF).

Cores are Core, ANDREW CHITTY (Director of University Shared Resources at OHSU (the Oregon Health and Science University) and current President The Association of Biomolecular Resource Facilities (ABRF)).

A strong research core infrastructure is a cornerstone for the modern research community. Cores and shared resources provide cutting-edge technology and essential services that allow researchers to perform innovative research and advance their research programs and funding success. Concentrated resources found in cores are cost prohibitive and difficult to sustain in individual laboratories. Cores and Shared Resources include state-of-the-art facilities, well-maintained instrumentation, and, most importantly, experts who know how to maximize the use and value of those facilities for optimal results. Therefore, a coordinated and appropriately funded core portfolio that runs parallel to and is supportive of the organization’s strategic plan is a critical element of success. A research resources program with strong scientific vision and healthy, sustainable operations management with supportive and committed leadership offers significant benefits to the research community and yields a return on investment in groundbreaking scientific discovery. This session will provide an overview of the core ecosystem, followed by a more in-depth look at how the core portfolio evolved organically over time at the Oregon Health and Science University up to the present-day operations. After considering ways to evaluate the health of a given portfolio of cores, the session will discuss OHSU’s proposed continuous improvements to the current model, and how new opportunities for collaboration support robust and accelerated discovery in the research world.

The Shared Economy for Scientists, CAROLINA B. LIVI, PhD (Affiliate Professor of Biology, SOU, Academic Segment Manager, Disease Research and Toxicology, Agilent).
Core facilities and contract research laboratories enable scientists to submit samples for analysis or hire experiments out entirely. As technology improves ever more quickly and instrumentation increases in complexity, shared resources are critical to enable broad access to state of the art measurements. A number of core facility marketplaces help in connecting researchers to laboratories with the resources to complete specific scientific projects. Often large datasets including use of multiple Omics need to be merged. The analysis, interpretation, archiving and sharing of the data and results remains an important challenge in team science. The collaboratorium and other cloud based servers can provide a space for data analysis and exploration in a decentralized way in support of multi-institutional collaborative projects.

2:30 Syngene Forces: Using Immune Cell Networks to Reverse Immune Suppression in Spaceflight and Melanoma, MICHAEL D. STADNISKY1,2*, JOSEF SPIDLEN1, ANDREAS PANOPLOUS1A, and CHRISTOPH FREIER1A

(1)Informatics, BD Life Sciences - FlowJo, 385 Williamson Way Ashland, OR 97520, mike.d.stad@gmail.com, josef.spiden@bd.com, jack@flowjo.com, christoph@freier.fr; 2 Foundry Scientific, 1001 Southwest Disk Drive, Suite 110, Bend, OR, 97702).

Immune cells are highly networked. Despite this, our mechanistic understanding of these networks is limited; we lack an ability to rigorously compare interactions over time and amongst diseases and have no way of exchanging information about individual cells in the network to drive deeper functional understanding of these nodes across laboratories. In parallel, the physical and scientific barriers between the flow cytometry, sequencing, and mass spectrometry core laboratories have been dissolving, driven by high-content analyses of single cells as the fundamental unit of health and disease. However, pursuit of multi-omics brings challenges to our paradigms of the traditional core model, how data is integrated and analyzed, and our desperate need for shared models. We have previously created the largest surface-protein-validated repository of healthy peripheral blood immune cell gene expression profiles (genomiccytometry.com), combining mass spec, single cell transcriptome, flow cytometry, and sequence-tagged antibody measurements. Herein, we share our efforts to create a model of immune cell communication, first enhancing our transcriptome and proteome immune network with the data from the 500 Human Functional Genomics consortium. We then used social network analysis (SNA) to create, visualize, and identify key relationships between cells as well as rank the importance of cell interaction trajectories. We then applied this approach in two different contexts and create a comprehensive network of immune cells in (1) zero gravity/spaceflight using the NASA data portal and (2) melanoma. We reveal commonalities in immune suppression, show how networks can be altered in both contexts to incite better immune responses. Finally, we brought our networks back down to earth and described a portable population definition such that any scientist, anywhere can sort a cell population (node) of a network, reproduce a result, or contribute more information to enhance understanding of any given network in health and disease.

3:00 Biomarker Discovery in Type 1 Diabetes: Merging Clinical and Cutting-Edge Methods. HOWIE SEAY, BD.

Cell phenotype and specificity within the adaptive immune system plays a critical role in type 1 diabetes (T1D) pathogenesis. Efforts to phenotype autoreactive B cell and T cells and sequence the adaptive immune receptor repertoire in T1D subjects have been limited to peripheral blood sampling. Not unexpectedly, these studies have failed to identify a peripheral biomarker – necessary not only for assisting in proper diagnosis, but also for response to treatment.

Previous studies at the UF Diabetes Institute have shown that signatures of T1D can be traced to the pancreatic islets and pancreatic-draining lymph nodes in organ donors with established T1D. Additionally, a Phase 2b clinical trial with low-dose anti-thymocyte globulin (ATG; 2.5 mg/kg), a rabbit polyclonal antibody shown to deplete T cells and prevent organ rejection, provided for long-term preservation of pancreatic β-cell function and reduction of glycosylated hemoglobin (HbA1c) in many of the patients treated. By far, the most successful intervention trial in T1D patients.

Additional studies are needed to elucidate the immunologic implications of low-dose ATG, and efforts to define responders and non-responders using mechanistic data are under way using Complete Blood Count (CBC), HbA1c, single-nucleotide polymorphism genotyping (SNP-typing), immunophenotyping (Flow Cytometry), single-cell RNA sequencing (scRNA-seq), and adaptive immune receptor repertoire sequencing (AIRR-seq). The outcome of this analysis will attempt to solidify the genetic and temporal factors necessary for a positive clinical outcome and relief from a lifetime of insulin dependence.

3:30 Elucidating the molecular basis of cancer through biobanking. Dr. ROBIN LEACH (Professor Department of Cell Systems and Anatomy, University of Texas Health Science Center, San Antonio and Co-leader, Biobanking & Genome Analysis for the Cancer Therapy and Research Center (CTRC)).

Many important cancer discoveries have been made using immortalized cancer cell lines and animal models. Availability of cell lines is often limited because of the growth properties of the cancer. Furthermore, animal models do not always mimic human disease and, thus, additional validation is needed to demonstrate the human relevance of these early stage translational findings before they can be explored in clinical trials. Therefore, confirming the alterations exist in primary tumor tissue is an essential next step. Most cancers are diagnosed through pathological specimens “biopsied” from the patient and many early stage cancers are treated by surgical removal. Clinical tumor tissues are available, but only small portions are stored and often after embedded. There is, however, an increasing need to “bank” fresh tumor tissues that can be evaluated on the molecular level. One of the largest molecular assessments of tumor tissue has been through the National Cancer Institute’s TCGA (The Cancer Genome Atlas) project. This initiative started in 2006 and has now molecularly characterized over 33 different cancer types using 20,000 cancer specimens. Numerous novel pathways have been discovered through these efforts. Interestingly, however, many of these discoveries may not be generalizable to all populations. The majority of clinical specimens
characterized by the TCGA were derived from non-Hispanic Caucasians; cancers in different populations appear to have unique molecular patterns that could contribute to the well-documented cancer health disparities. Furthermore, biobanking of human tumor tissues has several challenges, including: 1) new “common” rules requiring patient consent on all specimens; 2) linking clinical data with subsequent cancer outcomes to specimens; 3) accessing tumor specimens from minorities; and 4) obtaining “fresh” frozen specimens containing high quality proteins and nucleic acids. Nonetheless, there is a need for establishing and expanding biobanks to both better understand the molecular basis of cancer as well as to identify “drugable” pathways for developing new treatments.

Symposium: Transforming agriculture in the Rogue Valley: Moving from Mono-culture to “Agra-diversity”
Room 108
Wednesday
1:30 p.m. – 4:00 p.m.

For many years and continuing to this day, the agriculturally rich Rogue River Valley of Southern Oregon has produced a significant proportion of the pears consumed throughout the United States. In recent years, however, the Rogue valley has seen a dramatic increase in the diversity of agricultural products produced as well as a growing interest and public concern regarding the local consequences of GMO and pesticide laden conventional agricultural processes. Several years ago, for example, Jackson County banned the growing of GMO crops. The valley is also seen as a national leader in farm to table initiatives and local sourcing of agricultural product including organic seed crops, vineyards and wines, and hemp. Such products commonly derive from organic, agroecological and regenerative farming practices.

The speakers in this symposium will each describe different aspects of the ongoing transformation of agriculture in the Rogue Valley, including the growing emphasis on organic and regenerative farming methods including those farming practices that have the potential for regenerative farming, as well as farming practices that have the potential to mitigate climate change.

Symposium organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu

1:30  Seed Sanctuary: Making History & Protecting the Future, RHIANNA SIMES (Our family farms, Jackson County). When people understand where their food comes from, they can begin to understand its real value. As G. Russolillo said, “we buy food everyday, but it is an act that can change the world.”

Our Family Farms is a local nonprofit with a mission to educate, advocate, and inspire farmers, policy makers, and the community at large to support regenerative agricultural practices and protect traditional seeds. After the successful ballot measure campaign in 2014 to ban GMO crop cultivation from Jackson County, we continue to actively protect Oregon’s seed growing industry from contamination from GMO crop pollen. What is a seed sanctuary? Oregon is one of the top seed growing regions in the world. Oregon’s specialty seed industry is valued at $400 million annually. A Seed Sanctuary is a designated area protecting something valuable from being lost or destroyed. Why is this a big deal? According to the last census that counted seed diversity (conducted in 1983), the U.S. had lost 94% of vegetable seed varieties. This phenomenon results in the decrease of ecosystem abilities to provide food for people and decreases the function of other ecosystem services. The Food and Agriculture Organization of the United Nations has emphasized the importance of crop and animal biodiversity and the capacity for local environments and production systems to adapt to life in an environment with increasing climate extremes. As more people understand the danger of losing culturally significant crops to GMO contamination, the resistance against this technology grows stronger. This movement has widespread implications in our understanding and valuing of traditional seeds, heritage crops, and the health of our food systems. Come learn what is happening now with GMO canola in the Willamette Valley, why this issue is important, and what you can do to support the resistance!

2:00  Adapting a bio-regional seed system to regenerative and climate resilient farming methods to better serve a healthy, local food system, CHRIS HARDY (Rogue Valley Farmer). As global awareness of the unsustainable future of our current food system grows, it is clear how important seed diversity is to building a resilient, local food culture. Studies suggest we have lost most of the planet’s seed diversity in the past 100 years and due to mechanization and synthetic fertilizers of the green revolution we are creating dead soils and losing precious topsoil at an alarming rate. We need to move in the direction where organic, regenerative, living soil is the mainstay if we are to have a future that uses less water and other inputs. Those who grow our food are increasingly aware of a growing number of opportunities to produce seed in one of the top 5 seed producing areas of the world. Farmers must be empowered in their work to incorporate greater diversity, and to adapt their seeds to the local conditions and methods they employ on the farm, which vital to a climate resilient food system.

2:30  Encouraging Climate Change Resilience through Plant Breeding, DON TIPPING (Syskiyou seeds).
Plant domestication is an ongoing process, a relationship rather than an endpoint. When I first began seed saving nearly 25 years ago, I perceived our relationship with the domesticated plants as more akin to one of enslavement and servitude. The more time I work closely with saving seeds and making selections across a wide diversity of plant families I see how we are working towards one another’s best interests. Through understanding what traits enable a plant to adapt more proficiently to its environment we can tease out the best aspects of a given variety. When I take a big step back and look at the long view of the history of agriculture, I believe that seed saving is likely the defining element of agriculture, if not civilization itself. Consider that before humanity was harvesting, saving and replanting seeds we were hunter-gatherers. In this way we may equate seed saving with agriculture. Ironically, agriculture has become so specialized that it is the rare farm that actually saves any seeds now. Most farms buy all of their seed every year, even most organic farms. Seed saving has become a task relegated to the experts. A hallmark of subsistence agriculture has been the thoughtful selection of superior individuals within populations of plants to gather the stock seed for planting the next season’s crop. This stock seed is selected with a variety of agronomic, culinary, aesthetic traits through observation and growing variety trials to assess how the process of selection is generating genuine improvement. I will share some examples of the work we are doing at Siskiyou Seeds towards adapting important food plants to our local climate and bioregion. Climatic shifts brought about through climate change may create new opportunities to grow new crops as well.

3:00 Regenerative Agriculture and Agroecology: Beyond the Buzz, SCOTT GOODE (Geoscientist and regenerative farming researcher and instructor, Rogue Valley).

Regenerative Agriculture and Agroecology utilize processes found in natural environmental systems. In addition to time-tested techniques from traditional and Indigenous food production systems, new innovations brought to light by our ever deeper understanding of the Soil Food Web, the role of soil in balancing the earth’s climate, and an understanding of the interaction of the human microbiome with the global ecology are the basis for this new understanding of food production systems.

Weaving this understanding into reliable, well documented practices that result in a practical, sustainable, and profitable food production and environmental services system is where we find ourselves in the evolution of Regenerative Agriculture and Agroecology. Southwestern Oregon is emerging as a region where this evolution is supported and encouraged. Through instruction, demonstration, and research opportunities provided by the Southern Oregon Research and Extension Center, Rogue Farm Corps, the Our Family Farms program, and the Desert Research Institute in Reno, Nevada, the specific techniques as well as the efficacy of those techniques is being demonstrated on an ongoing basis. This presentation will examine some of these techniques, the principles they are based upon, and show how they accomplish the goals set forth in Regenerative Agriculture and Agroecology. The objective of this work is to supply practitioners of these food production systems with a complete suite of practices that allow them to replace their current methods with a system that is more profitable and sustainable. In addition, research aimed at establishing new techniques for carbon sequestration in the soil that are easily incorporated into crop production practices, and have been certified for inclusion in “Cap and Trade” carbon exchange programs, would allow food producers to augment their income with environmental services contracts.

3:30

Michael Moore, Quail Run Vineyards
Kathy Keesey, United Farm Workers (not certain)

Symposium: Engaging the Public in Science: Where Are They and How Do We Get There
Room 210
Wednesday
1:30 p.m. – 4:00 p.m.

There is no question that the growing complexity of important national issues, including those involving climate change and the environment will require an increased level of scientific understanding by policy makers and the public. Yet, a recent survey conducted by the University of Nevada found that only 14% of the American Public had a great deal of confidence in academic science, while a survey by the Pew Research Center in 2015 found that the number of respondents who said that science had “made life more difficult” rose 50% from 2009 to 2015. Keeping with these trends, a recent survey conducted by the US Government found that 35% of respondents indicated “a lot” of trust in scientists, while the number who did not trust scientists at all increased by over 50% compared to a similar poll in 2013. The symposium will consider programs and projects intended to bridge these gaps and working to deepen the public understanding and involvement in these complex and important societal issues.

Symposium organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu
Public acceptance of human-caused climate change has increased by direct and indirect experience of well-publicized calamities throughout the nation. Fires, droughts, floods, hurricanes, debris flows, excessive heat and cold have alerted people to the radically changed conditions on the planet.

Symposium: Artists and Scientists Respond to Climate Change with Science-Themed Works in Art, Literature, and the Humanities
Room 207
Wednesday
1:30 p.m. – 3:00 p.m.

The European experience in the JRC PESETA projects on climate impacts, Dr. JUAN-CARLOS CISCAR (Joint Research Center for the European Commission).

The JRC PESETA series of studies on the impacts of climate change in Europe have assessed for over a decade the possible consequences of climate change in a broad set of sectors or impact areas, ranging from agriculture to heat-related mortality. The PESETA studies rely on a wide range of scientific disciplines. The studies main output has mainly consisted of technical reports and summary for policymakers notes, in addition to a non-technical description of the project main elements and results in the project web page (https://ec.europa.eu/jrc/en/peseta-iii).

The PESETA projects have some experience in engaging the public with the use of videos and other material. This presentation will summarise the JRC PESETA main lessons in that respect and plans for future development regarding the key mission of engaging the public in the understanding of how climate change can affect their daily lives. Knowledge from other scientific disciplines like neuroscience and psychology can potentially improve that essential dimension of this kind of relevant project.

2:00 SOCAN’s Master Climate Protector - A Primer for Action. Dr. ALAN JOURNET (Co-Facilitator, SOCAN, (retired) Professor of Biology and Environmental Science, Southeast Missouri State University).

Many Oregonians are aware of the hazards imposed by global warming and peripherally conscious of the need to take individual and collective action to address it. However, few really sufficiently understand the basic science of global warming or the trends, projections and consequences to engage in conversations about the issue or, indeed, to be confident enough about what actions are or are not appropriate. The purpose of SOCAN’s Master Climate Protector program, a ten-week course with service expectations, is to provide a vehicle through which local residents can engage in a comfortable and rewarding learning experience that develops their understanding and skills. The focus is to start from the understanding of the science that participants bring to the course and encourage them, through presentation and group interaction, to increase that understanding.

This presentation will explain how we developed the course and how it achieves the objectives which we established for it.

2:30 Vesper Meadow: re-envisioning our land-human relationship and demonstrating community-powered rewilding, JEANINE MOY (Director of Vesper Meadow Education Program).

The new Vesper Meadow Education Program is strengthening local networks through community engagement in science, restoration, native food cultivation, and nature-inspired art. The primary program outpost, the Vesper Meadow Restoration Preserve, is an upland wet meadow surrounded by mixed conifer forest in the southern Cascades. After two centuries of heavy grazing, this site is serving as a restoration demonstration site and home to supporting interdisciplinary programs. Join Director Jeanine Moy and hear about this special place, its biodiversity, and the creative programs currently developing.

3:00 Forest for the Trees, DAN RUBY (Executive Director, Science Works, Ashland, Oregon).

Science museums play a crucial role for interpreting science to lifelong learners outside of academia, and keeping people engaged in, and participating with, the inherently human continuing dialogue of Science. For some topics this is easy, but for particularly polarized and politicized issues, including climate change, vaccines, evolution, and cosmology, how can researchers consider approaches to public outreach that are effective entry points, instead of immediate halts to necessary conversations?

3:30 Whyville.net 20 years engaging millions of children in game-based science learning on line. Dr. JAMES M. BOWER (CEO Numedeon Inc.).

Launched in April 1999, Whyville.net was the first browser-based, game-based, online learning virtual world, intended to provide a new approach to engaging children in science-based inquiry learning. Now 20 years later, Whyville has more than 8 million cumulative users worldwide, with many of those users continuing to be engaged with the site for many years. This talk will briefly introduce Whyville’s approach as well as its impact.
Yet, many in the arts and humanities have continued to depict the physical world in general and nature in particular in traditional ways. Landscapes, nature poems, novels often avoid the new harsh realities that would undermine the use of nature as a background setting rather than a dangerous protagonist in the current human drama. Even the familiar calendar art of environmental organizations stays focused on glorious, almost pristine images of nature. As radical as climate disturbance has become, the underlying western paradigm in the arts and humanities of a beneficent and supportive nature is hard to change.

The Arts and Humanities centered on climate change can help propel this necessary ideological shift. This interdisciplinary symposium invites papers on this topic from artists, humanists, and scientists alike. We would also welcome poems and excerpts of fiction that would be read in the symposium, along with the papers. If enough poets and writers contribute, we could set up a separate reading during lunch or another convenient time.

Symposium organizer: Dr. Robert Louis Chianese (Department of English (Emeritus), California State University Northridge, Northridge, CA)

1:30 Climate Disturbance and the Human Prospect: Art, Literature, the Humanities Respond to Social and Cultural Change, ROBERT CHIANESE (Department of English (Emeritus), California State University Northridge, Northridge, CA; rlchianese@gmail.com).

The global damage we are inflicting on the planet, with our own survival on the line, has profound influence on our concept of nature, especially with our intrusive and toxic presence now always in view. We can no longer be “out of the picture.” How might this influence our deep-seated cultural assumptions about our relationship to nature, the meaning we give to it, and our portrayals of it, particularly in both representational and imaginative art?

Most representational art and illustration of nature stays carefully within conventional parameters of seeing it as pure, serene, gorgeous, and imparting spiritual uplift. The radical feminist art critic Rebecca Solnit will have none of it. In 2001, she imposed a new aesthetic demand on nature artists: that they depict its physical often gross actuality—gritty, dirty, and assaulted. For Solnit, this complements the honest depictions of women who become symbols of messy nature in such 1990’s artists as Cindy Sherman, Judy Dater, Barbara Bosworth, and Ann Hamilton at the end of the twentieth century.

As we come to grips with climate-changed nature in the twenty-first century, we need to extend this feminist nature aesthetic to help us comprehend how radically changed the world is. Contemporary artists now must contend not only with pervasive despoliation, but intense climate disasters, up-ended familiar landscapes, and a disbelieving, hostile government for such revelations. This has drawn a number of artists both ways—to hyper representational realism and staggering imaginative fantasy, often an enhancement rather than the whole story. They also tend to reconcile the very forms and elements of previous nature art, for instance using found materials and employing older technologies.

Exploring some of these artists begins to give us a sense of the challenges and pleasures of a new climate-changed aesthetic, one that I have named the “Bald” or “Naked” or “Under the Skin Aesthetic,” or more formally, the “Anthropogenic Eco-Sublime.” “These terms capture the exposed state of the earth’s surfaces as we dry them out, set fire to them, flood and empty them, and often wipe them clean through the effects of our rampant climate-driven transformations. Finding ways to express this radical change will engage artists in both representational and imaginative strategies.

Artists directly experiencing local effects of climate-change disasters who then make art from it are worth examining as they bring to their work the passion and fear and comprehension of what people around the world have or will have to contend with. This includes Ventura County visual artists Hiroko Yoshimoto, Susan Petty, Luke Matjias, Karen Kitchel, Luther Gerlock and others. These locals deserve our attention for the heroics of their reflectiveness on experiences they and many others endured during fire and other environmental disasters, and they turned them into expressive art that helps define if not console about what the broader world has and will experience in the future.

2:00 Frederick Law Olmsted, Aesthetics and the Urban Commons, CARL A. MAIDA (Institute of the Environment and Sustainability, University of California, Los Angeles, Los Angeles, CA; cmaida@ucla.edu).

The commons is a central concept of advocates for urban preservation, restoration, and the adaptation and resiliency of urban design and landscape under a changing climate. Movements in support of aesthetic improvement, including preservation, conservation and restoration efforts on behalf of public space, parkland, and open space, typically emerge in the face of external threats to their sustainability. The move to protect the urban commons marks a sea change, as sustainability advocates rediscovered and champion the ideas of Frederick Law Olmsted, who understood city dwellers’ needs for personal renewal in the post-Civil War decades as he planned Central Park, Prospect Park and the World’s Columbian Exposition. With colleagues trained as scientific farmers, architects, city planners and landscape architects, Olmsted spearheaded movements that were clearly anti-hegemonic in the face of an unrestricted capitalism in the Gilded Age that threatened common resources in the city. Influenced by Hudson River School artists, they also became involved in preservation of wild land, from Yosemite to Niagara Falls, to prevent the sale and commercialization of these natural amenities. Their rationale was that urbanites needed to restore themselves and thereby benefit their health, mental health and overall wellbeing through respite both within urban green spaces and in wilder landscapes away from the industrial city and its pace of life. Following John Ruskin, Olmsted saw aesthetic sensibility as a way to dissuade Americans from their frontier mentality. He believed profound landscape experiences met unconscious needs for personal restoration based upon an aesthetic principle “elegance by design.” Olmsted’s pastoral style involved composition and perspective in landscape design. An accompanying principle was that “service must precede art” on
behalf of human needs. Contemporary artists and scientifically trained urban design professionals, notably architects, planners, and landscape architects, share Olmsted’s vision of the urban commons in their restoration and preservation efforts.

**Keywords:** commons, climate, aesthetics, urban, landscape

**2:30 Innovation and Entrepreneurship Policy for Performing, Visual Arts, and Design (PAVAM-D): The Iconic Case of Ashland’s Shakespeare Festival and Cultural Cluster, HENRY ETZKOWITZ1*, LEILA M. KEHL1*, and TATIANA SCHOFIELD2* (**1**International Triple Helix Institute, Palo Alto, CA, henry.etzkowitz@triplehelix.net; 2Royal College of Arts, Department of Knowledge Exchange, Kensington Gore, South Kensington, London, tatianaschofield@yahoo.co.uk).**

Knowledge-infused clusters are the epitome of contemporary economic development strategy. The role of Southern Oregon University (SOU) in the inception of the Oregon Shakespeare Festival (OSF) underlines the significant role education-focused universities play in local economic development through the creation of cultural clusters, with significant spillover effects. A case study the Ashland Shakespeare Festival was conducted as part of a European Union project on University-Business Interactions, with potential for replication. The stages and phases of the Festival’s evolution into a cultural cluster through university-industry-government (Triple Helix) interactions

Arts as well as the sciences provide a base for knowledge-based clusters. Therefore, PAVAM-D (performing, visual arts, music and design) is introduced as a conceptual label for a distinctive set of disciplines underlying the creative economy. Similar to Science, Technology, Engineering and Mathematics (STEM)’s role in fostering technological innovation, PAVAM-D provides an equivalent category to STEM, yet with distinctive differences drawing upon cultural heritage as well as the avant-garde. Through narrative, visual, sound and movement invention and recombination, PAVAM-D disciplines drive innovation in the creative economy. Possibilities for hybridization among STEM and PAVM-D disciplines, have neither escaped our attention nor that of digital/arts innovators, for example in Brighton UK.

Understanding how arts, as well as science, contribute to economy and society is fundamental to develop effective policies. Identifying sources and pathways of value creation by arts, entry points for policy become visible. A typology of arts value: arts as creativity, arts as knowledge production and arts as economic input is derived from comparison of US and the UK cases. Eschewing dichotomy: commercial use on the one edge and cultural on the other, in favor of continuum, allowed a mapping tool showing the proximity of artistic industries to the economy. Based on the findings, we discuss ways to improve the economic impact of PAVAM-D.

**Keywords:** arts entrepreneurship and innovation policy and practice, cultural cluster, PAVAM-D, STEM/PAVAM-D hybridization

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**III. Town Hall Meetings**

*Town Hall Meeting: Advancing STEM: Increasing Diversity in Academia and Industry*

Room 122

Wednesday

2:00 p.m. – 4:00 pm

Diverse communities create a more satisfying and productive learning and working environment. Despite this repeatedly reported research finding, and acknowledgement of the value of diversity in the mission statement of many organizations, increasing STEM workforce diversity continues to be a challenging goal for academia and industry alike. Reasons given to explain this slow change in STEM discipline demographics include low numbers of qualified candidates, resistance to targeted searches, and poor “fit”. Beyond recruitment, retention of underrepresented groups in STEM must also be addressed. The workplace environment is a key factor in attracting and retaining underrepresented groups. Full integration requires consideration of racial, gender, cultural, social, economic, interactional, structural, and climate influences and sufficient “critical mass” to support a diverse community. This town hall style session will provide an opportunity to share and discuss current data, persisting obstacles to and inequities in career advancement, and successful strategies to directly address the commonly expounded reasons for the lack of diversification in STEM.

Town hall meeting organizers: Dr. Hala Schepmann, Department of Chemistry, Southern Oregon University, schepmah@sou.edu and Dr. Maria Bertagnolli, Department of Biology, Gonzaga University, bertagnolli@gonzaga.edu
The American Association for the Advancement of Science was founded on September 20th, 1848 and is therefore 171 years old. Sigma Xi, the scientific research honor society, was founded in 1886, 133 years ago. This symposium will take place during the 100th annual meeting of the Pacific Division of AAAS and will consider the current and future value of scientific societies. How have changes in the structure of science and scientific careers changed the role that scientific societies play within science and for individual scientists? What are the current challenges facing scientific societies and how might we imagine their roles changing in the future?

Town hall meeting organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu

Participants:

Michael Savelli: American Association for the Advancement of Science (AAAS)
Eman Ghenem: Sigma Xi
Ken Gordon: Northwest Association for Biomedical Research
Dr. Phillip Mote: American Geophysical Society
Andrew Chitty: The Association of Biomolecular Resource Facilities

IV. Workshops

Workshop: Learn Calculus in 90 minutes with 3D Prints
Room 220
Wednesday
2:30 p.m. – 4:00 p.m.

When Isaac Newton developed calculus in the 1600s, he was trying to tie together math and physics in an intuitive, geometrical way. But over time math and physics teaching became heavily weighted toward algebra, and less toward geometrical problem solving. Thus, students are taught reams of algebra and formalisms that can completely obscure the elegance and simplicity of many core calculus concepts.

What might Isaac Newton and later mathematicians have created if they had owned 3D printers? The organizers’ forthcoming book, *Hacker Calculus*, uses 3D printed math models to teach calculus without (much) algebra. We will use some of the 3D printed models from the book, some PowerPoint, and maybe some paper and scissors to go through key concepts of calculus conceptually.

Workshop organizers: Joan Horvath and Rich Cameron, Nonscriptum LLC, Pasadena, CA. joan@nonscriptum.com

6:00 p.m. AAAS, Pacific Division Presidential Address

Ms. Crystal Goldman (President, Pacific Division of AAAS)
Meese Auditorium

“Open Libraries, Open Science”

Libraries have long been at the forefront of the making information accessible, and have played an increasing role in Open Access, Open Science, Open Data, and Citizen Science. The varied ways in which librarians enable these social and scientific movements include advocating and creating awareness, providing support for infrastructure and digitization, and training and
supporting researchers. From digitizing keys works in the history of science to facilitating cutting edge research data curation, this presentation will discuss the role of libraries and librarians in making science more accessible to students, researchers, and citizen scientists.

7:00 – 11:00 p.m. Science pub crawl around the square in downtown Ashland

Oberon’s Restaurant and Bar – Climate Change Poetry Jam

The Black Sheep – The Economic, Political and Social Consequences of Climate Change

Harvey’s Place – FIRES!!!
Thursday, 20\textsuperscript{th} June 2019

8:00 a.m. coffee 2\textsuperscript{nd} Floor Science Building

8:30 a.m. Meeting Announcements. Music Hall

8:45 a.m. Plenary talk – Music hall

Dr. Brian Smith
Inaugural Trustee Professor and Associate Dean of the Graduate College
Arizona State University

“The Honey Bee as a Model for Reverse Engineering a Brain”

I. Thursday morning Town Hall Meeting

Town Hall Meeting: Character, Illusion, Lighting, Sound and Madness
as Viewed by the Oregon Shakespeare Festival
Room 162
Wednesday
10:00 a.m. – 11:30 a.m.

This Town Hall Meeting will consider the science, engineering and psychology that goes into the success of Ashland’s world-famous Oregon Shakespeare Festival. The symposium will consider how actors create the inner world of the character, how what we say affects what we hear and perceive, including how voice and text change the perception of characters, of region, of class and space. The symposium will describe the smoke and mirrors being how artisans create illusion including illusions created by the automation team, as well as how sound designers create an auditory landscape, and lighting designers sculpt the air. Finally, a panel of actors and neurobiologists will talk about how they represent madness as well as other aspects of the human condition.

Town Hall Organizers, Ms. Doreen O’Skea, Director of Legacy and Leadership Giving, Oregon Shakespeare Festival, and James M. Bower, Department of Biology, Southern Oregon University

Participants from the Oregon Shakespeare Festival:
Amanda Haverick - scenic painter. Basically using chemistry to change textures and our perceptions of what we see.
Rebecca Clark Carey - voice and text - what we hear changes what we perceive.
Ryan Callahan - automation technician. Making wooden boats glide on wooden floors making it look like water.
Tasia Simon - Master Carpenter - using found items and different textures to create the world of the play. Did you know that old screen doors can be twisted to become clouds and then the waves in the ocean.
Josh Hovath - Sound designer - what is the sound scape of life? What is the sound scape of the world of the play. What is that affect that makes it feel like it is raining in the theatre right now and we feel like we should be looking for shelter?
Mac Vaughey - Lighting Designer - sculpting air. It’s one of my favorite things.

Neurobiologists from AAAS:
Dr. James M. Bower, Department of Biology, Southern Oregon University
Dr. Stuart Firestein, Chairman Department of Neurobiology, Columbia University
Dr. Brian Smith, Inaugural Trustee Professor and Associate Dean of the Graduate College, Arizona State University
II. All Day Thursday Symposia

(SOU Science Building)

Symposium: Boise Extravaganza in Set Theory (BEST)
(two-day symposium)
Room 173
Wednesday and Thursday
9:30 a.m. – 4:00 p.m.

This symposium is a continuation of the well-known Boise Extravaganza in Set Theory (BEST) conference. BEST focuses on the mathematical discipline called Set Theory, and its applications in other disciplines in Mathematics. BEST has been a symposium of the AAAS Pacific Division since 2013; previously it was hosted at Boise State University in Boise, Idaho.

Symposium organizers: Liljana Babinkostova, (lilianababinkostova@boisestate.edu) John Clemens, Samuel Coskey (scoskey@boisestate.edu), and Marion Scheepers, Department of Mathematics, Boise State University, Boise, Idaho).

9:30 Selection Principles in Mathematics, PIOTR SZEWCZAK and CARDINAL STEFAN WYSZYŃSKI (University of Warsaw, Poland).

The theory of selection principles deals with the possibility of obtaining mathematically significant objects by selecting elements from sequences of sets. The studied properties mainly include covering properties, measure- and category-theoretic properties, and local properties in topological spaces, especially functions spaces. Often, the characterization of a mathematical property using a selection principle is a nontrivial task leading to new insights on the characterized property. I will give an overview of this theory and present some recent results related to this field.

10:30 Inaccessible Jónsson Cardinals, SHEHZAD AHMED (Ohio University). (STUDENT PRESENTER)

Given an inaccessible Jónsson cardinal $\lambda$, a sequence of results due to Shelah tell us that $\lambda$ must be at least $\lambda \times \omega$-Mahlo. Unfortunately, not much progress has been made on this problem since Sh413 due to the opaque nature of the proofs involved. The goal of this talk is to provide motivation for looking at this problem, and to survey Shelah's results with the hope of making them more accessible. With this in mind, we will also sketch a new proof of the $\lambda \times \omega$ bound based on the work done in the following paper: https://arxiv.org/abs/1901.02417

11:00 Computable Reducibility of Equivalence Relations and a Jump Operator, GIANNI KRAKOFF (Boise State University, Boise, ID; giannikrakoff@u.boisestate.edu). (STUDENT PRESENTER)

Computable reducibility of equivalence relations is a tool to compare the complexity of equivalence relations on natural numbers. Borel equivalence relation theory motivates questions about computable reducibility. We will define a jump operator on equivalence relations analogous to the Friedman--Stanley Jump and study proprieties of this operation and its iteration. We will then apply this new jump operation by studying its effect on the isomorphism relations of well-founded computable trees as well as c.e. equivalence relations.

11:30 100 Years of the Borel Covering Property, MARION SCHEEPERS (Department of Mathematics, Boise State University, Boise, ID; mscheepe@boisestate.edu).

In a 1919 paper on Lebesgue measure zero sets of real numbers, Borel introduced a covering property. Ten years later in an unrelated investigation F.P. Ramsey published a result now known as Ramsey's Theorem.

On account of work over the last two decades or so, Borel's covering property and Ramsey theory are now inextricably linked. In this talk we give a brief report on this confluence of mathematical themes.

12:00 – 1:30 LUNCH

1:30 Weak Computability in the $\kappa$-Turing Degrees, REESE JOHNSTON* and NOAH SCHWEBER (University of Washington Robinson Center, University of Washington, Seattle, WA; reesej2@gmail.com).

We present several set-theoretically natural examples separating weak notions of computable reduction from Turing reductions in the context of $\kappa$-recursion for inaccessible cardinals $\kappa$. In particular, under sufficiently strong large-cardinal assumptions on $\kappa$, we present a natural length-$\kappa$ sequence of sets that form a strictly descending sequence under many-one reducibility, despite being pairwise Turing-equivalent.

2:30 – 2:55 BREAK
The determinacy of some games arising in topology and number theory. STEPHEN JACKSON*, LOGAN CRONE, LIOR FISCHMAN, and NATHANIEL HIERS (University of North Texas, Denton, TX; Stephen.Jackson@unt.edu).

We consider some natural games which arise in topology, analysis, and number theory. In particular we consider the Rothberger game on topological spaces, and the Schmidt game on $\mathbb{R}^2$. We show that the Rothberger game for $T_2$ spaces is equivalent to a restricted form of the Menger game which answers a question of Aurichi, Bella, and Dias. For Schmidt games, we investigate their determinacy under AD, and prove a result which extends some work of Becker, Freiling and Martin. In particular we show these games are determined from AD for $d=1$, but not in dimension 3 or higher. For $d=2$ we do not know.

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Symposium: Pollinators, Buzzways, Private Gardens and Creative Education:
An activated grassroots effort to save Pollinators in the Rogue Valley through political advocacy and touching hearts
(full day symposium)
Room 108
Thursday
9:30 a.m. – 4:00 p.m.

In August 2014, Talent Oregon became the second designated ‘Bee City USA’ in the United States. Very quickly, Talent was joined by Ashland, Phoenix, and Gold Hill, and just this year, Medford become one too. At the same time, Southern Oregon University became the first ‘Bee Campus USA’ in the country! Starting with a few private gardens, expanding to public spaces, pollinator gardens in the Rogue Valley are now being mapped by Pollinator Project Rogue Valley and SOU, to identify locations of ‘Buzzways’ for pollinators.

This symposium will describe the development of the public awareness and public commitment to pollinators, as well as the stresses and challenges to pollinators here and elsewhere. The symposium will also consider the complexities of human behavior on pollinators, as well as its consequences.

Symposium Organizer: Kristina Lefever, Pollinator Project Rogue Valley

9:40 Welcome and introductory comments/ KRISTINA LEFEVER (Pollinator Project of Rogue Valley)

9:45 Conserving Biodiversity: Ruminations of a State Fish and Wildlife Commissioner, KIM THORBURN (kthorburn@msn.com).

While not a party to the Convention on Biological Diversity, the United States has laws to protect species from extinction, most notably the Endangered Species Act. Its focus on recovering species already in serious decline is fraught with challenges. Using a case study of the Greater Sage-Grouse (Centrocercus urophasianus) with which the author has both programmatic and policy experience, this paper will highlight difficulties in relying on species recovery to conserve biodiversity. More recently, Congress directed the U.S. Fish and Wildlife Service to require states to identify species in greatest conservation need and develop State Wildlife Action Plans to qualify for State and Tribal Wildlife Grants. These state plans, first developed in 2005 and updated in 2015, have eight required elements that focus on monitoring and prevention of species decline. States tally species in greatest conservation need and ecological systems of concern with plans for conservation. These efforts are only five percent funded by the available grant funding. The Recovering America’s Wildlife Act before Congress is an attempt to provide needed funding to support states’ implementation of their wildlife action plans. The views expressed are those of the author and not the Washington Fish and Wildlife Commission.

10:10 Sub-lethal levels of heavy metals, pesticides and fungicides have adverse impacts on honey bee behavior, BRIAN H SMITH1, GLORIA DEGRANDI-HOFFMAN2, NICOLE DESJARDINS1, JENNIFER FEWELL1, ADRIAN FISHER1, JON HARRISON1, and CAHIT OZTURK1 (1School of Life Sciences, Arizona State University, Tempe, AZ, brian.h.smith@asu.edu, ndesjard@asu.edu, j.fewell@asu.edu, afishe16@asu.edu, j.harrison@asu.edu, Cahit.Ozturk@asu.edu; 2Carl Hayden Bee Research Center, USDA-ARS, Tucson, AZ, gloria.hoffman@ars.usda.gov).

Insect pollinators can be exposed to many different toxins, ranging from pesticides and fungicides to naturally occurring and waste-related heavy metals. It is essential to monitor exposure to these toxins, and combinations thereof, because they can have significant impacts on individual health. For social pollinators such as honey bees, toxins can have an impact on how well the colony can survive. Moreover, it is critical to understand the conditions under which these chemicals are toxic, which is typically assessed in terms of lethality on one or more life stages. However, we have now shown in a series of studies that heavy metals such as selenium, copper, lead and cadmium all have significant effects on individual honey bee behaviors even at levels that do not produce lethality. Furthermore, bees can taste some metals (e.g. lead) but not others (e.g. selenium), which affects how well the bees might be able to avoid metal-laced nectar and pollen. Our current research with a commonly used
fungicide also shows sublethal effects on individual honey bee behavior, and we have begun a long-term longitudinal study of how this effect on individuals affects colony behavior and health. In both types of toxins the sublethal effects we have studied involve how well honey bees learn about and show memory recall for floral odors associated with sugar-water rewards. This kind of learning about many characteristics of flowers is critical to pollinator success in finding food. The procedure we have developed is easy to implement and can be used by apiculturists as a regular assay of pollinator health. In conclusion, monitoring sublethal effects of many environmental contaminants will be critical in evaluation of whether and how these chemicals disrupt pollinator health and compromise their ability to pollinate wildflowers and agricultural crops.

10:35  **Bee City USA Talent and Beyond, Dolly Warden** (Pollinator Project of Rogue Valley).
This is a brief history starting with the July newsletter of the Center for Honeybee Research located in Asheville, North Carolina in 2013. It is tied to roots in my childhood when I helped my father care for the bees in our apiary. I was retired and living in Talent, Oregon when I received the newsletter by email. There it told how Asheville became the first Bee City in the United States. I was determined, when I read it, that Talent would be the second. Next, I will tell about recruiting other people to join in the effort. Most important was why the bees and other pollinators needed our help. There was an aborted start due to different ways of perceiving that the work should take place. Educating citizens was the major aspect of our work. We held forums, had booths at the markets, and gave out information especially to persons who were parents. Educating Talent city council members was another aspect of our work. When the vote was taken to become a Bee City a year after my resolve, it was unanimous. Finally, recruiting other cities to join became the focus of the effort and continues reaching even to Bee City Canada.

11:00  **Monarchs and Milkweeds: Creating Habitat to Attract Monarch Butterflies and Other Pollinators, Dr. TOM LANDIS** (Native Plant Nursery Consulting).
This talk will begin by discussing the current status of the western monarch butterfly, and what we can do to help rebuild populations after their recent crash. Monarchs are charismatic emblems of good environmental stewardship, and our recovery efforts have received tremendous popular support. SOMA has been creating pollinator habitat in southern Oregon for over 5 years. The main focus of this workshop will be a discussion on how to establish monarch waystations – specialized pollinator gardens that include milkweed. Since milkweed is the only plant that monarch caterpillars can eat, we’ll talk about the importance of using native milkweed species. Nectar from flowers is the only food source for butterflies, including monarchs, so we’ll discuss the best native nectar species that flower in the early season, mid-season, and especially late season. Late blooming nectar plants are critical to fuel migrating monarchs and help them build-up fat reserves to sustain them overwinter.

11:40  **Bees in Public Places, SHARON SCHMIDT** (Chairperson, Bee City USA).
This presentation discusses an education and research initiative by Cascade Girl organization, a non-profit affiliated with the Klamath Basin Beekeepers Association. The idea behind the initiative is to interest people in pollinators at an experiential level in accessible areas, to identify factors involved in making realistic risk assessments of hives or bee boxes, to present such factors to those working in decision making capacities, and to prepare the groundwork for future research questions related to hive conditions. This presentation recaps information related to data on risk assessment and teaching methods, summarizes what is known presently about pesticide exposure and identifies research questions for the future.

12:00 – 1:00  **Lunch**

1:00 - 1:25  **Panel: Pollinating Bee City USAs in the Rogue Valley and Beyond!**
Dolly, Kristina, Sharon, Amrita (Lee Finney, Mike Oxendine, Jamie Hickner)
The Rogue Valley is home to five Bee City USA cities and one - the first! - Bee Campus USA. Our panel will discuss the answers to these questions and more:

1. What is a Bee City USA and a Bee Campus USA?
2. Why are there so many in the Rogue Valley?
3. What is the mission?
4. How is the mission expressed?
5. What are the benefits?

1:30  **A Rogue Valley Girl and Her Bees: Past, Present, and Future (video.) SARAH RED LAIRD**
The year 2020 will mark the Bee Girl organization’s ten year anniversary. Sarah will comment on her adventures as a young pioneer in the bee community, her current work, and wishes for the future of bees in the Rogue Valley and bee-yond.

1:50  **Buzzway: Connecting Gardens and Communities. KRISTINA LEFEVER and SETH CAMPBELL** (Student Presentation)
Pollinator Project Rogue Valley is helping to inspire and empower people to create safe pollinator habitats in the Rogue Valley. Through community outreach, events, and our Rogue Buzzway mapping project, our volunteer-run nonprofit is
communicating our message that beautiful landscapes and food for people and wildlife, happens because of the work of insects, and that to ‘save the bees’, we must plant pesticide-free gardens and landscapes.

Primary components of our message will be illustrated:

- Educating people about the amazing diversity of bees, butterflies, moths, beetles, hummingbirds and more, is helping to expand their knowledge of the natural world.
- Inspiring people to think of their gardens as part of the larger ecosystem is helping to create habitat that supports a myriad of insects, birds, fish, and other wildlife.
- Connecting gardeners and communities is helping us visualize the pollinator corridors - the ‘Rogue Buzzway’ - within our beautiful Rogue Valley.

2:15  Creating Public Pollinator Gardens, GERLINDE SMITH (Talent Oregon Garden Club).

To build/plant public pollinator gardens in Talent, the 2nd Bee City in the USA, creates public awareness about the urgency to nurture/protect pollinators from a rapid decline and potential demise. What are the steps to implement such a garden: the garden lasagna method comprises of organic soil, compost; plants that have not been treated with neonicotinoids or other chemicals; weed barriers e.g. old cotton bed sheets, cardboard; mulch or cover crops. To date Talent has 6 certified pollinator gardens and one certified monarch waystation – how has this impacted the community? Although I have spearheaded these garden (with the exception of one), it took several members of the Talent Garden Club to actualize them. Consecutively, we have educated the public on a variety of native pollinators. There are 500 species of native bees in Oregon alone, not to mention an unknown species of syrphid flies, bats, butterflies and hummingbirds and it is important to provide the right shelters or environments for them. Through word of mouth and social media, we have promoted pollinator gardens within the Rogue Valley and beyond, including overseas countries. Coinciding with our quest to provide havens for pollinators, our city has adopted an IPM program and has for the most part eliminated the use of chemical applications on city lands.

2:40  What is Good for Bees is Good for Humanity: Fun Facts, Motivating Metaphors and Tender Touchstones. Why we can and must see the Pollinator as Nature’s Greatest Emissary, LAURA BEE FERGUSON (Talent Garden Club).

Laura Bee is offering a new look at Apis mellifera by studying the bee with a broad, liberal arts perspective. With a background and degree in Anthropology and Religious Studies, Laura travels the world connecting people to the Sacred in Nature. With an eye toward ethics, communication, and the rich, world-wide historical relationship humans have with honey producing insects, Laura Bee will provide an inspirational template for relating to this beautiful species and humanity’s great friend. Her flash presentation will provide a bee-centric look at what the bees are telling us and why we must listen.

3:05  Adventures with the Oregon Bee Atlas (video) SARAH RED LAIRD

The Oregon Bee Atlas is an innovative and powerful community science project that is establishing a baseline for bees in every corner of Oregon. Sarah will discuss her experience with this project, and share a very exciting announcement.

3:15  Thank you, Appreciation, Comments/Q&A, Adjourn KRISTINA LEFEVER

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Symposium: Environmental and agricultural measuring and monitoring in the Rogue Valley
(full day symposium)
Room 122
Thursday
9:30 a.m. – 3:00 p.m.

The geology and geography of Southern Oregon is highly diverse with significant variations in soil composition, hydrology, and climate. In addition, the Rogue Valley has been a major agricultural producer for more than 100 years, providing, for example, a significant percentage of the pears consumed in the United States. In recent years, the rich soils, relative abundance of water and agriculturally friendly climate has resulted in a considerable increase in the diversity of local agricultural products, with a growing emphasis on organic production and regenerative agriculture. In addition, Southern Oregon is a significant producer of cannabis as well as hemp.

This symposium will consider the challenges and opportunities presented for sophisticated measurement and monitoring of the chemical composition of the Rogue Valley’s soil, water, and air, as well as the chemical composition of the foods and agricultural products it produces. The symposium will specifically consider the importance of this effort in the context of an environment long subjected to the use of agricultural chemicals (pesticides for example), as well as the growing economic importance of food products being marketed for their health benefits.

Session Organizer: James M. Bower, Pacific Division AAAS
The challenge of data in multi-sector climate impact assessment: the European JRC PESETA experience and lessons, JUAN-CARLOS CISCAR (European Union office of Economics of Climate Change).

The JRC PESETA series of studies on the impacts of climate change in Europe have assessed for over a decade the possible consequences of climate change in a broad set of sectors or impact areas, ranging from agriculture to heat-related mortality. The PESETA studies rely on a wide range of scientific disciplines. The studies main output has mainly consisted of technical reports and summary for policymakers notes, in addition to a non-technical description of the project main elements and results in the project web page (https://ec.europa.eu/jrc/en/peseta-iii).

Any multi-sector impact assessment is very challenging in terms of data requirements. The presentation will present the JRC PESETA experience in working with data in the three main steps of the project: climate futures, climate impact models and economic modelling. The credibility of data is essential for calibrating the climate impact models and also the economic tool. The data difficulties and challenges are diverse and can be a major handicap in some specific cases. Sharing the PESETA experience and lessons can be valuable for some similar studies on climate impacts at the local and regional scales.

Nutrient measuring of the soil and crops, ROCKY COWIE (Rancher Rogue Valley).

Topics covered include: Nutrient measuring of the soil and crops; Various ways to measure nutrients while shopping, before you buy; Types of soil reports and what they actually mean to the crop and yields; Soil analysis guidelines for optimum production; The difference between soil nutrients being merely present in the soil but unavailable to the plant and having nutrients actually available to the plant; The law of minimums and how it applies to nutritious foods; How to increase yields of any crop while actually improving the soil at the same time; The physical, chemical and biological interdependence of the soil and the resulting nutrition; Biological components in the soil; The soil food web; Benefits of microorganisms to the soil and the crop; Field photographs of soils inoculated with microbes; How to raise crops that are almost immune to most insects.

Data Driven Decision Making for the City of Talent, Oregon, MICHAEL HOCH (Energy Efficiency Coordinator, City of Talent).

The presentation will begin with the discussion on the importance of data-driven decisions, as well as barriers to entry in this field. This will include a brief introduction to behavioral economics and how the human brain misallocates perceived perceptions. The presentation will also explore methods by which municipalities can communicate energy data effectively to their residents. The presentation will subsequently elaborate on the various barriers to entry for institutions, more specifically, local municipalities to participate in this big data world. Then, the presentation will describe how the City of Talent overcame these barriers and how we now use data and regression analysis to lower energy usage for the City. The talk will also highlight the partnership between the City of Talent and AmeriCorps and how the University of Oregon’s Recourse Assistant for Rural Environments (RARE) program helped them overcome this issue. It will also consider the use by the City of Talent of the Energy Trust of Oregon’s Strategic Energy Management System (SEM) program, which assists with finding the best low-to-no cost energy efficiency upgrades or renewable energy developments.

Chemical and Molecular Analysis of Grapes and Wine, CAROLINA B. LIVI, PhD (Affiliate Professor of Biology, SOU, Academic Segment Manager, Disease Research and Toxicology, Agilent).

From detecting cork tainting and sources of peppery flavors to authenticity testing, the wine industry is moving toward routine chemical and molecular testing. This presentation will cover a range of omics technologies as well as a description of targeted and untargeted analysis. Examples of published studies of grape transcriptomics and sensitive detection of compounds in wine using mass spectrometry will describe sample preparation, assay selection and most importantly study design and results interpretation. Although grapes and wine are the focus, the same principles apply across food and AgBio research.

Carbon phases in the Rogue Valley's Serpentine Soils, SCOTT GOODE (Geoscientist and regenerative farming researcher and instructor, Rogue Valley).

Soil carbon has gained attention for its potential to mitigate greenhouse gases in the atmosphere and improve the fertility and moisture in agricultural soils. In the last decade, advances in evaluating the nature of soil carbon through the use of Laser Induced Breakdown Spectroscopy (LIBS), Inelastic Neutron Scattering (INS), and Near-infrared Spectroscopy (NIRS) have demonstrated that the traditional view of humic acid macromolecules formed by the aggregation of fulvic and malic precursors is not supported by direct spectroscopic observation. It now appears that the humic substances long thought to compose stable soil carbon was generated by the laboratory extraction process and not actually present in the soil.

Current research demonstrates that soil carbon is composed of the residue of decomposed organisms and that the resilience of soil organic matter is a function of the resilience of the original biological substances. So that remnants of resilient molecules such as chitin and glomalim form the most stable soil organic matter. As a result, the initial soil biology, such as fungal dominated soil ecologies, have a significant impact on the likelihood of a soil to sequester carbon over the long term.

In addition, one of the unique qualities of soils derived from the Serpentine geology found in western Oregon is its ability to incorporate carbonate phases of soil carbon into carbonate minerals. This process locks carbon into minerals like ankerite (Fe2+ Mg)(CO3)2. When carbon is combined in a mineral, it is far less likely to return to the atmosphere than even the most
stable soil carbon species. In addition, carbonate minerals usually reside in the thicker B horizons of soils, separated from the atmosphere by the usually thinner A horizon providing an additional and overlooked reservoir for carbon.

12:00 – 1:30 LUNCH

1:30 Hemp Cultivation and Related Industries are Expanding Rapidly, EMILY GOGOL (CEO, Infinite Tree).

The cultivation of hemp, and all of the associated industries such as site preparation, nursery/breeding, and post-harvest processing, are rapidly growing in the Rogue Valley, and nationally. Our discussion will focus on how hemp cultivation affects our local environment and the role consumers play in advocating for consumer products containing hemp derived ingredients that are safe, effective, and produced responsibly.

2:00 CHRIS HARDY

III. Thursday Morning Symposia

(SOU Science Building)

Symposium: The Future of Precision Medicine
Room 161
Thursday
9:30 a.m. – noon

With the development of new molecular methodologies, evidence based medicine began enabling patients to get more individualized care. Clearly individual variation including genetic differences and environmental exposures play a role in disease risk, progression and also in treatment response. Technology now enables precise genomic assessment and mass spectrometry based assay measurements of drugs, proteins and endogenous metabolites with high sensitivity and specificity. Knowledge from biomedical research can be used, not only to discover and develop new biomarkers and treatments, but also to identify patients most likely to benefit from intervention and for longitudinal monitoring of responses. In this symposium, a number of examples of how the promise of precision medicine is changing the approach to translational research will be covered.

Symposium organizer: Dr. Robin Leach, Department of Cell Systems and Anatomy, University of Texas Health Science Center, San Antonio: Leach@uthscsa.edu

9:30 Welcome and Introduction: Dr. ROBIN LEACH (Department of Cell Systems and Anatomy, University of Texas Health Science Center, San Antonio).

9:45 All of Us and the Future of Medical Research, PRISCILLA OPPENHEIMER*1,2 and ALAN OPPENHEIMER*2
(1Department of Computer Science, Southern Oregon University, Ashland, OR, oppenheim@sou.edu; 2The Alan and Priscilla Oppenheimer Foundation, Ashland, OR, alan@oppenheimerfoundation.org).

This presentation examines the effort by the National Institutes of Health (NIH) "All of Us" program to gather, and make available to researchers, genomic and health data from a million people living in the United States. The All of Us program arose from President Obama's Precision Medicine Initiative with a goal to make advances in medical care that can be tailored to individuals based on their particular genes and health. All of Us provides an opportunity for research scientists, citizen scientists, and people simply concerned about their health to contribute to an historic effort to change the way diseases are diagnosed, treated, and prevented. By enrolling a million participants, the program will have the scale to research a wide range of diseases. All of Us is open to all researchers and is catalyzing innovation in how research is conducted. The program will provide researchers with computing and analytic tools to support complex data analyses in a secure data environment, and enable researchers to leverage a rich resource of data, including genomes, bio-specimens, electronic health records, and mobile device health tracking data. In addition to facilitating research, the program plans to return results to participants, including disease-associated variants in their genes and information on how their genes may affect their response to medications. By taking into account personal differences in lifestyle, socioeconomics, environment, and biology, All of Us researchers will uncover paths toward delivering precision medicine. The results will benefit all of us by delivering individualized disease prevention, treatment, and care.
10:15 All of Us Research Program: Community Engagement, Dr RUBIN BASKIR (National Institutes of Health, All of Us Research Program).

This presentation will provide background information on the All of Us Research Program, from the perspective of working inside the program. Dr. Baskir will talk about his role in the program and the history of his work via the AAAS fellowship. He will then focus on engagement efforts of the program. The talk will discuss working with community partners, partnerships with the National Library of Medicine, and the All of Us Participants-as-Partners initiative. It will also explain what participants can do in the program right now and introduce the community homepage and public data browser.

11:00 Multi-modal testing for precision medicine, Dr. CAROLINA LIVI (Academic Segment Manager, Disease Research and Toxicology, Agilent Technologies, Inc.).

There are significant differences in the processes used to measure analytes from different classes of molecules. The fields of genomics, proteomics, metabolomics and functional biology have been applied to translational research largely in isolation. Multi-omics efforts provided opportunities for correlation studies across this divide. This integrated biology approach yielded significant contrasts in the utility of each molecular type leading to the development of multi-modal testing. This presentation will cover the challenges in sample preparation, quality control and data analysis required for this approach.

11:30 Precision Medicine’s Impact on Risk Assessment, Dr. ROBIN LEACH (University of Texas Health Science Center, San Antonio).

Common diseases, such as Alzheimer’s disease and breast cancer, have both familial and sporadic cases. In the familial cases, the disease is observed in most generations and appears to be inherited by Mendel’s laws. For individuals with familial risk, increased monitoring for disease development has become standard-of-care. For individuals without a strong family history, there are often additional cases of the disease in their family, but the disease may skip a generation. With genome-wide genetic approaches, molecular epidemiological studies have identify genetic variants that increases an individual’s risk for developing a disease, even in an absence of any known family history. These latter genetic variants, however, only have a modest effect on the risk of developing the disease, though the polymorphisms are often associated with the same molecular pathways as the familial genes. To assist patients in determining their risk of developing a disease, risk assessment tools have been developed. These tools incorporate not only clinical and demographic data, but also integrate these modest risk genetic variants as well as molecular biomarkers. Such tools can contribute to the early detection of common diseases.

Symposium: Seeing with New Eyes: The Role of New Scientific Techniques and Perspective in Revolutionizing the Search for the First Americans
Room 207
Thursday
9:30 a.m. – noon

The geographic origins and initial travel routes of the first human communities to migrate from the Old World into the twin continents of North and South America have been subject to intense interest by scholars around the world for over 500 years. Following the dramatic discoveries of the early 20th Century that firmly established the Terminal Pleistocene (~13,000 calendar years before present) occupation of the Americas by sophisticated big game hunters bearing the iconic Clovis points, major changes in perspective did not become salient until the beginning of the 21st Century. In the last 20 years, however, game-changing discoveries have occurred across the hemisphere, ranging from new dates from remarkably old sites such as Monte Verde in Chile, to detailed paleolandscape reconstructions, to greater understanding of the genetic structure of these early migrant communities from finds in Oregon, Montana, and several sites in Latin America. In fact, it has often been discoveries in Latin America that have forced a change in perspective within this constellation of research agendas. Now, armed with new scientific techniques and a perspective no longer bound by decades of status quo thinking, scholars across the hemisphere are changing not only what we know, but how we know it in fascinating and revolutionary ways.

Symposium organizer: Dr. Claudia Garcia-Des Lauriers, Department of Geography and Anthropology, California State Polytechnic University: clauriers@cpp.edu

9:30 Welcome and Introduction Dr. Claudia Garcia-Des Lauriers, California State Polytechnic University

9:45 A Pedoarcheological Approach to the Holocene Period of the Central Desert, Baja California, Mexico, SAMUEL C. WILLIS (Oregon Department of Parks and Recreation, Oregon Parks and Recreation Department, Stewardship Section, Salem OR; Samuel.Willis@oregon.gov).

The Holocene period of the Central Desert region represents an opportunity to study a unique socio-ecological record. Patterns of human organization and land use throughout the Holocene co-occurred during periods of environmental and climatic
transformations, including alternating periods of climatic stability and instability. While human behavior is culturally driven, it is, to an extent, responsive to both predictable and stochastic shifts in environmental productivity. Therefore, understanding the environmental context through time is paramount for more accurately reconstructing any synchronic and diachronic archaeological record. In this paper, the usefulness of applying a soil geomorphological methodology to an archaeological research program is discussed. Between 2009 and 2012, a multi-disciplinary study—the Central Desert Early Prehistory Project (CDEPP)—was undertaken to better understand the Holocene socio-ecological record of this remote and isolated region. A trans-peninsular mega-transact approach was used in this study from Punta Calamajue on the Gulf of California to Bahia Blanco located on the Pacific Coast. To create a broader explanatory framework, a soil geomorphology analysis was undertaken throughout each field season. By applying soil geomorphology methods to a larger archaeological research program allows for a more refined understanding of specific patterns of Holocene forager behavior and land use systems. Results of a soil geomorphology approach used in the CDEPP, in terms of its effect and refinement towards clarifying our understanding of past socio-ecological patterns in the Central Desert, were highly successful. More importantly, this study demonstrates the complimentary application and usefulness of a pedoarchaeological approach to large-scale archaeological research programs.

10:05 The Submerged Paleoamerican Cave Site of Hoyo Negro, Mexico: Recent Advances in Virtual Taphonomy, DOMINIQU E RISSOLO1, VID PETROVIC1, ALBERTO NAVA BLANK2, JAMES C. CHATTERS3, BLAINE SCHUBERT4, PILAR LUNA ERREGUERENA5, and FAL KO KUESTER1 (1Cultural Heritage Engineering Initiative (CHEI), Qualcomm Institute, UCSD Division of Calit2, University of California, San Diego, La Jolla, CA, drissolo@ucsd.edu, vpetrov@ucsd.edu, fkuester@ucsd.edu; 2Global Underwater Explorers, Seaside, CA, betonavab@gmail.com; 3Applied PaleoScience and DirectAMS, Bothell, WA, USA, paleosci@gmail.com; 4Center of Excellence in Paleontology and Department of Geosciences, East Tennessee State University, Johnson City, TN, schubert@etsu.edu; 5Subdireccio de Arqueologia Subacuatica, INAH, Mexico City, Mexico).

The submerged cave systems of Quintana Roo provide access to well preserved Late Pleistocene and Early Holocene deposits that can reveal a wealth of information about the ecology of the Yucatan Peninsula at the end of the Last Glacial Maximum. The interdisciplinary Hoyo Negro Project aims to identify and reconstruct the processes that have formed and transformed the site over millennia. In addition to ongoing studies of the human skeleton from Hoyo Negro and the diverse assemblage of Pleistocene fauna and botanical remains, the development of point-based visual analytics tools enable novel approaches to site-scale taphonomic studies. Domain experts can conduct a range of taphonomic or spatial analyses via a digital surrogate of the site. Rather than simply serving as models of the site and its ancient faunal and human remains to view and share, the full-resolution point-clouds can be manipulated by a variety of user-scripted tools. The interactive, point-based visual analytics workflow has proven to be especially empowering for researchers unable to otherwise access deep and remote underwater sites.

10:25 Gender and Settlement Patterns during the Terminal Pleistocene Migrations in Western North America, RAFAELLA LISBOA (California State University, Northridge, Department of Anthropology, Northridge, CA; rafaela.lisboa.98@my.csun.edu).

The social dynamics of human-environmental interactions have often privileged either an androcentric decision-making model or a heuristically ‘gender-neutral’ human community. Both of these approaches fail to consider the range of factors influencing human decisions regarding resource exploitation, settlement patterns, storage, and mobility that may vary in key ways depending upon the gender of the actors involved. The varied geographic and ecological contexts of the migrations at the end of the last Ice Age mean that the role of gender and its influence on the ecological decision-making would have been distinct for maritime and terrestrial groups. Additionally, groups with greater dependency on plant resources would have been tethered in ways distinct from those with greater dependence upon mobile herds of herbivorous animals. A particularly appropriate regional case study is that presented by the Terminal Pleistocene archaeological record of the Baja California Peninsula.

10:55 Ancient DNA Analyses, Long Term Research Collaborations and the Yukisma Mound from Central California, CARA MONROE1,2, ALAN LEVENTHAL3, CHARLENE NIJMEH1, MONICA V. ARELLANO1, and ROSEMARY CAMBRA1 (1University of Oklahoma, Laboratories of Molecular Anthropology and Microbiome Research; 2Department of Anthropology, University of Oklahoma, monroecara14@gmail.com; 3San Jose State University, Department of Anthropology, College of Social Sciences; Muwekma Ohlone Tribe of the San Francisco Bay).

Ancient DNA analyses from human skeletal remains remains a controversial avenue of research, especially when there is minimal permissions or participation from descendant communities. However, it not only possible, but also critically necessary to create long term reciprocal research collaborations with descendant communities. The result is elevated scientific research that has mutual and meaningful investment and interest to all parties. In partnership with the Muwekma Ohlone Tribe, I will present ancient DNA and bioarchaeological data from CA-SCL-38 the Yukisma Mound (Place of the Oaks) a Late Period site in South San Francisco Bay.

11:15 Haskett, Clovis, and a Case for a Two-Tradition Colonization of North America, DARON DUKE1 and DAN STUEBER2 (1Far Western Anthropological Research Group, Inc., Desert Branch, Henderson, NV, daron@farwestern.com; 2University of Victoria, Department of Anthropology, Portland, OR, dan@thunderstones.com).

Recent discoveries of Haskett projectile points in the Intermountain West indicate that Haskett is overlapping or coeval with the well-known Clovis style. Haskett is likely the initiating point style for the Western Stemmed Tradition in the Great
Different, these approaches have and continue to be simple approaches to the analysis of form. The advent and technological strategies. Here, we discuss how geographic information systems can be strategies and methods along with their potential drawbacks, and this in turn benefits students. This symposium aims to engage faculty and students who are interested in promoting active learning in college science classrooms. We will hear from different presenters about the methods they use, what has worked well for their courses and potential hurdles to utilizing active learning in undergraduate education. The information in the presentations can be applied to inform instructional decision-making and future research about active learning in college science courses.

Symposium organizer: Dr. Julia Ruppell, University of Portland: ruppell@up.edu

9:30 Introduction and Welcome, JULIA RUPPELL (University of Portland)

9:45 Strengthening Oral Communication Skills in STEM Students, VERONICA V. GALVÁN (Psychological Sciences, University of San Diego, San Diego, CA; vgalyan@sandiego.edu).

In the 1990s, the National Education Goals Panel identified oral communication competency as an important skill for students to learn. This skill is important because it enables students to share scientific ideas and results with other scientists and
to communicate scientific information to the public. It also prepares them for careers inside and outside of science, as well as for engagement as a member of society. Educational institutions at all levels have renewed their focus on oral communication, but this skill may still receive less classroom emphasis relative to content and written communication. This presentation will discuss strategies to weave oral presentation skills into the STEM classroom, keeping mind the importance of content and written skills. Emphasis will be on methods of guiding students and specific examples of assignments, including activities with community engagement components.

10:15  An Analysis of Successful Strategies for Active Learning in an Introductory Biology Course. JULIA C. RUPPELL (Department of Biology, University of Portland, Portland, OR; ruppell@up.edu).

Active learning is a trend in higher education with numerous institutions encouraging instructors to utilize new methods of teaching. Many instructors would benefit from increased knowledge of active learning methods and their usefulness for covering different content in their courses. I will discuss the different methods that have been successful in my introductory majors’ biology courses along with potential hurdles to utilizing active learning in undergraduate education.

10:45 Using Free Apps and Online Resources to Enhance Teaching and Learning Process in Chemistry Courses, JOZEF STEC (Department of Pharmaceutical Sciences, College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA; jstec@ketchum.edu).

During this session, the participants will be familiarized in a nutshell with various apps and on-line resources that can be effectively utilized to enhance teaching and learning process of various concepts in general, organic and medicinal chemistry as well as biochemistry. Numerous concepts in a course can be readily delivered in an attractive and attention-sparking 3D fashion by employing easy-to-use and free resources such as apps, on-line animations, and visualization programs, which provide additional insights and better understanding of the discussed topics. This presentation will demonstrate how teaching of challenging concepts (e.g. stereochemistry of organic compounds, protein-protein interactions, enzymes’ active centers) in various courses can be significantly enhanced by implementing such resources into the traditional, hybrid, or online course. This session will also provide tools that can be employed to generate new or support existing ideas for medicinal chemistry research projects (e.g. capstone or thesis). Overall, this session is deemed to be a good opportunity to witness how to simplify complex teaching concepts and to create a learning experience that is engaging and transformative.

11:15 Three-Dimensional Learning: Applications of Cross-Curricular Teaching Strategies in High School Science Education, CAROLINE H. TSUYUKI (Science Department, Carondelet High School, Concord, CA; etsuyuki@carondeleths.org).

Next Generation Science Standards (NGSS) developed by the National Research Council in 2012, have revolutionized Science education in K-12 classrooms. Traditional modes of teaching involving rote memorization, cookbook labs with preplanned outcomes, unidirectional information flow (teacher-to-student), and endless worksheets are undergoing transformative change to usage of factual information as tools to design explanations and solutions supported by evidence, self-designed, guided-inquiry laboratory exercises that have a range of possible answers and a multitude of explanations, and students learning writing skills, data analysis and reasoning for journals, reports and posters. Perhaps the greatest tragedy of traditional modes of teaching has been the oversimplification of activities for students who are perceived to be of lower ability in doing Science or Engineering. Providing supports for these students allows them to engage in higher order learning in these fields. Applications of 3-D learning in my classrooms have taken a variety of forms: self-designed, guided-inquiry laboratory exercises and technical writing challenges in Biology and Chemistry, “legacy” projects in Anatomy & Physiology and Biotechnology skills showcases in extrascholastic STEM workshops. These novel methods of assessment have allowed students of diverse abilities to develop critical thinking skills and a sense of fearlessness to ask questions and synthesize reasoning in a supportive environment.

12:00 LUNCH

1:30 afternoon sessions start
IV. Thursday Afternoon Town Hall Meetings
(SOU Science Building)

Town Hall Meeting: Different Styles, Different Insights, Different Science:
Using Maker Tech to Teach STEM
Room 162
Thursday
1:30 – 4:00

Maker Fairs have been drawing huge crowds worldwide as people flock to explore how they can learn subjects like electronics, 3D printing, coding and traditional trades in a do-it-yourself fashion. Yet this energy has been slow to penetrate traditional STEM teaching even though there are significant overlaps.

The organizers will start off with brief remarks about their experiences developing maker-style STEM materials in formal and informal educational settings, including teaching the visually impaired. They have found that coming at teaching science and math hands-on often brings new insights and will bring along some examples.

Attendees who have done their own explorations in teaching this way are encouraged to attend to share their successes and lessons learned. Those who are thinking about it will be welcome to join in the discussion about how they might adopt some of these ideas as well.

Town hall meeting organizers: Joan Horvath, Rich Cameron, Nonscriptum LLC, Pasadena, CA. and Lindsay Yazzolino, Touch Graphics. joan@nonscriptum.com.

Town Hall Meeting: Citizen Science, Climate Change and Fire in Western North America.
Room 122
Thursday
1:30 p.m. – 4:00 p.m.

This round table discussion will consider subjects addressed by Stephen J. Pyne, The Fire Age: “The traditional view of the Great Plains generally divides it into humid east and arid west with the border between them running roughly along the 100th meridian. It’s a division by water but it works for fire as well. It also marks a potential boundary between Pleistocene and Anthropocene… East and west represent two kinds of fires and two kinds of future for humanity as keeper of the planetary flame. One is a Promethean narrative that speaks of fire as technological power, as something abstracted from its setting, perhaps by violence, certainly as something held in defiance of an existing order. The other is a more primeval narrative in which fire is a companion on our journey and part of a shared stewardship of the living world. Sometime over the past century, we crossed the 100th meridian of Earth history and shed an ice age for a fire age. Landscape flames are yielding to combustion in chambers, and controlled burns, to feral fires. The more we burn, the more the Earth evolves to accept still further burning.”

Town Hall meeting organizer: Dr. Carl Maida, UCLA Schools of Dentistry and Medicine, University of California,

Town Hall Meeting: A Glimpse into the Possible Climate Future of Oregon Wineries
Room 207
Thursday
4:00 p.m. – 6:00 p.m.

Vignerons and Vintners must manage the grapes they grow on relatively long-time scales. After planting, it typically takes 3 years before a new grape vine produces grapes, and grape vines have been known to produce grapes in vineyards for up to 120 years. This means that managing vineyards, in principle, takes place on long time scales. Grapes are also well known to be highly sensitive to soil and climactic conditions, even on a year to year basis. Accordingly, the additional variation now related to climate change, itself unpredictable has added an additional uncertainty to the management of wineries. In this Town Hall
meeting. Vigneron’s and Vintners will discuss with climate experts the possible implication of climate change for the multi-billion dollar wine industry.

Town Hall organizers: Michael Moore, Quail Run Vineyards, and James M. Bower, Department of Biology, Southern Oregon University: bowert@sou.edu

Participating Vintners:

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jason Cole</td>
<td>Pacific Vineyard Management</td>
</tr>
<tr>
<td>Steve Hall</td>
<td>Troon</td>
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<tr>
<td>Michael Moore</td>
<td>Quail Run Vineyards</td>
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<tr>
<td>John Pratt</td>
<td>RVHPA</td>
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<tr>
<td>Nicole Shulte</td>
<td>Barrel 42</td>
</tr>
<tr>
<td>Terry Sullivan</td>
<td>Upper Five</td>
</tr>
<tr>
<td>Mark Tarlov</td>
<td>24 Chapter Wines</td>
</tr>
</tbody>
</table>

Participating Scientists

At the international level:
Dr. JUAN-CARLOS CISCAR, member of the Joint Research Center of the European Commission and an expert on assessing the economic consequences of climate change (http://piamddi.stanford.edu/pi/juan-carlos-ciscar).
Dr. STUART FIRESTEIN, Chairman of Neuroscience, Columbia University, and an expert on the relationship between chemical components found in wine and wine flavors (https://biology.columbia.edu/people/firestein).

At the national level:
Dr. CAROLINA LIVI, Global Academic Segment Manager, Disease Research and Toxicology, Agilent Technologies Inc. (https://www.linkedin.com/in/carolinalivi/).

At state and local levels:
Dr. ALAN JOURNET and Dr. KATHY CONWAY, co-facilitators of SOCAN (Southern Oregon Climate Action Now – https://socan.eco).
HANNAH SOHL (Rogue Climate – https://www.rogueclimate.org).
ALAN HICKENBOTTOM, Regional director for the national Lean Energy Coalition (http://leanenergyoregon.org/oregon-team/).

3:00 – 4:00 p.m. Judging Meeting
5:00 – 7:00 p.m. Pacific Division Council Meeting
7:00 – 9:30 p.m. Banquet (Science Works)
Friday, 21st June 2019

8:00 a.m.   Coffee 2nd Floor Science Building

8:30 a.m.   Meeting Announcements, room 151 Science Hall

I. Friday Morning Symposia

(SOU Science Building)

Symposium: The Social, Economic and Political Impacts of Climate Change
Room 108
Friday
9:00 a.m. – 11:30

Much of the conversation surrounding climate change, to date, has focused on "hard science" measures like the abundance of greenhouse gases, global changes in air and sea temperatures, rates of polar ice melting, increased intensity of storms, and expected the global rise in sea levels. With climate change now largely regarded as an established fact, attention has begun to turn to what might be considered more local and 'softer science' influences on the social, economic and political fabric of society. The speakers in this symposium will consider the consequences of climate change from this "softer science" perspective.

Symposium organizer: Dr. Juan-Carlos Ciscar, The Institute of Prospective Technological Studies (IPTS) of the Joint Research Center (JRC) in the European Commission: Juan-Carlos.CISCAR@ec.europa.eu

9:00 Climate Impacts in Europe and EU Climate Policy (Vision of Zero GHG Emissions by 2050, JUAN-CARLOS CISCAR (Joint Research Center for the European Commission).

The presentation will start introducing the key elements of the EU climate policy, including the recently announced EU vision of zero net GHG emissions by 2050, as proposed by the European Commission (https://ec.europa.eu/clima/policies/strategies/2050_en) and to be negotiated with the European Parliament and the EU member states (the European Council). The GEGO 2018 study (https://ec.europa.eu/jrc/en/geco), partly regarding the techno-economic assessment of that vision, will be also briefly presented. The presentation will mainly focus on the JRC PESETA III project (https://ec.europa.eu/jrc/en/peseta-iii) that has assessed the climate impacts in Europe for eleven climate impact areas, ranging from river floods to habitat losses. The PESETA study has combined climate data with bottom-up and empirical sectoral impact models, whose results are partly integrated into an economic setting. The main results in terms of the most important sectoral climate impacts, the geographical pattern of damages and the extent to which impacts would be reduced under a 2C climate future will be discussed. Next steps, regarding the on-going JRC PESETA IV project and other studies will be also discussed, together with the main lessons and priorities for further research, relevant for policymakers and the general public.

9:50 Five Ideas To De-Carbonize The Global Economy, PHILIP W. KITHIL (CEO Ocean-based Climate Solutions, Inc., Santa Fe, NM 87501, oceanbased.pk@gmail.com).

The difficulty in solving the “wicked problem” of fossil fuel CO₂ emissions is self-evident from attempts to impose a carbon tax: voted down by large margins and cause riots! We instead propose the following: 1. Reduce emissions by reducing the supply of fossil fuels. In the US, terminate new coal/oil/gas leases on public lands and stop all imports/exports of fossil fuels. Prices will increase – reducing consumption and emissions by about 20%. Windfall revenues go to a CO₂ Fund which supports economic dislocation from climate change; 2. Increase awareness of personal CO₂ footprints with a CO₂ Labeling Act. Like food product labels which identify contents, products/services display CO₂ content. Consumers can then buy the lowest-CO₂ item (or even forego the purchase); 3. Implement a personal monthly Quota. Details: Like US rationing during WW2, each person receives an equal monthly CO₂ budget. Purchases reduce their available Quota. If the consumer exceeds their Quota in a month, the price of the item increases with this surcharge also paid into the CO₂ Fund. The Quota system is administered via the country’s banking system. The gap between sustainable and current lifestyles in the USA based on per capita annual CO₂ emissions is about 16 tons vs. estimated sustainable lifestyle CO₂ footprint of 3 tons. The sustainable Quota of three metric tons annually is phased-in over several years; 4. CO₂ Fund provides support to lessen the economic impact of
climate change. Funded by windfall revenues of fossil fuel companies, and Quota surcharges; 5. Public-traded corporations voluntarily agree to remove one gigaton of CO₂ over 15 years, by sponsoring negative emission technologies. By paying in their public-traded common stock, not cash, this is essentially free to the corporate sponsor. Shareholder dilution is recovered as investors move funds into more sustainable companies. Subscribers gain benefit of “bragging rights” – a marketing advantage.

10:50 Hoist By My Own Petard: The Oregon Legislative District Summaries, Dr. ALAN JOURNET (Co-Facilitator, SOCAN, (retired) Professor of Biology and Environmental Science, Southeast Missouri State University).

In the arena of climate change communication, it has long been understood that the best way to reach those who are less aware of the urgency of addressing the cause of global warming is to provide them with a summary of what is happening in their own back yards, what the future holds, and what the impacts might be. Several years ago, I produced a proposal to develop a set of climate change summaries for Oregon that would achieve this goal. The idea that I shipped around to various state-wide environmental organizations was to use the available literature to develop a summary of the climate trends, projections and consequences (including economic) for each Oregon Legislative District. The idea was greeted enthusiastically everywhere, but no-one volunteered, as I hoped they would, to assume the task of developing such a package. Finally, I realized that if this idea were to be actualized, I would need to engage personally and supervise it. In this presentation, I will outline how this was achieved, and how the summaries have been and can be used.

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Symposium: FIRES!!
Room 161
Friday
9:00 a.m. – 11:30

Climate models have been predicting for many years that expected changes in climate will be manifest not only through climate measures (temperature, rain fall, sea water rise, etc.), but also through associated changes in the dynamics of the environment, including the incidence and severity of forest fires. While one can argue that forest fires have always been a component of life especially in the Western United States, the combination of climate change with forest management practices over the last 100 years has now put the west at considerable economic and environmental risk.

This symposium will consider the likely impact of forest fires on the economy and quality of life in the Western United States in general and in the Rogue Valley in particular. The symposium will include information on how local municipalities and businesses are seeking to accommodate or mitigate the threat from forest fires, as well as the outstanding concerns and challenges of forest fires going forward.

Symposium organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu

9:00 Introduction and Welcome: Dr. JAMES M. BOWER, Department of Biology, Southern Oregon University

9:15 How Climate Change Will Impact Our Landscapes...and What We Can Do About It! JOSEPH VAILE (Executive Director, KS Wild).

Climate change is here. Downscaled climate models project hotter, drier summers with more drought conditions and a greater likelihood of wildfire. While there will be annual variability, we can predict the general impacts of warming climate trends on ecosystems in southern Oregon and northern California. We need to act today to take the necessary steps to prepare our communities and the natural world for the changes we know are coming. How will these drier conditions impact the world-renowned biological diversity of the Klamath-Siskiyou Region? How can we manage to mitigate these impacts and give this ecoregion a soft landing to the dramatic climate change we expect to occur? This presentation will take a look at the research on climate projections, explore how climate change will interact with past and present land uses, and suggest climate based land management recommendations for the millions of acres of public and private lands surrounding developed urban areas in this region. These recommendations will focus on biodiversity conservation, maintaining cold water refugia, and increasing forest resiliency, with an emphasis on wildfire and forest management practices.

10:00 Flight of the Phoenix: Out of the Ashes Wildfires Rejuvenate Western Forests, DOMINICK A. DELLASALA, Ph.D. (Chief Scientist, Geos Institute).

Wildfires have shaped the world-class biodiversity of the Klamath-Siskiyou ecoregion and western forests in general for millennia. Large wildfires (landscape scale) produce a patchwork mosaic of burn-severity effects on vegetation ranging from unburned (fire refugia) to large and small severely (>75% tree kill) burned patches with extraordinary levels of biodiversity. This is commonly referred to as “pyrodiversity begets biodiversity.” The high-severity patches within large fire complexes are called “complex early seral forests,” also “charcoal” or “snag forests.” Scientists have only recently discovered that these forests...
have levels of plant, invertebrate, bird, and mammal species richness comparable to old-growth forests, providing habitat for
deer and morel mushrooms, songbirds and bats, smoke-seeking beetles, and imperiled species like Black-backed Woodpecker
and Northern Spotted Owl. This forest type is at risk of widespread logging and fire suppression that is greatly impacting an
underappreciated community of fire-dependent species. Large fires that produce complex early seral forests are often
demonized as “bad fires” because of misperceptions that only low-moderate fires (“good fires”) were historically dominant and
the ensuing tree death in large fires is unprecedented. Consequently, many land managers and politicians are posing untenable
levels of fire suppression and logging that will have severe consequences on biodiversity, ecosystem services, and carbon
sequestration. I demonstrate that wildfires of all burn severities, including large high-severity patches, are at historical lows,
and how logging, including some forms of thinning, can actually increase fire intensity especially in a changing climate. I close
with why we need to get to coexistence with wildfire that is not going away no matter how much fire is politicized or demonized
because it is a self-willed force of nature that will always find its way.

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Symposium: The Opioid Epidemic: Up close and Personal.
Room 162
Friday
9:00 a.m. – 11:30

According to the National Institutes of Drug Abuse, at present, more than 130 people die in the United States every day as a
result of overdosing on Opioids. As most Americans are now aware, the misuse and addiction of opioids, including prescription
pain relievers, heroin and synthetic opioids such as Fentanyl is a serious national crisis that affects public health as well as
social and economic welfare.

This symposium will consider the global structure and nature of the crisis, using mathematical modeling tools, as well as
it’s on the ground, local impact. The symposium will also seek to put the current crisis in the larger context of the history of
drug addiction in the United States.

Symposium organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu

9:00 Opioids: Understanding the Current Epidemic and the Evolving Science of Pain and Addiction Co-Morbidity, Dr.
Darryl Inaba, PharmD, CATC-V, CADC III

The National Institute on Drug Abuse estimates the co-morbidity of addiction and chronic pain to vary widely from 3 to
40%. Those working in either addiction treatment or in the management of chronic pain would usually lean towards the higher
projection of this co morbid disorder. The 2015 NIH White Paper on this subject documents a current epidemic of prescription
opioid addiction and opioid overdose deaths. On October 26, 2017, President Trump declared the Opioid Crisis a Public Health
Emergency with 6-8 Americans dying every hour of an opioid overdose. Iatrogenic opioid addiction once considered to be very
rare in now more common. Treatment of especially opiate/opioid use disorder in a patient with chronic pain continues to be a
very difficult challenge as is the treatment of pain in patients with any substance-related and addictive disorder. A historical
swing between over and under treatment of pain will be considered. Pharmaceutical Industry attempts to produce diversion
resistant opioid medications and how these efforts continued to be thwarted by abusers and/or merely promote the abuse of
heroin and other illicit opioids will be examined. This education track will then review the current increase in opioid overdose
and addiction problems especially in patients treated for chronic pain. The wide range opioid substances currently abused will
also be examined inclusive of Kratom, a non-opioid substance with major opioid effects. Brain imaging of both physical and
emotional pain will be examined. Newer understandings of how hyperalgesia, hyperpathia, hyperkataifeia, allodynia, and opioid
addiction compromise the use of opioids in the treatment of chronic pain will conclude the presentation.

9:50 Which Opioid is Best: A Mathematical Approach, Sam Rivas and Alex Tessner (Department of Mathematics,
University of Portland). (STUDENT PRESENTATION)

In 2016, more than 11 million Americans abused prescription opioids. Of all opioid overdoses, 40% of them were caused
by prescription opioids. The National Institute on Drug Abuse considers the opioid crisis a national addiction epidemic, with
this epidemic impacting an increasing number of people each year. Using the framework from mathematical modeling of
infectious diseases, we create and analyze an opioid-abuse model that includes the four most commonly prescribed opioids.
We use this model to study the relative effects on the overall crisis of each of these opioids.

10:10 Why Decreasing Prescriptions has Increased Overdoses: A Mathematical Approach, Eli E Goldwyn
(Department of Mathematics, University of Portland)

Drug overdoses are now the leading cause of death of Americans under age 50, with two-thirds of those deaths coming
from opioids. Unlike many other illicit drug epidemics, opioid addiction is widely believed to be caused by legally prescribed
medications. Paradoxically, a recent decrease in prescription opioids has caused an increase in overdoses, likely due to a
corresponding increase in heroin and fentanyl. Using mathematical modeling techniques from the study of infectious diseases, we examine this paradox to better understand the driving forces behind addiction and overdose rates.

10:30 – 10:45  BREAK

10:45  Quantifying the Impact of the Opioid Epidemic in Native American Communities, K.E. FISCHER\(^1\)\(^2\) and HON. A. ABINANTI\(^1\)(Yurok Tribe, Klamath, CA; \(^2\)Department of Biology, University of Alabama at Birmingham, Birmingham, AL).

Opioids and polysubstance abuse have had a devastating impact on Native American communities. Nationwide, deaths involving opioids among Native Americans increased more than 500% between 2000 and 2016. In 2016, the opioid-related overdose death rate among Native Americans was 13.7 per 100,000, compared to the national rate 13.1 per 100,000. Here we quantify the impact of opioids and polysubstance abuse on Native American communities, with a special focus on the Yurok Tribe.

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Room 233
Friday
9:00 a.m. – 11:45

During the first two decades of the twentieth century four expositions were held on the Pacific Coast, Portland (1905 Lewis and Clark Exposition), Seattle (1909, Alaska-Yukon-Pacific Exposition), San Francisco (1915, Panama-Pacific International Exposition), and Diego (1915-1916, Panama-California Exposition). In the context of these fairs, this symposium will consider how the American West thought of itself and its conscious effort to dispel eastern perceptions of the West as an untamed, wild, and uncivilized frontier shaped the four fairs and the exposition promoters’ efforts in what they displayed. Themes of economic opportunity, the natural world and environment, and race, were shown throughout the fairs, proclaiming to visitors that the region west of the Rockies represented the future of the United States.

Symposium organizer: Dr. Alan L. Bain (National Anthropological Archives, Smithsonian Institution)

9:00  Introductory Comments, ALAN BAIN


10:40  Questions and Answers/General Discussion.


11:30  Questions and Answers/General Discussion

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Symposium: Reduce, Reuse, recycle: SUSTAIN!!!

Room 236
Friday
9:00 – 11:30

While many attribute the movement to recycle to the start of the modern environmental movement in the 1970’s, in fact, it can be argued that creative reuse of materials by humans almost certainly dates back thousands of years, especially for scarce commodities. However, in the 1960s and 70’s, the focus shifted from getting the most out of materials to an effort to deal with the massive amounts of waste produced during the second half of the 20\(^{th}\) Century. 50 years later, the focus appears to be
shifting again towards the larger and more complex task of resources sustainability, with its many interrelated components and parts.

This symposium will consider current efforts to achieve resource sustainability as applied to several different types of institutions both public and private. Presentations will specifically focus on the challenges and opportunities represented in several local efforts to promote long term resource sustainability.

Symposium organizer: Dr. James M. Bower, Department of Biology, Southern Oregon University: bowerj@sou.edu

9:00  Real World Recycling - Challenges and Opportunities Working Towards Zero Waste in Retail Grocery, RIANNA KOPPEL (Sustainability Coordinator at the Ashland Food Co-op).

The Ashland Food Co-op adopted four sustainability goals in 2009, driven by our member-owners. One of the most important goals to our owners is Zero Waste. How can a natural foods retail grocer make a sustainable impact on the recycling market? What does real world diversion from landfills look like? Do customers actually recycle?

This presentation offers an authentic look at the challenges and opportunities of moving towards zero waste from the ground up. Plastic is a major concern of consumers, and is systematically integrated into almost every aspect of food production and food grade safety. How can local grocers make choices towards a sustainable future with less plastic in the face of regional, national, and international recycling regulations? What do we prioritize, knowing the economic costs and needs of our business?

Learn more about the real world application of plastics and recycling for the everyday necessity that is food production, transport, and safety. There will be time for discussion at the end of the presentation.

9:30  Clean and Green: Increasing Sustainability and Security in US Prisons and Jails, PAUL SHELDON

In the last 10 years, America’s prisons and jails have discovered that sustainability-oriented and environmentally-responsible practices can a) save money; b) produce innovative income streams; c) increase security for staff and people in custody; d) increase public safety by reducing recidivism. Since 2009, the American Correctional Association has taken a leading role to promote recycling, energy efficiency, water efficiency, composting, gardening, transportation efficiency, hydroponics, aquaponics, and related job training for people in custody. This interactive presentation will include examples from correctional institutions across America, by Paul Sheldon, M.A., who serves as a founding member of the American Correctional Association’s Advisory Committee on Sustainability-oriented and Environmentally-Responsible Practices in Corrections, through which he served as primary author for the American Correctional Association’s Policy and Audit Standard on Sustainability-Oriented Practices used by correctional institutions throughout North America. Mr. Sheldon is also an active member of the North American Association of Wardens and Superintendents and an Advisor to Natural Capitalism Solutions, for whom he has written scholarly reports on energy and economic alternatives to coal plants and more inclusive alternatives to triple-bottom-line thinking.

10:00  Climate Action at SOU and the City of Ashland, ROXANE BEIGEL-CORYELL (Sustainability and Recycling Manager, Southern Oregon University).

The science is in, climate change is real. So what are we doing about it? Join us for a presentation about the plans and actions Southern Oregon University and the City of Ashland have in place to address climate change. Learn more about how climate action rose as a priority for SOU and Ashland, what goals they are chasing, some of the actions being proposed and/or taken to reduce greenhouse gas emissions, and more.

10:30  Food Waste Reduction for Climate Mitigation, ANGELINA COOK (Ashland Drawdown).

If society is to reverse our collective greenhouse gas (GHG) emission trajectory, practical alternatives to carbon intensive industry and lifestyle choices must be available at the local level. While the ramifications of atmospheric carbon loading demand action from the highest levels of government, America’s response to the global climate crisis has been woefully inadequate and communities can no longer wait for solutions to come from the top-down. Thankfully, the City of Ashland has exhibited foresight and leadership by mandating GHG emission reductions from the ground-up through its Climate & Energy Action Plan (CEAP). An anthology called “Drawdown” features 100 of the most powerful ways humans can combat climate collapse. According to the book, reducing food waste is the 3rd most potent option for removing excess GHG emissions from the atmosphere. In addition to generating multiple environmental and economic benefits, innovative food solutions offer some of the most cost-effective climate mitigation tools available to businesses and households. Community groups in southern Oregon are collaborating to improve efficient food systems in the Rogue Valley. By connecting efforts already underway, and bridging gaps where necessary, we aim to prevent waste where possible, recover waste where practical, increase affordable access to local food, and accelerate realization of the City of Ashland’s climate goals.

11:00  Recycle, Re-Use, Reduce, Refuse and Remove: Obstacles and Answers to Creating a new Materials Recycling Movement, CATIE FARYL

There is a great need to consider our attitudes and treatment of many, many materials and outdated systems, attitudes and beliefs that are contributing to the climate crisis. There are habits to be changed, obstructions to be removed and emerging businesses to be supported in order to create a new social order of responsibly addressing the reality that “There is no Away”! We still have only this one precious, pale blue planet to sustain us! We will explore the need for better recycling facilities short
term, identifying domestic markets, and reducing polluting packaging in favor of new and ancient replacements, helping advance legislation to create funding and remove obstacles to innovation and common sense, and re-educating the public about how to apply the reduce, refuse and remove slogan to energy use, consumption and other aspects of everyday life. After sharing some exciting possibilities, Catie will offer an overview of what consumers, businesses, community groups, elected officials and legislators can do to restore tried and true practices, create new ones and embrace actions that makes sense environmentally, economically and for climate justice – a tall task for a 20 minute presentation!

II. Pacific Division Review and Celebration Meeting
   Room 151 Science Building
   11:45 – 12:15
CONTRIBUTED ORAL TALKS  
(Science Building)  

WEDNESDAY, 19th June 2019  

Room 210 Science Building  
Wednesday  
9:30 a.m. – 3:30 p.m. 

Earth Sciences Section  

Section chair and program organizer: Dr. Jad D’Allura, Department of Geology (emeritus), Southern Oregon University, Ashland, OR; dallura@sou.edu and rockit526@gmail.com (copy e-mail to both accounts).  

9:30 Effects of Legalized Cannabis on Water Resources of Southwestern Oregon, MICHAEL THOMA*, JAKE JOHNSTONE, SHAVON HAYNES, and JOE KEMPER (Oregon Water Resources Department, Salem, OR; Michael.J.Thoma@oregon.gov).  

In 2015, Oregon legalized the use, sale, and production of recreational cannabis across the state while allowing individual counties the option to regulate time, place, and manner. The new law further requires that cannabis producers have a legal source of water in order to obtain a license to sell their products commercially. Thus with legalization came a sharp increase in the demand for water, especially in Southwest Oregon where the climate and general public opinion are ideal for fostering cannabis production. Most surface water in the region has already been closed to further appropriation so the requests for legal water sources came to groundwater. The Oregon Water Resources Department (OWRD) saw an increase in the number of applications for groundwater from an average of 4 applications per year prior to 2015 to over 100 applications in 2016-2018. While not all applications were approved, OWRD has permitted 74 new irrigation and nursery water rights totaling 4.85 cubic feet per second of groundwater production since 2016 (roughly a 16% increase in permitted groundwater use). In response to the increase in groundwater use, OWRD began applying water-level measurement and water-use reporting conditions on all new groundwater rights in addition to continuing its own regional groundwater level network. Despite the increased demand for water, groundwater level data across Southwest Oregon has shown no significant changes between 2016 and 2019. The fact that no significant change has been observed in groundwater levels is due to the nature of the aquifer throughout the region, namely: 1) pumping impacts are localized and well yields are comparatively low, 2) there is efficient connection between groundwater and surface water so much of the impacts from new groundwater use will be to surface water.  
Keywords: groundwater, Cannabis, geology, resource-management , Rogue Basin  

10:00 Commingling of Columbia River Basalt Group Aquifers: A Challenging but Solvable Problem, KENNETH E. LITE, JR. (Retired Hydrogeologist, Portland, Or 97239; crbgaqua10@gmail.com).  

Groundwater levels are declining markedly in Columbia River Basalt Group (CRBG) aquifers throughout the Pacific Northwest. Declines exceed 100 meters in some areas, and management strategies have mostly been ineffective. Research has shown that a principle cause of the declines is depressurization of aquifers through intraborehole flow in improperly constructed wells that allow commingling.  

Effectively managing well construction (to reduce commingling) requires a thorough understanding of the CRBG aquifer systems, which is not yet developed in many areas. It also requires increased institutional fortitude and resources from regulatory agencies charged with setting and enforcing well construction standards.  

Research in the Mosier Creek basin, a small watershed that is tributary to the Columbia River in North-Central Oregon, has documented the impacts of commingling in a CRBG groundwater flow system and led to an approach to alleviate the problem. Groundwater levels in CRBG aquifers in the Mosier area have declined 44 meters during the past 45 years. Declines have resulted in the loss of flowing artesian conditions in some wells, reduction in yields rendering some wells inadequate for their intended uses, drying of parts of aquifers, and reduced streamflow to Mosier Creek. The Mosier Watershed Council, Wasco County Soil and Water Conservation District, and Oregon Water Resources Department have been working together to address commingling by: 1, establishing Special Area Well Construction Standards to ensure new wells are constructed to prevent commingling, and 2, providing incentives for owners to repair or abandon (i.e., seal) existing commingling wells. These approaches have required cooperation and support of local water users, and their implementation has benefitted from considerable scientific investigation. Although promising, continued monitoring of groundwater levels and groundwater discharge to streams will be necessary to judge the effectiveness of the approaches.  
Keywords: CRBG, aquifers, groundwater, commingling, Mosier
The geology of the Williams Creek Watershed is composed of Klamath Mountain accreted terranes made up of volcanically derived sediments, volcanic island arcs, and granitic plutonic rocks. The eastern part of the watershed is composed of metavolcanic sediments and quartzites of the Applegget Group. Plutonic rocks of gabro, quartz diorite, and diorite form a central north-south trending zone of multi-phase granitcs that include the highlands of Grayback Mountain as well as the deeply eroded central part of the valley floor. The western ridges are composed of basalt, ultramafics, volcanic sediments, and marble lenses that are a part of mélange of accreted volcanic archipelagos of the Pacific tectonic plate. These terranes are separated by old subduction faults containing mylonites and other metamorphic rocks. The presence and distribution of groundwater in the watershed is perhaps the most important aspect in making the Williams Valley a livable and naturally productive environment. Groundwater movement is controlled predominantly by the nature of rocks that underlie the surface, the topography of the basin, and geologic controls and boundary conditions. Groundwater generally moves slowly down gradient under the influence of gravity through rock and soils at differing rates depending on the physical characteristics of the unconsolidated and consolidated earth materials. This study develops an overall model that charts the location and movement patterns of groundwater within the watershed.

Keywords: Klamaths, Grayback, accreted, mélange, groundwater

11:00  

**Pseudotsuga** (Douglas Fir): Oregon’s Tree, **JEFFREY A. MYERS**¹, **DIANE M. ERWIN**², and **HOWARD E. SCHORN**² ¹Western Oregon University Department of Earth Science, Western Oregon University, Monmouth, OR, myersj@wou.edu; ²University of California, Berkeley, Museum of Paleontology, Berkeley, CA.

Douglas Fir (*Pseudotsuga*) is one of the most important timber trees in North America. Fossil occurrences of the genus have been reported from as early as the Cretaceous and from dozens of localities in western North America and Eurasia. Here we reevaluate and revise the fossil record of *Pseudotsuga* in order to establish the chronology and pattern of its diversification and changing distribution. A revision of the megafossil record found that the majority of specimens identified as *Pseudotsuga* were either incorrectly identified or too poorly preserved to be identified. All unequivocal records in western NA and eastern Asia occur within the present range of the genus, and virtually all reports from throughout the Great Basin and high elevations of the west (including the Sierra Nevada) are incorrect. The oldest known occurrence is from the ~ 32 Ma Rujada Flora of the Western Cascades east of Cottage Grove, Oregon. *Pseudotsuga* is sparsely represented throughout the Neogene of Oregon and Idaho, and, slightly later, California. These fossils closely resemble the two extant North American species: *P. macrocarpa* (32 Ma to present) and *P. menzeisii* (14 Ma to present). The genus first appears in the Eurasian fossil record in the early Miocene. While all North American fossil and extant occurrences of *Pseudotsuga* possess leaves with acute apices, all Asian fossil and living forms have emarginate apices, suggesting that *Pseudotsuga* originated in the wet, warm temperate Pacific Northwest and migrated to Eurasia during the early Miocene. In North America the genus expanded its range into drier regions of California and the interior NA west in the middle or late Miocene. This contrasts with earlier studies in which the genus was interpreted to have been widespread throughout the west through the middle Miocene and became increasingly restricted in its range as western NA climate cooled and dried.

Keywords: Douglas Fir, Paleobotany, Cenozoic, Conifers, *Pseudotsuga*

11:30  

**Preliminary Volcanic Geology of the Northern Portion of the Extended Cascade-Siskiyou National Monument, Southwestern Oregon, JAD D’ALLURA** (STEM, Chemistry Department, Southern Oregon University, Ashland, OR; rockit526@gmail.com).

Oligocene to Lower Miocene volcanic rocks of the Western Cascade Volcanic Series and Upper Miocene to Quaternary High Cascade rocks comprise the northern portion of the Cascade-Siskiyou National Monument. A small portion of continental braided stream rocks of the Upper Eocene Payne Cliffs Formation are overlain by volcaniclastic rocks presumably equivalent to the medial fan facies of the Oligocene Colestin Formation. Those rocks grade upward into rocks increasingly dominated by lava flows and breccia of medial to proximal volcanic facies that comprise the Upper Oligocene Roxy Formation. The compositions of those rocks, likely belonging to several volcanic centers, range from dominantly basaltic andesite through andesite, dacite, and rhyolite. An abrupt change in character occurred during the Early Miocene when voluminous rhyolitic and dacitic volcaniclastics of the Wasson Formation were erupted. Bimodal composition (basaltic andesite and silicic andesite to dacite) volcanic centers typify this unit. Rocks of the Lower Miocene Heppsie Formation herald a return to basaltic andesite compositions constructing shield volcanoes and broad proximal facies breccia deposits. The upper part of the formation is marked by a return to more violent eruptions typified by higher alkali content than earlier. Units dominated by weak, easily eroded pyroclastic flows (Wasson and upper Heppsie Formations) are prone to massive landslides.

Basalt and basaltic andesite lava erupting from fissure and local vents dominate Upper Miocene to Quaternary High Cascade volcanism, the flows of which unconformably overlie gently NE-dipping rocks of the Western Cascade Series. Both Cascade Series are cut by NE-trending faults close to Bear Creek Valley changing to oblique movement NW-trending faults toward the west. Both the latter set and a later normal movement NW-trending set affect High Cascade rocks and serve as conduits for volcanism.

Keywords: geology, southwest Oregon, Western Cascade volcanic rocks, High Cascade volcanic rocks, Cascade-Siskiyou National Monument
12:00 – 1:30 Lunch

1:30 Recently Reported Oregon Dinosaurs. GREGORY J. RETALLACK (Department of Earth Sciences, University of Oregon, Eugene, OR; gregr@uoregon.edu).

Before October 2018, there were no confirmed dinosaurs from the state of Oregon, but by the end of that month there were two. One of these is a toe bone of a large (5.1 m long and 678 kg live weight) ornithopod from near Mitchell, Oregon, found by Greg Retallack. Associated ammonites give a very precise age of about 103 Ma (early Albian, Early Cretaceous), and also indicate that it was from a disintegrating carcass that drifted out into the ocean. The Mitchell ornithopod is a pedal phalanx lacking collateral pits and girdling sulcus of most dinosaur toe bones, but has lateral lappet basins like large ornithopod dinosaurs. The age of the Oregon toe bone is between that of well-known Tenontosaurus and Eolambia from Utah and Wyoming. Associated fossil plants in the same marine shales are evidence of a coastal redwood forest like that of modern Redwoods National Park. A further similarity with Northern California today, are the gravelly sediments of shingle beaches and alluvial fans from nearby sea cliffs.

A second report in October was a sacrum of an equally large ornithopod from marine sandstone of Cape Sebastian, found along with ammonites and inoceramids dated to about 74 Ma (late Campanian, Late Cretaceous). This specimen was first discovered in 1969 by Don Savage of Berkeley, and collected in 1994 by David Taylor, but preparation from its very hard matrix was completed recently. It has eight co-ossified vertebras, an undulose iliac bar, and tall strut-like sacral ribs fused centrally to the centra. The most similar known sacra are those of hadrosaurine duckbills of the genus Kritosaurus. Associated fossil leaves are evidence of broadleaf forest flanking shallow marine or shore-face sandstones of a low gradient coastal plain.

Keywords: dinosaur, Oregon, age, Early Cretaceous, environment

2:00 Geology of the Mount Whitney Intrusive Suite, Eastern Sierra Nevada, California, WILLIAM HIRT (Biological and Physical Sciences, College of the Siskiyous, Weed, CA; hirt@siskiyous.edu).

The Mount Whitney Intrusive Suite (MWIS) consists of three nested granitic plutons and several related dikes that were intruded along the eastern margin of the Sierra Nevada batholith from 90.6–82.6 Ma. Cenozoic uplift and erosion have created three kilometers of local relief that permit study of compositional and textural variations in this composite intrusion that may help us understand the origins of “supervolcanic” magma reservoirs.

Initial Sr and Nd isotopic compositions indicate the MWIS’s magmas were mixtures of Proterozoic North American continental crust and mafic magmas that rose from an underlying subduction zone. Younger members are progressively more felsic and isotopically evolved, suggesting that crustal contributions increased over time as a zone of partial melting and hybridization developed at depth.

Although the suite’s oldest member consists of several discrete intrusions that apparently underwent limited internal differentiation, its youngest grades continuously to more felsic compositions upward towards its roof on a scale of hundreds of meters. This transition suggests warming of the upper crust during the suite’s growth slowed the cooling of successive magma batches, enabling them to mix and form differentiable reservoirs. 2-D thermal modelling supports this interpretation, predicting that the times required for successive intrusions to cool to ‘critical crystallinity’ increased from a few thousand to >100,000 years during the suite’s growth. High in the two younger plutons interstitial melts were segregated into subhorizontal sheets as crystal-rich solidification fronts pulled away from the roofs of growing magma reservoirs.

U/Pb zircon ages indicate that the MWIS’s two younger members consist of at least three intrusions that crystallized at 87.6, 86.4, and 84.7 Ma. Abrupt increases in enclave abundance across contacts between these intrusions suggest that their ascents were triggered by episodic injections of mafic magma that added heat and volatiles to a gradually-evolving volume of felsic magma at depth.

Keywords: Sierra Nevada, granite, pluton, igneous petrology, geochronology

2:30 Geology Controls the Landscape of the Rogue Valley, Southwest Oregon, KAREN GROVE (Professor Emerita, Department of Earth AND Climate Sciences, San Francisco State University, San Francisco, CA, currently: Ashland, OR; kgrove@sfsu.edu).

The Rogue Valley is a low feature in the landscape because the sedimentary rocks that underlie it are less resistant to weathering and erosion than the rocks in the adjacent ridges. All geologic units tilt northeastward; thus, oldest rocks are to the southwest and they are progressively younger to the northeast.

To the southwest, ridges are part of the Klamath terrane that comprises fault-bounded blocks formed as offshore volcanic island chains that accreted to the continent during the Paleozoic and Mesozoic Eras. Between these blocks are fragments of oceanic crust and overlying sediments that were caught up in the collision of successive volcanic island chains. Rocks were metamorphosed during the collisions, and blocks were “stitched” together by the intrusion of Jurassic-aged granitic masses such as the Ashland pluton.

Overlying the Klamath terrane, and underlying the Rogue Valley, are sedimentary rocks of the Hornbrook Formation that formed during the Cretaceous Period around 100 Ma. The oldest sediments are non-marine, but the region was soon covered by ocean water that got progressively deeper with time. The Hornbrook is mostly highly erodible mudstone that creates the valley.

The Payne Cliffs Formation, which overlies the Hornbrook, was deposited by rivers about 40 Ma. There is no record of the intervening retreat of the ocean. Plant fossils in the Payne Cliff indicate a warm, tropical climate. This unit makes up the
foothills of the northeast ridge and is overlain by volcanic rocks of the Western Cascades that was active around 35-20 Ma. These rocks are more resistant to erosion and create the northeastern ridge.

After Western Cascade volcanism ceased, contraction tilted all units to the northeast and created the valley’s orientation. Volcanism resumed around 7 Ma, but these High Cascade volcanoes are located eastward of the Western Cascade volcanoes.

**Keywords:** Hornbrook Formation, Payne Cliff Formation, Klamath terrane, Western Cascades, Rogue Valley

### 3:00 Using Custom-Built Parks and Climbing Walls to Teach Earth History, LEONARD I. EISENBERG (223 Granite Street, Ashland, Oregon 97520; evogeneao@gmail.com).

Briscoe Geology Park uses landscaping, custom tile work, rocks and fossils, replica trackways, and interpretive signs to teach earth history and local geology. Three time walks represent different slices of earth history, scaled to show period details. Landscaping reflects the evolution of plants during the Phanerozoic. Custom tile work shows species characteristic of each period, their size and scientific name; when mass extinctions and ice ages occurred; ages and names of geologic periods; world tectonic maps; and episodes from local geology. Interpretive signs provide information on evolution, plate tectonics, local geology and mass extinctions. An educational program of classroom visits and field trips to the park has been successfully used since 2008. At the park students receive an age-appropriate activity sheet, questions on which are answered using a ‘treasure hunt’ style quest for information using all features of the park. Briscoe Geology Park was built and funded by volunteers, with the help of Ashland Parks Department, and is an official city park.

The ‘Climb through Time’ geologic climbing wall is an outdoor, transverse climbing wall sculpted and painted to resemble tilted rock layers. Each layer represents a geologic period, whose thickness is proportionate to its duration in millions of years, and in which sculpted fossil replicas show life characteristic of the period. Rock layers are sculpted and painted to reflect rock types characteristic of geologic periods of the western USA. Names and ages of geologic periods are identified above each layer. Climbing becomes more difficult at mass extinctions, so that visitors experience ‘extinction’ when they fall off. Interpretive signs explain geologic time, evolution, and provide detail on each of the fossil species represented on the climbing wall. Climbers are challenged to complete the climb without going ‘extinct’, and to locate all the fossil replicas on the wall.

**Keywords:** Earth history, geology, outdoor education

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Room 123 Science Building
Wednesday
1:30 p.m. – 4:10 p.m.

**Evolution, Organismal Biology, and Biodiversity Section**

Section chair and program organizer: Dr. Julia Ruppell, Department of Biology, University of Portland, Department of Biology, Portland, OR; ruppell@up.edu.

### 1:30 DNA Barcoding of Invertebrates from the Great Salt Lake Ecosystem, SABRINA HANEY* and JONATHAN CLARK (Department of Zoology, Weber State University, Ogden, UT; sabrinahaney19@gmail.com, jclark1@weber.edu).

(STUDENT PRESENTATION)

The Great Basin is the largest endorheic watershed in North America, encompassing an area of 295,000 km². Among the dominant features of this extensive region is Great Salt Lake (GSL), in northern Utah. GSL is the fourth largest terminal lake in the world, with a surface area of 4200 km² and an average elevation of 1280 m. The lake is a fascinating example of an extreme environment, with salinities in some regions exceeding 20%. Invertebrates, including brine flies and brine shrimp, are the dominant animals in the lake’s waters and are important for supporting a population of birds estimated at over 7 million individuals. This study uses mitochondrial cytochrome c oxidase I DNA barcodes to examine the diversity of other invertebrates associated with the GSL ecosystem. DNA barcoding is the international standard for species identification based on genetic comparisons and provides an estimate of species diversity and distribution. Invertebrates were collected from the lake, the rocky shoreline and adjacent vegetation and the samples sorted based on gross morphology and DNA barcodes determined by polymerase chain reaction and sequencing. The sampling included arachnids, insects, and crustaceans and within each group individuals were identified to the genus and species level using phylogenetic analysis. The barcoding reveals a surprising diversity of invertebrates, many of which have not been previously described from the GSL ecosystem. Sequence comparisons were also used to examine the degree of genetic differentiation among individuals from the same species. This study represents one of the few assessments of invertebrate biological diversity from an extreme environment and may have implications for how to manage a natural resource under increasing pressure from human activities.

**Keywords:** DNA barcoding, invertebrate diversity, extreme environment
While not a party to the Convention on Biological Diversity, the United States has laws to protect species from extinction, most notably the Endangered Species Act. Its focus on recovering species already in serious decline is fraught with challenges. Using a case study of the Greater Sage-Grouse (Centrocercus urophasianus) with which the author has both programmatic and policy experience, this paper will highlight difficulties in relying on species recovery to conserve biodiversity. More recently, Congress directed the U.S. Fish and Wildlife Service to require states to identify species in greatest conservation need and develop State Wildlife Action Plans to qualify for State and Tribal Wildlife Grants. These state plans, first developed in 2005 and updated in 2015, have eight required elements that focus on monitoring and prevention of species decline. States tally species in greatest conservation need and ecological systems of concern with plans for conservation. These efforts are only five percent funded by the available grant funding. The Recovering America’s Wildlife Act before Congress is an attempt to provide needed funding to support states’ implementation of their wildlife action plans.

The views expressed are those of the author and not the Washington Fish and Wildlife Commission

Keywords: biodiversity, ecosystem, recovery, prevention, policy

Ecology, Environmental Sciences, and Sustainability Section

Section chair and program organizer: Dr. Richard Van Buskirk, Environmental Studies, Pacific University, Forest Grove, OR; vanbuskirk@pacificu.edu.

Further Characterization of Some Extended-Spectrum Beta-Lactamase-Producing Coliforms and Their Plasmids, JORDAN M. CLAWSON*, JACOB McWHORTER, ANNAKARINA THORNOCK, JEREMY ORELLANA, ABIGAIL KOVASH, and RUHUL KUDDUS (Department of Biology, Utah Valley University, Orem, UT; jomarclaw@gmail.com, 10732844@my.uvu.edu, akthornock@gmail.com, jeremy.orellana@yahoo.com, 10791804@my.uvu.edu, ruhul.kuddus@uvu.edu). (STUDENT PRESENTATION)

Background: Extended-spectrum beta-lactamase (ESBL)-producing pathogenic coliforms are serious public health threats. We collected ESBL-producing coliforms from wastewater and characterized the isolates for resistance genes and plasmids. Materials and method: Wastewater samples were serially diluted and plated on HardyCHROM ESBL and blood or MacConkey agar plates. Colony forming units (CFU)/ml were counted after incubation. Some isolated colonies were characterized biochemically. Selected colonies were grown in LB broth containing ampicillin and DNA was extracted. PCR was conducted using primers specific for the beta-lactamase genes CTX, GES, SHV, TEM, and VEB. The PCR amplicons and untreated or S1 nuclease-treated crude plasmid DNA were analyzed by gel electrophoresis. Results: Wastewater bacteria able to grow on ESBL plates ranged between 1.88 x 10^4 and 7.20 x 10^4 CFU/ml. Comparison of CFU/ml on MacConkey and ESBL plates indicated that about 0.4% to 4% of coliforms are ESBL-producers. About one-third of tested colonies were found to harbor small plasmids (about 2 to 20 kb). The presence of large plasmids is currently being investigated. The fraction of tested colonies positive for different beta-lactamase genes were GES (41%), CTX (27%), TEM (23%), SHV (18%), and VEB (0%). The fraction of colonies positive for one, two, three, and four of the beta-lactamase genes were 32%, 27%, 4.5% and 0%, respectively. Disc diffusion test indicated that some colonies were also resistant to certain aminoglycosides, tetracyclines, macrolides, quinolones, aminocoumarins, and bacitracin. Conclusions: ESBL-producing coliforms are abundant in the raw sewage of Utah Valley. Some of the ESBL-producing isolates carry one or more of the four common beta-lactamase genes and some of the isolates are multi-drug resistant. Further investigations into the genomics and environmental sources of the ESBL-producing coliforms is warranted.

Keywords: antibiotic resistance, extended-spectrum beta-lactamase, coliforms, bacterial genomics, public health

Habitat–Community Ecology Value Rigidity Traps, STEVEN P. FERRARO (Retired, Newport, OR; steveferrararo@peak.org).

Value rigidity traps are strongly held beliefs that block cognitive understanding. The South Indian Monkey trap is an example. It employs value rigidity, specifically, the high and unyielding value monkeys place on food, to trick them into being trapped by their own volition. Ecologists fall into value rigidity traps when they operationally define core ecological concepts, such as habitat and community, based on principles of scientific philosophies and schools of thought that are ill-suited for the purpose. For example, since habitats and communities are human constructs and not natural kinds, the principles of epistemology are suitable in habitat–community ecology while those of organicism are not. Reductionism can also lead to value rigidity traps. For example, one ecological school of thought deems abiotic, biotic, elemental and synthetic environmental factors acceptable habitat characters, whereas another deems only abiotic and elemental environmental factors acceptable. Consequently, adherence to the latter school of thought is a value rigidity trap in ecosystems where biotic or synthetic environmental variables are critical habitat characters. It’s also a clear case of “greedy reductionism,” i.e., reductionism driven by a hypothetical ideal (e.g., the notion that since all biotic factors are hypothetically reducible to abiotic factors, abiotic factors are ideal) rather than its utility in predicting natural phenomena. As value rigidity traps are insidious impediments to scientific progress, the situation begs the question: What can be done about them? First and foremost, scientists should be on the look-
out for them with deliberateness and an open mind. In addition, the operative philosophy and school thought along with their assumptions and constraints should be reported in publications for clearer and fuller methodological disclosure, to provide the groundwork for comparative analyses of the efficacy of the different philosophies and schools of thought, and to expose value rigidity traps.

**Keywords:** value rigidity traps; habitat; epistemology; organicism; reductionism

2:50  **Five Ideas To De-Carbonize The Global Economy.** PHILIP W. KITHIL (CEO Ocean-based Climate Solutions, Inc., Santa Fe, NM; oceanbased.pk@gmail.com).

The difficulty in solving the “wicked problem” of fossil fuel CO$_2$ emissions is self-evident from attempts to impose a carbon tax: voted down by large margins and cause riots! We instead propose the following:

1. Reduce emissions by reducing the supply of fossil fuels. In the US, terminate new coal/oil/gas leases on public lands and stop all imports/exports of fossil fuels. Prices will increase – reducing consumption and emissions by about 20%. Windfall revenues go to a CO$_2$Fund which supports economic dislocation from climate change.
2. Increase awareness of personal CO$_2$ footprints with a CO$_2$ Labeling Act. Like food product labels which identify contents, products/services display CO$_2$ content. Consumers can then buy the lowest-CO$_2$ item (or even forego the purchase).
3. Implement a personal monthly Quota. Details: Like US rationing during WW2, each person receives an equal monthly CO$_2$ budget. Purchases reduce their available Quota. If the consumer exceeds their Quota in a month, the price of the item increases with this surcharge also paid into the CO$_2$Fund. The Quota system is administered via the country’s banking system. The gap between sustainable and current lifestyles in the USA based on per capita annual CO$_2$ emissions is about 16 tons vs. estimated sustainable lifestyle CO$_2$ footprint of 3 tons. The sustainable Quota of three metric tons annually is phased-in over several years.
4. CO$_2$Fund provides support to lessen the economic impact of climate change. Funded by windfall revenues of fossil fuel companies, and Quota surcharges.
5. Public-traded corporations voluntarily agree to remove one gigaton of CO$_2$ over 15 years, by sponsoring negative emission technologies. By paying in their public-traded common stock, not cash, this is essentially free to the corporate sponsor. Shareholder dilution is recovered as investors move funds into more sustainable companies. Subscribers gain benefit of “bragging rights” – a marketing advantage.

**Keywords:** climate change, CO2 emissions, sustainability, fossil fuels, negative emissions.

3:10  **‘Tis A Time for Transformation in Earth and Environmental Sciences Education – NGSS, CTE, and STEM.** PAUL H. RUSCHER (Science Division, Lane Community College, Eugene OR; ruscherp@lanecc.edu).

Across the west, the natural landscape and ecosystems present provide opportunities for critical examination in pedagogical settings, yet structurally, we have not recognized this fact in our systems for preparing future teachers, implementing new national science standards in K-12 arena (the Next Generation Science Standards, NGSS), or in recognition of the value of the geosciences and environmental sciences to core degree components as well as major programs of study. Geology and Natural Resources programs have been eliminated at the Bachelors level while interest in ecosystem and public health, renewable energy, climate change, geophysical hazards, and habitat loss grows.

Public interest is very high across the geosciences and in environmental issues, and these topics are enmeshed in the NGSS area of earth and space sciences. Yet, in Oregon, which was a leader in the development and implementation of NGSS, it is typical for programs to emphasize biology, chemistry, and physics only, with a few bones thrown in for the earth sciences. There is also no teacher certification for earth science or environmental science in the state. Another emerging trend in Oregon recognizes increased value in the Career Technical Education (CTE) fields, which are often not associated with STEM.

I advocate here for inclusive and more deliberate linkages between CTE and STEM (Science, Technology, Engineering, Mathematics), something which is already being advanced in the state’s STEM hubs, for example, but may not yet be fully developed within the higher education systems. Too many influential stakeholders view STEM pathways narrowly, in a calculus-based educational framework, neglecting some desirable pathways in allied health professions, advanced technology, or field-based programs in natural resources and agriculture. This is important for all of STEM and CTE. I will survey some of these issues and solutions, and seek input for systemic action at the state level.

**Keywords:** geoscience, STEM, CTE, climate change, education

3:30  **Engaging Students in Social Science Research Practice through a Local Environmental Movement.** JESSICA PIEKIELEK* and WALLACE BAKER (Department of Sociology and Anthropology, Southern Oregon University, Ashland, OR; piekie1j@sou.edu, bakerrw2@sou.edu).

High impact practices in higher education, including service learning and undergraduate research, are lauded for engaging undergraduate students in critical thinking, communication, and problem- or question-based inquiry. They also pose pedagogical and other challenges to students and instructors. In a sociology and anthropology class on environmental movements, students conducted participant observation within a local movement opposing construction of an LNG pipeline-the Jordan Cove Project- in southern Oregon. The case served as an example for exploring environmentalism, social movements, and social-environmental change. In this paper, we share instructor and student reflections on a local environmental campaign; on research and activism; and on the potentials and pitfalls of engaged, hands-on learning exercises.

**Keywords:** environmental movements, undergraduate research methods, community engagement
An Unorthodox view of Belief – Why People Believe What They Do and How to Change Beliefs, DAVID RABINOWITZ (Corvallis, OR; rabinowd@oregonstate.edu).

People believe what they choose to believe and then select or invent evidence which supports their beliefs and ignore or misinterpret evidence which contradicts their beliefs. Everyone does it, me, you and Albert Einstein. This talk, based on a longer presentation to the Academy for Lifelong Learning, examines how people choose what to believe, and effective approaches to get people to change their beliefs. Today there is a lot of distrust of science, and the approaches generally used by scientists to persuade people do not address the actual reasons for their beliefs and have generally been ineffective. This talk
explains why these approaches don't work and provides alternative approaches for scientists and others to effectively communicate their ideas in ways which can lead to changing beliefs. The basic ideas are that science is inherently uncertain and that some people are very uncomfortable with uncertainty and seek certainty from various sources. These sources enlist other people who can handle uncertainty to join them for social reasons (belonging and loyalty). Once someone is part of such a group, their beliefs align with the group's and are generally not swayed by evidence. There are other approaches which can alter beliefs and these are discussed and examples given. The way you get people to change their beliefs is to make them want to change their beliefs by making them want to join a group which shares the belief you want them to adopt. Evidence doesn't work. Confrontation doesn't make people want to join you. What is needed is invitation. Citizen science can bring people in, but only if you target people who are not members of the choir and invite them in a way which will make them want to join. People need to be invited not to learn what you are doing, but rather to check on what you are doing and correct your errors. If you are totally convinced that you are right you are not practicing science, which is inherently uncertain. The key phrase is “Ask, don't tell”. Examples of how this approach has worked will be presented.

Keywords: belief, evidence, communicate, convince, change

2:10 The Pendulum, the Pyramid, the Parthenon, and the Pound: The Pendulum and Standards of Measure in the Ancient World, ROLAND A. BOUCHER (Irvine, CA; rolandfly@sbcglobal.net).

In early England at the time of the Norman conquest and up to the time of the Magna Carta many of the numerous standards of measure in use were of Sumerian or Minoan origin. Later Queen Elizabeth I, in the late 16th century, would also establish the British Imperial Foot and Pound from Ancient Sumerian Standards. The foot was established as 1/660 of the Anglo Saxon Furlong of 200 Anglo Saxon Yards which can be traced back to the Sumerian Lunar Steps (yards) of Lagash, immortalized in Guda’s rule and in Entemena’s vase. The English pound was established as the French wool pound of 6992 grains rounded up to 7000 grains. It can be traced back through the Etruscan pound to the Babylonian “Octopus” Talent Weight of 64 pounds or the weight of one Babylonian cubic foot of water. This Babylonian foot was the second Sumerian attempt to establish their cable of 360 steps or 1000 feet equal to 1/360 of degree of the polar circumference of the earth. It appears that the Famous pyramid at Giza was designed to this standard with its perimeter equal to 3000 Sumerian feet or 1/2 nautical mile. In the 19th Century, both Stuart and Penrose accurately measured the dimensions of the Parthenon finding its width to be 0.9997 arc seconds on the polar circumference of the Earth. This accuracy puzzled scholars for 150 years. Our research shows the width of the Parthenon in Athens was designed to be 1/3600 of a degree or one arc second. The same pendulum formula used to design the pyramid, when timed with Venus rather than the Sun, increased the pendulum length just the right amount. This precision was not dumbfounding—it was just dumb luck.

Keywords: pendulum, pyramid, Parthenon, pound, foot.

2:30 Structure, Culture, and Agency: Library Succession Planning in the California State University System, CRYSTAL GOLDMAN, (Geisel Library, University of California, San Diego, La Jolla, CA; elgoldman@ucsd.edu).

The Library and Information Science (LIS) literature in the last few decades has made clear that academic libraries have experienced deep budget cuts, hiring freezes, and an aging workforce. In response to this, many libraries have reorganized and flattened the hierarchy in their organizational structures, leaving far fewer middle management positions. An unfortunate consequence of this situation is that, as Baby Boomer library administrators retire, there are few qualified applicants to succeed them.

Thus, many in the LIS field have called for better succession planning by current library administrators, while others have pointed out the difficulty of succession planning in libraries with flat organizational structures. Few studies, however, have directly addressed this issue by exploring administrators’ perceptions or behavior in regards to succession planning. This presentation will begin filling this LIS knowledge gap through a discussion of findings from a recent qualitative study, which involved the thematic analysis of interviews with six library administrators in the California State University system, all of which have flat organizational structures. Findings include an examination of the structure, culture, and agency of the administrators involved, which impact how and why they engage or do not engage in succession planning.

Keywords: library science, succession planning, academic library management, leadership preparation, higher education administration.

2:55 Assessing Library Instruction: Aligning Accreditation Competencies with Professional Standards, DOMINIQUE TURNBOW, CRYSTAL GOLDMAN*, and KAREN HESKETT, (Geisel Library, University of California, San Diego, La Jolla, CA; clgoldman@ucsd.edu).

The University of California, San Diego is accredited by the Western Association of Schools and Colleges (WSCUC) Senior College and University Commission (WSCUC), and is currently undergoing review to reaffirm accreditation. Since the university’s previous review in 2010, WSCUC has introduced information literacy as a core competency to be included in “an integrated course of study of sufficient breadth and depth to prepare...[students] for work, citizenship, and life-long learning” (WSCUC, 2013). Additionally, “for each core competency, the institution may set a specific level of performance expected at graduation and gather evidence of the achievement of that level of performance (which can be based on sampling) using the assessment methods of its choice” (WSCUC, 2013). Information literacy instruction and assessment has long been at the core of academic library services, so it made sense for the library to partner with campus to help set the standard of performance expected of undergraduate students for information literacy.
Within the same timeframe, the Association of College and Research Libraries (ACRL) replaced their long-standing Information Literacy Competency Standards for Higher Education with the Framework for Information Literacy for Higher Education. However, the WSCUC handbook mentions the use of Association of Colleges & Universities (AAC&U) VALUE rubrics, and the Information Literacy VALUE Rubric is based on the now-outdated ACRL Standards. Therefore, UC San Diego librarians needed to find a way to align the new accreditation core competencies with their new professional standards. This presentation will discuss a project by UC San Diego librarians to combine the AAC&U Information Literacy VALUE Rubric and the ACRL Framework for Information Literacy for Higher Education, and how the combined rubric will provide the foundation for creating an online database that librarian instructors can use to create appropriate information literacy learning outcomes for their workshops or courses, paving the way for designing deep learning and creating appropriate formative and summative assessments.

**Keywords:** instructional assessment, assessment rubrics, information literacy, librarian professional standards, accreditation

### 3:20 Beyond Coding: Building Research Data Management Skills Using The Carpentries, KATHERINE E. KOZIAR, (Orbach Science Library, University of California, Riverside, Riverside, CA; katherine.koziar@ucr.edu).

Data management is ubiquitous across disciplines, yet good data management skills are often difficult for students, and sometimes researchers to define. More often, poor data management skills and their results are easy to describe, since they can cost time and money. Over the past decade, librarians — masters of organizing and managing information — have moved actively into the role of sharing our data organization knowledge and skills with the wider research community by teaching research data management.

At University of California, Riverside, interest and attendance of our Introduction to Research Data Management workshops was poor, with attendees often there to solve singular or advanced problems rarely answered by the introductory workshop. Recognizing that computational skills are transferrable to data management, UCR librarians changed workshop message and content from “Learn Research Data Management” to “Learn Research Tools,” and adopted curriculum and philosophy of The Carpentries, a community that develops and delivers workshops on fundamental computing skills that support research. This change has resulted in a trend of increased workshop interest and attendance.

This presentation will describe how we successfully incorporated and adapted The Carpentries curriculum to offer workshops focused on best practices in computational, and by extension, research data management skills.

**Keywords:** research data literacy, research data management, computational skills, data management skills, library workshops.

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Room 218 Science Building

Wednesday

1:30 p.m. – 2:10 p.m.

**Psychology Section**

Section chair and program organizer: Dr. Veronica Galván, Department of Psychology, University of San Diego, San Diego, CA: vgalvan@SanDiego.edu.

### 1:30 Autonomous Sensory Meridian Response (ASMR). What is it? And Why Should We Care? DAVID J HARDY

(Department of Psychology, Loyola Marymount University, Los Angeles, CA; david.hardy@lmu.edu).

Autonomous sensory meridian response (ASMR) is a unique sensory experience characterized as a tingling electro-static sensation typically at the back of the scalp but sometimes other body regions as well (back of the neck, spine, etc.). Common ASMR triggers include whispering, personal attention, observation of slow or repetitive movements (e.g., folding towels), crisp sounds, and so on. Interestingly, ASMR seems to be experienced only in some people (including the author). Only a handful of formal studies of ASMR has been conducted to date, and no prevalence estimate of ASMR exists. The present study involved 496 college students and a survey that included questions on mood, personality, and other psychological factors, as well as an inquiry about possible ASMR experiences. Of this group, 104 participants (21%) reported they experienced ASMR, with 260 (52.4%) reporting no such experience and 132 (26.6%) as unsure. Similar to previous research, whispering sounds were the most frequent trigger and the posterior scalp was the most common loci for the ASMR sensation. Anxiety as measured by the Beck Anxiety Inventory was significantly higher in the ASMR group (p=.005), but there was no statistically significant group difference on the Beck Depression Inventory (p=.103). A majority (44.2%) of those in the ASMR group indicated that the experience did have a positive impact on mood (p=.039). Because ASMR is typically a euphoric experience, it is tentatively proposed, based on these preliminary results, that ASMR, present in about a fifth of the population, is a unique and adaptive mechanism in certain individuals with generally higher levels of anxiety, to lower such anxiety to a more optimum level that results in improvement of mood as well. The possibility of ASMR having clinically ameliorative effects increases the importance of researching this curious phenomenon. Keywords: ASMR, mood, anxiety.
Increasing Capacity Building in Science and Health Literacy in Rural Nigeria by Butressing Human Rights Through Education, MARK J. JOHNSON\textsuperscript{1,2,a}, NATALIE FLORES\textsuperscript{1,2}*, MIBENGE BAGUNDA\textsuperscript{2}, IKORO MADUKA\textsuperscript{2}, MARIA ALEJANDRA MARTINEZ\textsuperscript{2}, and SQUIRE BOONE\textsuperscript{2} (\textsuperscript{1}Department of Health & Behavior Studies and Department of Curriculum and Teaching, Teachers College, Columbia University, New York, NY, mjj2143@columbia.edu, nyf2104@columbia.edu; \textsuperscript{2}Refugee and Migrant Workgroup, Global Health Section, Asset Procurement Group, Brooklyn, NY, mibenge@assetprocurementgroup.org, maduka@assetprocurementgroup.org, mmartinez@assetprocurementgroup.org). (STUDENT PRESENTATION)

The United Nations’ 2030 Agenda for Sustainable Development produced a set of 17 interdisciplinary goals that empowered UN member states to shape and implement comprehensive strategies that included 169 targets to enhance the survivability of the planet whilst increasing the quality of life for all. In Nigeria, science literacy remains a principal driver of averting an assortment of regional contractions in health, from schistosomiasis to retroviral infection. HIV/AIDS often frame doleful outcomes that enmesh severe health comorbidities leading to death that further strains the average annual household income of families as well as macroeconomic metrics. Currently, Nigeria is the most populated country in Africa coupled with the highest HIV/AIDS mortality rate; ergo, we evaluated and optimized existing public and private partnerships between a variety of nongovernmental organizations and stakeholders, and through exhaustive consultations with Nigerian participants, our team developed a culturally competent sexual health modality to increase science literacy of HIV disease transmission whilst driving down the incidence of newly diagnosed HIV cases. Because the national school life expectancy is only 9 and 8 years, for males and females respectively, and a literacy rate of less than 50% for females, we promoted issues for young women and girls, to build aptitude and knowledge sharing of sexual and reproductive health rights among other social signals such as consent, and relationship dynamics with young men and boys. We collectively converged upon the third Sustainable Development Goal (SDG3), “Good Health & Well-being”, “Quality Education for All” (SDG4), and “Gender Equality” (SDG5); culminating in the enrichment of both science and sexual health literacy in the short term, whilst improving regional and national economic outputs by maintaining a healthier, sustainable workforce to improve micro and macroeconomic indicators, underscoring the return of investment (ROI) in health services and education. \textbf{Keywords:} new approaches to STEM education K-12; sustainable development; engaging public in science; fostering inclusion in underrepresented minorities in science; the importance of interdisciplinary approaches in science and technology.

\textbf{CONTRIBUTED ORAL TALKS}

\textit{(Science Building)}

\textbf{THURSDAY, 20th June 2019}

\begin{flushleft}
Room 220 Science Building  
Thursday  
9:30 a.m. – 10:50 a.m.
\end{flushleft}

\textbf{Agriculture, Food, and Renewable Resources Section}

Section chair and program organizer: \textit{Currently vacant position.}

\textbf{9:30} \textit{Aspergillus tubingensis is a Pre-emergent Pathogen of Date Palm Seedlings}, MARYAM MOHAMMED ALOMRAN\textsuperscript{1,4,*}, JOS HOUBRAKEN\textsuperscript{3}, and GEORGE NEWCOMBE\textsuperscript{2} (\textsuperscript{1}Department of Plant Sciences and \textsuperscript{2}Department of Forest, Rangeland and Fire Sciences, University of Idaho, Moscow, USA; \textsuperscript{3}Department of Applied and Industrial Mycology, Westerdijk Fungal Biodiversity Institute, Utrecht, Netherlands; \textsuperscript{4}College of Science, Department of Biology, Princess Nora Bint AbdulRahman University, Riyadh, Kingdom of Saudi Arabia; alom4874@vandals.uidaho.edu, j.houbraken@westerdijk institute.nl, and georgen@uidaho.edu). (STUDENT PRESENTATION)
Many diseases of date palm are known but pathogens that might affect seed germination and seedling emergence from soil are poorly studied, perhaps because date palm cultivars are propagated vegetatively. Here we determined effects of date seed fungi on germination and emergence of 600 seeds overall (200 of each of three cultivars: ‘Thoory’, ‘Halawi’, and ‘Barhi’). In each cultivar, 100 seeds were from Saudi Arabia (part of the native range), and 100 were from the southwestern USA. Just four genera (i.e., Alternaria, Aspergillus, Chaetomium, Penicillium) were isolated from surface-sterilized date seeds. Alternaria was found in only one cultivar in the American Southwest. Aspergillus tubingensis was in highest relative abundance among the remaining three genera at 39%, and it was significantly more common overall in Saudi Arabian seeds than in American seeds (116 versus 39, respectively; \(\chi^2=51.58, p=0.0001\)). Aspergillus tubingensis reduced germination of seeds (\(\chi^2=22.13, p=0.0001\)) and then also reduced emergence when germinated and non-germinated seeds were planted in potting mix in a greenhouse (\(\chi^2=77.42, p=0.0001\)). In contrast, Penicillium species were more common in American seeds than Saudi seeds (\(\chi^2=14.57, p=0.0001\)); they did not have an effect on germination (\(\chi^2=3.43, p=0.06\)) although they did have a positive effect on seedling emergence (\(\chi^2=5.52, p=0.019\)). In a second experiment with Halawi seeds, half of fungus-free germinants were inoculated with A. tubingensis and all seeds were then planted. Seeds that were not inoculated emerged whereas Aspergillus-inoculated seeds did not. Our findings show that Aspergillus tubingensis is a seedborne pathogen that has not previously been reported as a pathogen of date palm. Our findings also suggest that A. tubingensis may be more common in seeds in the native range of its host than in its introduced range.

**Keywords:** Phoenix dactylifera, seed pathogen, biogeography, native range, desert ecology

9:50 **Improving Nutrient Use and Reducing Greenhouse Gas Emissions of Dairy Manure through Chemical Coagulation Processes, RYLIE ELLISON*, XIA ZHU-BARKER, and WILLIAM R. HORWATH** (Department of Land, Air, & Water Resources, University of California, Davis, Davis, CA; rjellison@ucdavis.edu, wyjzhu@ucdavis.edu, whorwath@ucdavis.edu). (STUDENT PRESENTATION)

The large variability of dairy manure properties and management practices make it difficult to predict the manure’s nutrient value and availability for crop growth. As a result, storage and agricultural applications of manure often result in high nutrient loss to the environment and generation of greenhouse gases, including methane and nitrous oxide. Treating manure can physically and chemically alter the organic matter to stabilize and standardize the carbon (C) and nitrogen (N) mineralization properties. Enhancing solid-liquid separation with chemical coagulants traditionally used in wastewater treatment can isolate the organic manure solids into a stable fertilizer for agricultural application while leaving the plant-available ammonium-N in the liquid fraction. By separating these fractions, solids can more easily be transported off-farm while the liquid fraction has a more predictable N value for field application. Furthermore, storage and field application of separated manures will result in reduced greenhouse gas emissions compared to traditionally-managed manures. Several laboratory incubations were conducted to determine the greenhouse gas emissions and C and N transformations of each separated manure fraction in storage and applied to soil. The treatment of chemically separating organic matter from manure slurry slowed the N mineralization process and reduced greenhouse gas emissions of manure solids applied to soil. Greenhouse gas emissions and nitrogen availability of the liquid manure fraction applied to soil were not significantly different than unseparated manure. However, under anaerobic conditions, like a storage lagoon, methane emissions from the separated liquid manure was almost entirely eliminated. Controlling nutrient flow and availability is key to preventing nutrient losses while increasing crop uptake for maximum economic value. The nutrient residual value of processed wastes can be further determined to reassess the fertilizer needs of crops.

**Keywords:** dairy manure, nutrient cycling, greenhouse gases, wastewater treatment, coagulation

10:10 **Factors of Resilience and Adaptation to Climate Change that Contribute to Food Security, CHRISTIAN FRANCO-CRESPO* and VERONICA GARCÍA** (Dirección de Investigación y Desarrollo, DIDE, Technical University of Ambato, Ambato, Ecuador, 180104 Huachi, cd.franco@uta.edu.ec).

The purpose of this paper is to analyze the resilience levels of small farmers in the province of Tungurahua in relation to their capacities for the construction of methodologies that increase the adaptability to Climate Change and guarantee Food Security. Some literature evaluates the effect of public policies application, as an instrument, to modify farmers behavior and improve the use of resources against future scenarios. On the other hand, Food Security is a pillar to guarantee the welfare of the population. The purpose of this study, the province of Tungurahua has been considered as the study area. Information was obtained directly from farmers to know the capacity of farmers resilience in the face of climate change. Quantitative analysis evaluates the correlations that exist between future scenarios of variation of climatic events and capacities. There are 1168 surveys on six cantons of the province of Tungurahua. From the surveys, the construction of a database composed of 24 variables divided into four groups is considered. With this information, it is proposed to measure the levels of resilience, based on the indicators that are established according to the methodology of the studies carried out. Additionally, with the data collected from the surveys, the correlations are defined to observe the factors that can increase the capacity of adaptability to climate change. The results are expected to obtain information on the factors that reduce or increase the resilience of farmers. Also, it is expected to develop a tool to facilitate the characteristics that improve the adaptability of small farmers against CC. This aspect is relevant if one considers the impact it can have on Food Security and the negative effects due to lack of availability of food, price increase, or reduction of adequate nutritional source for the population.

**Keywords:** climate scenarios, Andean crops, Simulation models, small-farming, Ecuador
Chemistry and Biochemistry Section

Section chair and pro-gram organizer: Dr. Owen M. McDougal, Department of Chemistry and Biochemistry, Boise State University, Boise, ID; owenmcdougal@boisestate.edu.

10:30 Changes in Arsenic, Copper, Iron, Manganese, and Zinc Levels Resulting from the Application of Poultry Litter to Agricultural Soils, RICHARD D. FOUST, JR1,*, MICHAEL PHILLIPS2, KILLIAN HULL1 and DARIIA YEHOROVA1 (1Department of Chemistry and Biochemistry, James Madison University, Harrisonburg, VA 22807; 2Natural Resources Conservation Service, Virginia, United States Department of Agriculture, Harrisonburg, VA 22801; foul@jmu.edu, mike.phillips@va.usda.gov, killian.hull@gmail.com, yehorox@d.ukes,jmu.edu).

Twelve applications of poultry litter were made to a 2.1-ha field located in the Shenandoah Valley of Virginia, United States (USA), between March 1999 and August 2014. The field was planted with bermudagrass (Cynodon dactylon) and used as a pasture on an active farm. Copper, iron, manganese, zinc, and arsenic concentrations in the poultry litter were measured, and the application rates of these metals were calculated. The median application rates were: Cu, 1.32 kg/ha, Fe, 5.57 kg/ha, Mn, 1.80 kg/ha, Zn, 1.39 kg/ha, and As, 0.011 kg/ha. Twelve surface and subsurface soil samples were taken from the treated field in February 2016. Twelve samples were also taken from a comparison site. The comparison site was directly adjacent to the study site, consisted of the same soil type, and had been maintained as an undisturbed forest. Extractable Cu, Fe, Mn, Zn, and As concentrations in the soil samples were determined by atomic absorption spectroscopy, and the results of the chemical analysis were analyzed by ANOVA. Fe and Mn were depleted from the soil in the treated field, while Cu and Zn levels increased over the 12 years of treatment and grazing, and arsenic levels were unchanged in both the surface and subsurface soils between the comparison and the study site. The changes observed for Cu, Fe, Mn, and Zn are within the critical deficiency level and critical toxicity level for these metals, and no arsenic remains in the soil from roxarsone feed supplements, which were added to the poultry feed when the litter was applied to the study site.

Keywords: poultry litter; soil; iron; manganese; copper; zinc; arsenic; diversification of local agriculture

Room 233 Science Building
Thursday
9:30 a.m. – noon

Cell and Molecular Biology Section
(including Medical and Dental research in these areas)

Section chair and program organizer: Dr. Carolina Livi

9:30 CC-NBS-LRR Gene Resistance to WPBR in Western White and Whitebark Pine, CAITLIN DIEFENDORF1,*, JASSMINE REILL2, and RONA CAMPBELL2 (Department of Biology, Southern Oregon University, Ashland, OR; cmdiefendorf@gmail.com, campbellr3@sou.edu, reillj@sou.edu). (STUDENT)

The goal of this study was to better understand Western White Pine (P. monticola) and Whitebark Pine (P. albicaulis) resistance to White Pine Blister Rust (C. ribicola) on a molecular level. These species are prevalent in the Pacific Northwest and both considered endangered. It was hypothesized that the allele discovered by Jermstad et al., (Pl-RGC-CC_1), or closely related alleles, are responsible for resistance in P. monticola and P. albicaulis. This particular sequence is of the CC-NBS-LRR gene family, which is a component of Effector Triggered Immunity in plants. If our hypothesis were correct, then these alleles should be found at higher frequencies in resistant trees, while susceptible trees will lack this allele sequence in comparison. Amino acid alignment, phylogeny, and synonymous mutation patterns were evaluated among extracted DNA in order to conclude the particular sequenced gene was not responsible for resistance among our samples. These results contradict the initial hypothesis, but further research must be completed in order to obtain conclusive results.

Keywords: genetic resistance, DNA sequencing, white pine trees, white pine blister rust, local Oregon environmental issues

9:50 Inflammatory Cytokines Play a Novel Role in Extracellular Matrix Remodeling of the Breast Tumor Microenvironment that May Promote Metastasis, SIMION C. DINCA1,*, DANIEL GREINER2, and CHERYL L. JORCYK1,2 (1Department of Biomolecular Sciences and 2Department of Biological Sciences, Boise State University, Boise, ID; simioncinca@u.boisestate.edu, danielgreiner@u.boisestate.edu, cjorcyk@boisestate.edu). (STUDENT PRESENTER)

Studies have shown that the tumor microenvironment (TME) plays an important role in the invasive and metastatic potential of breast cancer. Specifically, the ability to cross-link and align the collagen fibers of the extracellular matrix (ECM) provides tracks on which tumor cells can metastasize. Enzymatically active lysyl oxidases (LOX, LOXL1, 2, 3, and 4) are responsible for priming collagen fibers to be cross-linked by reacting with peptidyl lysine residues on collagen molecules. In
this study, we investigate the effects that proinflammatory cytokines of the immune response have on ECM-modifying proteins in the lysyl oxidase family. Using MCF7, MDA-MB-468, and MDA-MB-231 human breast cancer cell lines, our studies demonstrate that lysyl oxidase-like 2 (LOXL2) are induced by inflammatory cytokines via qRT-PCR and immunostaining. Specifically, we found that cytokines are responsible for a significant increase in protein expression of the glycosylated, enzymatically active LOXL2 (~105kD). This is supported by Kaplan-Meier plots demonstrating that patients with high levels of LOXL2 have significantly worse survival and develop distant metastasis faster than those with low to normal levels. We then assessed the enzymatic activity of LOXL2 and observed the effect that cytokine-induced LOXL2 has on collagen fiber density, crosslinking, and alignment; which were all altered significantly. These alterations were not present with cytokine treatment when LOXL2 enzymatic activity is inhibited detailing importance of LOXL2. These outcomes demonstrate that cytokine signaling has a drastic effect on TME structure, through remodeling of ECM. Collectively, our results, supported by bioinformatics data, suggest that cytokine promoted ECM remodeling through LOXL2 expression may contribute to cytokine-induced invasion and metastasis of breast cancer tumor cells. This is significant as the relationship between cytokines and LOXL2 can be exploited as a potential therapeutic target.

The project described was supported by NIH grants P20GM103408, P20GM109095, and R25GM123927, NSF-BSF 2017237, Murdock (M.J.) Charitable Trust 2000000722, the METAirror Quinn Davis Northwest Arkansas METSquerade Fund, and the Smylie Family Cancer Fund. We also acknowledge the generosity of The Biomolecular Research Center at Boise State University.

Keywords: breast cancer, cytokines, extracellular matrix, collagen, matrix remodeling proteins

10:10 Estrogen Receptor and HER2 Status Play a Role in Cytokine-induced Breast Cancer Metastasis. CODY WOLF*, KEN TAWARA, and CHERYL L. JORCYK (Department of Biological Sciences, Boise State University, Boise, ID; Codywolf@u.boisestate.edu, Kentawara@u.boisestate.edu, cjorcyk@boisestate.edu). (STUDENT)

Breast cancer is the most commonly diagnosed cancer and is currently the second leading cause of cancer-related deaths among women in the United States. Breast cancer is categorized into multiple subtypes; mainly estrogen receptor (ER) positive, human epidermal growth factor 2 (HER2) positive, and triple-negative breast cancer (TNBC). While therapeutics have been developed for ER+ and HER+ breast cancer patients, limited options are available for TNBC patients, making it the most challenging to treat. Our lab has previously demonstrated that proinflammatory cytokines such as IL-6 play a significant role in the progression of breast cancer metastasis. Recent evidence, however, indicates that positive ER and HER2 status may inhibit the JAK/STAT3 pathway. By utilizing multiple human breast cancer cell lines with varying hormone status, we have established that STAT3 may be inhibited with positive receptor status. Triple-negative MDA-MB-231 human breast cancer cells show a significant reduction in cytokine-induced signaling compared to ER+ T47D cells. MDA-MB-231 cells transfected with ER (ER+ MDA-MB-231) also have reduced signaling compared to control MDA cells, indicating ER may inhibit the signaling cascade. Additionally, HER2- cell lines exhibited a similar trend. While hormone status appears to be crucial for cytokine signaling, the exact mechanisms have yet to be understood. By using computational molecular modeling, we can predict conformational structures that may provide a means to understand direct ER binding with intracellular signaling proteins such as STAT3. Evaluation of ER-mediated gene upregulation of STAT3 inhibitors will alternatively be evaluated using ER+ T47D and MCF-7 breast cancer cells, as well as TNBC MDA-MB-231 and modified ER+ MDA-MB-231. This research suggests that proinflammatory cytokines play a distinct role in TNBC breast cancer, and may provide novel therapeutics for TNBC breast cancer patients.

The project described was supported by NIH grants P20GM103408, P20GM109095, and R25GM123927, NSF-BSF 2017237, Murdock (M.J.) Charitable Trust 2000000722, the METAirror Quinn Davis Northwest Arkansas METSquerade Fund, and the Smylie Family Cancer Fund. We also acknowledge the generosity of The Biomolecular Research Center at Boise State University.

Keywords: estrogen receptor, human epidermal growth factor 2, cytokine, breast cancer, triple-negative breast cancer

10:30 Clinical Research in Diseases of the Aging Brain, WALTER G. CARLINI (Medford Neurology - Providence Medical Group, Medford, OR; walter.carlini@providence.org).

Diseases of the aging brain are stubbornly resistant to treatment. Three of the most common and devastating diseases of the aging brain - stroke, Alzheimer’s disease, and Parkinson’s disease - have been the focus of clinical research involving patients and physicians in southern Oregon. The rationale for investigating these disorders; distinguishing them from normal aging of the brain; their putative cellular and molecular pathophysiology; and the scope, methodology, results, and implications of the local clinical trials addressing them are summarized. Synopses of selected ongoing and planned clinical trials, and the basic research prompting these trials, are presented.

Keywords: brain, Alzheimer’s, Parkinson’s, stroke

10:50 Navigating the Depths and Avoiding the Shallows of Pancreatic Islet Cell Transcriptomes, ALEX M. MAWLA1* and MARK O. HUISING1-2 (1Department of Neurobiology, Physiology & Behavior, College of Biological Sciences, University of California, Davis, CA, USA, ammawla@ucdavis.edu, mhuising@ucdavis.edu; 2Department of Physiology and Membrane Biology, School of Medicine, University of California, Davis, CA, USA). (STUDENT PRESENTATION)

Islet gene expression has been widely studied to better understand the transcriptional features that define a healthy beta cell. Transcriptomes of FACS-purified alpha, beta, and delta cells using bulk RNA-sequencing have facilitated our understanding of the complex network of crosstalk between islet cells and its effects on beta cell function. However, these approaches were by design not intended to resolve heterogeneity between individual cells. Several recent studies used single cell RNA-sequencing (scRNA-Seq) to report considerable heterogeneity within mouse and human beta cells. In this
perspective, we assess how this newfound ability to assess gene expression at single cell resolution has enhanced our understanding of beta cell heterogeneity. We conduct a comprehensive assessment of several single human beta cell transcriptome datasets and ask if the heterogeneity reported by these studies showed overlap and concurred with previously known examples of beta cell heterogeneity. We also illustrate the impact of the inevitable limitations of working at or below the limit of detection of gene expression at single cell resolution and their consequences for the quality of single islet cell transcriptome data. Finally, we offer some guidance on when to opt for scRNA-Seq and when bulk sequencing approaches may be better suited.

Keywords: the expanding role of computational modeling in basic science, integrative science, genomics, single cell sequencing, heterogeneity

11:10  Is Fecal Matter an Appropriate Proxy for the Intestinal Tract in Studies of the Gut Microbiome? ENRIQUE REYES* and HOLLY PINKART (Department of Biology, Central Washington University, Ellensburg, WA; ReyesEn@cwu.edu, PinkartH@cwu.edu). (STUDENT PRESENTER)

As many health phenomena seem to be affected directly and indirectly by the microbiome, gut microbiome research has increased in the last decade. Issues like allergies, cancer, obesity, and other health phenomena have been researched and found to be influenced by the microbiome. Most of gut microbiome research is done by collecting and sequencing the DNA of the microbiome of the falcet matter from model organisms or human subjects. Studies that use this method of sample collection and analysis assume that falcet matter microbiomes are identical to intestinal microbiomes. At present, no published studies exist which directly compare stool microbial composition and intestinal microbial composition. Fecal matter bacterial composition and intestinal bacterial composition was assessed by extracting and sequencing 16S ribosomal RNA genes from stool and intestine (ileum cecum, and colon) of C57BL/6 wild-type male mice. Communities were compared using MicrobiomeAnalyst software. Microbial community comparison showed no significant difference between the species evenness and microbial diversity of all three sections of the gut and stool. Species composition does vary between sample sites. Although more data is required, the preliminary results support the assumption that stool microbial composition is a proxy for intestinal microbial composition, at least in terms of species evenness and diversity.

Keywords: microbiology, biodiversity, gut microbiome, microbial community comparison, 16s rRNA sequencing

11:30  Effects of 5α-Dihydrotestosterone (DHT) on Mouse Gut Microbiome – A Study of Sex Differences and Hormonal Effects on Gut Microbiome Composition, BIKESH SHRESTHA* and HOLLY C. PINKART (Department of Biological Sciences, Central Washington University, Ellensburg, WA; bshrestha1987@gmail.com, PinkartH@cwu.edu) (STUDENT PRESENTER)

Type 1 Diabetes (T1D) is a polygenic and multifactorial disease, traditionally attributed to genetic susceptibility and diet. Over the past decade, novel studies have placed a higher significance on the role of gut microbiome in T1D pathogenesis. Furthermore, diabetic mice models have shown higher incidence of T1D in females compared to males, attributed to the differences in gut microbial community structure. Interestingly, female mice models elicited male- like protection when transplanted with the male gut microbiome. In a previous study, we observed that female Non-obese diabetic (NOD) mice implanted with slow release 5α-dihydrotestosterone (DHT; inhibits conversion of testosterone to estrogen) for 90 days showed improved glucose tolerance when compared to untreated females. We hypothesize that DHT treatment alters the female gut microbial profile to resemble a male-like microbiome that induces improved glucose tolerance, a determinant of T1D protection. Phylogenetic analysis of intestinal bacterial composition was assessed by sequencing fourth variable (V4) region of the 16S ribosomal RNA genes. Diversity indices and principle components analysis was performed with MicrobiomeAnalyst software. Furthermore, we used 16s rRNA sequence data with Piphillin, a web-based algorithm to predict metagenomic content and infer functional profile by generating metabolic potentials. Preliminary analysis microbiome community comparison shows higher species diversity in DHT-implanted females compared to placebo-implanted females. We did not observe a significant difference in metabolic potentials between the three treatment groups. Although more data is required, preliminary observations support the assumption that the gut microbial profile in DHT-implanted females resemble male gut microbial profile with higher species diversity compared to the placebo- implanted females. Further study will help us better understand the effects of androgens on gut microbiome composition and its protective effects against T1D.

Keywords: type 1 diabetes, dihydrotestosterone, DHT, gut microbiome, NOD mouse

11:50  Computational Modeling of Carbohydrate Allocation in a Mink Endometrial Cell Line (GMMe) to Understand Hormone Regulation of Fertility, ANGELIQUE YANG*, HUNTER BAIN, and JENNIFER CHASE (Department of Biology, Northwest Nazarene University, Nampa, ID; ayang@nmu.edu). (STUDENT PRESENTER)

The cells lining the uterus secrete a carbohydrate-rich metabolite broth to support early embryo development. Changes in the levels of hormones, including estrogen and progesterone, must shift the metabolism of these cells during the uterine cycle from storage of glucose as glycogen, to cell proliferation, and to releasing of glucose and glycolytic products to the uterine lumen. Because most mammalian embryos are lost in this early stage, we need to understand how the nutrient supplies are regulated. While previous work in uterine cell lines and tissues has attempted to isolate to dissect the roles of particular steps in this system, we have been fully characterizing the system in mink uterine epithelial cells (GMMe cell line) and have used a computational systems approach, revising a model of HeLa metabolism to identify crucial controlling steps. GMMe cells,
~90% confluent, were treated for 24 hours at 5 mM in DMEM/F-12 with 10 μM progesterone (P₄), or 10 nM estrogen (E₂), or vehicle. Glycogen and lactate production (glycolytic flux), and steady-state metabolite levels were measured spectrophotometrically using standard coupled reactions in lysed cells. Glucose uptake and oxygen consumption were measured using assay kits (e.g., Glucose UptakeGlo, MitoXpress). Enzyme Vmax and Kms were measured spectrophotometrically in cell extracts. The model was constructed in COPASI 4.25 (copasi.org) and unknown parameters were fit to the fluxes or used HeLa values. Glycolytic flux was unchanged by hormone treatment (~19 nmol/min/mg protein). Estrogen treatment downregulated the Vmax of 9 enzymes, while progesterone affected 4 enzymes. Preliminary modeling results implicated the pentose phosphate pathway and glycogen synthesis/degradation fluxes as most flux controlling for glycolysis. A validated model of carbohydrate metabolism will be useful for identifying risk factors or therapeutic targets that affect fertility in mink and other mammals.

**Keywords:** the expanding role of computational modeling in basic science, estrogen, progesterone, carbohydrate metabolism, fertility

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Room 218 Science Building  
Thursday  
9:30 a.m. – 11:50 a.m.

**Pharmaceutical Sciences Section**

Section chair and program organizer: Dr. Jozef Stec, Department of Pharmaceutical Sciences, College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA; jstec@ketchum.edu.

9:30  **Would an Anti-inflammatory Therapeutic Prevent Metastatic Breast Cancer?** CHERYL L. JORCYK (Department of Biological Sciences, Biomolecular Sciences Program, Boise State University, Boise, ID; cjorcyk@boisestate.edu).

Breast cancer affects millions of women worldwide, and in the US alone, 1 in every 8 women will develop breast cancer during their lifetime. When breast cancer cells escape from the primary tumor and metastasize to other organs such as lung, bone, liver, and brain, patient prognosis becomes unfavorable. Recently, tumor cell invasive and metastatic capacity has been correlated with the inflammatory process. Proteins such as interleukin-6 (IL-6) and other IL-6 family members have been implicated in a number of biological processes including hematopoiesis, immune responses, development, and inflammation. These proteins are produced by multiple cell types including activated T cells, macrophages, neutrophils, and breast tumor cells. Evidence in the literature and data from our laboratory suggests that IL-6-family cytokines promote tumor invasion and metastasis. In breast cancer cells, these cytokines induce secretion of proteases important for breakdown of the extracellular matrix during invasion and metastasis, promote expression of angiogenic factors such as vascular endothelial growth factor (VEGF), and induce circulating tumor cell (CTC) numbers. The results from our novel translational studies will be presented and should provide evidence that this family of cytokines make important therapeutic targets for the prevention/treatment of breast cancer.

NIH/NIHMS P20GM109095 and P20GM103408, NIH/THS, Idaho HERC, NIH/ITRI, ACS RSG-09-276-01-CSR, Susan G Komen KG100513, NSF-BSF 2017237, METAvivor, the M.J. Murdock Charitable Trust; MSTMRI, the Idaho State Board of Education, the Higher Education Research Council (HERC), the Birt Family, and the Smylie Cancer Fund.

9:50  **Ophtalmic (Pseudo) Drug Delivery Using a Mucoadhesive Polymer in Man.** JERRY R. PAUGH* and RONALD C. CHATELIER (Southern California College of Optometry at Marshall B. Ketchum University, Fullerton, CA; jpaugh@ketchum.edu; Universal Biosensors, Mt. Waverly, Victoria, Australia, ron.chatelier@gmail.com).

**Purpose:** The purpose of this investigation was to measure the bioavailability of sodium fluorescein, serving as a pseudo drug, in an optimized vehicle of sodium carboxymethylcellulose (CMC) in normal humans. **Methods:** To identify an optimum delivery vehicle, six CMC solutions, of approximately 90 kDa and 700 kDa MW were formulated to physiologic pH and osmolality at three viscosities (~25, 100 and 250 mPa.s). An optimum vehicle was identified as the formulation yielding the longest residence time (in minutes, measured using fluorometry) with the greatest comfort. This was the 250 mPa.s viscosity, 700 kD MW CMC formulation. Drug delivery vs. saline control was assessed by adding sodium fluorescein (MW 376 Da) as a pseudodrug and monitoring anterior chamber (AC) fluorescence over 6 hours in 11 young, healthy subjects. **Results:** The mean AC enhancement ratio, CMC vs. control, was equal to or greater than 3.0 and maintained for the 6 hour study period. The comfort rating of CMC vehicle and saline control were 96.2 ± 4.4) and 96.4 ± 5.0) respectively (“100” = ‘cannot be felt’); p = 0.875, Wilcoxon exact test, 2-sided). **Conclusions:** The > 3-fold improvement in enhancement ratio over saline represents a two-fold improvement over that found with similar fluorescent methods. Pseudoplastic formulations can be well-tolerated which in turn prolongs contact time and resultant drug delivery. Use of such a vehicle has application in treatment of glaucoma using compounds such as timolol maleate (e.g., Timoptic), dipivefrin (e.g., Propine) and pilocarpine.
Fatty acid amide hydrolase (FAAH) is a key enzyme involved in degradation of various regulatory lipophilic molecules such as anandamide and oleamide. Therefore, inhibition of this enzyme impacts the action of the natural, endogenous CB agonists. Such approach to modulate the endocannabinoid system shows good promise for the treatment of pain, inflammatory, sleep, eating, and central nervous system disorders. While there have been reported various synthetic agonists of CB receptors, sadly often they are accompanied with adverse effects such as impaired memory, cognition, and most notably addiction. On the other hand, the endogenous agonists such as the aforementioned anandamide (AEA) and 2-arachidonoylglycerol (2-AG) have very short half-lives therefore short duration of actions because they are susceptible to enzymatic hydrolysis. In this study, we examined in vitro a series of novel acylated carbamates and diacylated ureas as prospective FAAH inhibitors. These compounds were efficiently prepared in one-pot two-step reaction sequence. Among over 50 small molecules prepared and tested, 10 compounds showed 50% or greater inhibition of FAAH activity at 50 µM compound’s concentration. The structure-activity relationship analyses revealed structural features that contribute to the desired activity of the novel compounds. Accordingly, the obtained results suggest that acylated carbamates and diacylated ureas can serve as a starting point for further rounds of medicinal chemistry structure optimization in search of effective FAAH inhibitors.

Science and the Arts and Humanities Section

Section chair and program organizer: Dr. Robert L. Chianese, Department of English, California State University, Northridge, Northridge, CA; rlchianese@gmail.com.

10:30 Performing Arts Medicine: An Inter-Professional Research Using Multimodalities to Examine a Professional Pianist with Focal Dystonia, SANG-HIE LEE1*, JUAN SANCHEZ-RAMOS2, RYAN MURTAGH2, TUAN VU2, DUSTIN HARDWICK2, and STEPHANIE CAREY4 (1School of Music, University of South Florida, Tampa, FL; 2Department of Neurology, Morsani College of Medicine, University of South Florida, Tampa, FL; 3School of Physical Therapy & Rehabilitation Sciences, Morsani College of Medicine, University of South Florida, Tampa, FL, USA; 4Department of Mechanical Engineering & Center for Assistive, Rehabilitation & Robotics Technologies (CARRT), University of South Florida, Tampa, FL, USA; slee@usf.edu or sanghielee@gmail.com).

Performing arts medicine is an emergent inter-professional field that involves multidisciplinary collaboration between artists and scientists to search for causes, prevention, treatment, and rehabilitation of artists’ performance-related pain, injury, and dysfunction. Task-specific dystonia is characterized by excessive muscle contractions producing abnormal postures. These functional changes are known to be a result of maladaptive neuroplasticity to prolonged, intense, repetitive movement. While we have increasing knowledge about the contributing factors and neuropathology of focal dystonia, we do not yet understand fully the etiology of task-induced focal dystonia. We examined hand biomechanics, neurophysiology, and music performance outcomes in a 53-year old male pianist with dystonic extension of the left 3rd digit while playing the piano. We aimed to gain information that can help develop a holistic rehabilitation strategy. The pianist led a life with constricted work patterns leaving little time to recharge or relax. He had large hands with a hypermobile structure. Music Instrument Digital Interface (MIDI) data showed the lack of fine digital touch control required for skilled music playing. Functional magnetic resonance imaging (fMRI) demonstrated enhanced activity in contralateral (right) primary sensorimotor cortex, supplementary motor area and parietal-occipital regions during simulated left-hand scale playing. Intramuscular needle EMG analysis demonstrated hyper-activation of the left extensor digitorum communis (EDC) with a distinct periodic oscillatory pattern during and persisting after playing, coinciding with the dystonic posturing. These patterns were not as prominent in the unaffected extensor indicis proprius (EIP), thus demonstrating that pianist’s focal dystonia was associated with increased activity in the contralateral motor area and a distinct oscillatory EMG activity. While a complete recovery of the affected finger deficit remains elusive, video and MIDI recordings of retraining showed progress. This case experimentation provided insights that lead to creating a novel device to redress the deficit in sensory-motor integration.
**Engineering, Technology and Applied Sciences Section**

Section chair and program organizer: Dr. Frank Jacobitz, Department of Engineering, University of San Diego, San Diego, CA; jacobitz@sandiego.edu.

10:50 On Lagrangian and Eulerian Accelerations in Turbulent Stratified Shear Flows, FRANK G. JACOBITZ1* and KAI SCHNEIDER2 (1Mechanical Engineering Department, Shiley-Marcos School of Engineering, University of San Diego, San Diego, CA, USA, jacobitz@sandiego.edu; 2Institut de Mathématiques de Marseille, Aix-Marseille Université, 13453 Marseille Cedex 13, France, kai.schneider@univ-amu.fr).

Shear and stratification are ubiquitous and competing features of the turbulent motion in the geophysical environment. In order to gain more understanding of the dynamics of such flows, the correlations of Lagrangian and Eulerian accelerations are studied using data from direct numerical simulations of homogeneous turbulence with uniform shear and stable stratification. In order to vary the relative importance of shear and stratification, the Richardson number is varied from Ri = 0, corresponding to unstratified shear flow, to Ri = 1, corresponding to strongly stratified shear flow. The correlations between the Lagrangian and Eulerian accelerations are observed to increase with increasing Richardson number. Using a wavelet-based scale decomposition of the accelerations, their correlations at different scales of motion are investigated. It was found that the Lagrangian and Eulerian accelerations are strongly correlated at large, energy-containing scales of motion. However, the correlations decrease with decreasing scale of the turbulent motion and the accelerations are mainly decorrelated at small, dissipative scales of motion.

11:10 The Development of an Analysis Tool for the Comparison of the Microcirculation in Rat Spinotrapezius Muscle and Muscle Fascia, AMANDA C. KENNEDY1*, JAYDEN R. YEOMAN1*, and FRANK G. JACOBITZ (Mechanical Engineering Department, Shiley-Marcos School of Engineering, University of San Diego, San Diego, CA, USA; amandakennedy@sandiego.edu, jyeoman@sandiego.edu, and jacobitz@sandiego.edu). (STUDENT)

The microcirculation comprises the flow of blood through small vessels that supply nutrients to and remove metabolites from surrounding tissues and cells. It is difficult to analyze the microcirculation based on simulation results without a visualization of a variety of flow variables, including pressure, velocity, flow rate, Reynolds number, or Womersley number. In order to overcome this gap in understanding we must be able to map the simulation results onto the network structure in a way where it can be seen and understood visually. The network includes small arterioles, capillaries, and venules with vessel diameters ranging from 8 to 150 μm. In this study, the network connectivity is obtained from microscopic images of blood vessels and the simulation results are mapped back on the network structure. From the microscopic images, a matrix is created that describes each blood vessel and its location. This matrix is then used to display the solution of flow properties onto the vessel structure, allowing a spatial analysis of the simulation results in addition, for example, to a statistical analysis. The microcirculation in rat spinotrapezius muscle and muscle fascia is analysed and compared. Both vessel networks show the general trend of high pressure in arterioles, intermediate pressure in capillaries, and low pressure in venules. However, it can be seen from these pressure maps that the muscle fascia has a lower average pressure. The pressure histogram for the muscle fascia is also more skewed to a predominance of lower pressure values, while the skeletal muscle histogram demonstrates a more Gaussian distribution.

**Physics Section**

Section chair and program organizer: Dr. Ellen Siem, Department of Physics and Engineering, Southern Oregon University, Ashland, OR; sieme@sou.edu.

11:30 Perception of Gravity by Living Cells, ANTONIO B. NAFAFARATE (Deputy Editor Website animalnav.org, Walnut Creek, CA; antonionafarate314@gmail.com).

Gravity affects all masses. Newton provided this formula and it is equal to the product of the masses, divided by the square of the distance multiplied by the Cavendish constant. All living cells contain large numbers of the molecule of ATP Synthase (ATPase) containing an internal rotor with the same dynamic properties of a spinning top tending to have a motion of precession around the direction of the local vertical (the line of action of gravity). In the vast majority of cells the axes of rotation are distributed in all directions resulting in a zero or neutral effect. In particular areas and organelles in plants and animals the rotors are well aligned and produce definite directional effects, because of their angular momentums. In the growing shoots of plants there is an increased production of ATP beyond the metabolic needs and the excess has to be destroyed by Apyrases. Nature is not wasteful but it needs the information supplied by the pointing direction of the angular momentum of the ATP rotors. These places in addition of the growing shoots in the tip and roots of plants are also in some specific organelles in animals such as the Pineal gland in birds and Suprachiasmatic nucleus in mammals. In plant cells the up or down direction is given by the Cholodny-Went Model based on the precipitation of Starches (Amyloplasts).

**Keywords:** gravity, Newton, angular momentum; ATP synthase, internal rotor
9:30  **Introductory Comments**

9:45  **Constitutive Model of PLG 10-90 for Anterior Cruciate Ligament Reconstruction.**  
**PETER KUETZING*, TEHREEM RAZA, ALBA DELGADILLO, and MEHRDAD HAGHI** ('Department of Mechanical Engineering, California State Polytechnic University, Pomona, 3801 W Temple Ave, Pomona, CA 91768, pmkuetzing@cpp.edu, taraza@cpp.edu, aldelgadillo@cpp.edu, mhaghi@cpp.edu).  
(STUDENT PRESENTER)

There are an estimated 100,000 cases of torn Anterior Cruciate Ligaments (ACL) in the United States each year [1]. Although autografts and allografts are approved treatments, they are expensive, labor intensive, cause donor site morbidity, and require a lengthy patient recovery process [2]. Despite decellularization treatments, DNA left in allografts can increase the risk of disease transmission and immunogenic response [3]. Synthetic implants eliminate the harvesting procedure and have great biocompatibility. Understanding the time dependent properties of a synthetic material that closely matches those of native ligaments is imperative for ACL reconstruction innovation.

PLG 10-90 (L-lactide -co-glycolide) monofilament is an absorbable biopolymer and strong candidate for ACL reconstruction. The biopolymer sufficiently matches average native ACL tensile strength and percent elongation to fracture. Additionally, the dissolution time of PLG 10-90 is approximately the same as ACL growth time. This inversely proportional relationship offers the potential of scaffold reconstruction procedures. This research will determine a set of evolutionary equations which predicts failure under a variety of conditions. Specimens are stored under an assortment of loads at in-vivo conditions. A specimen is then subjected to one of several tensile tests, including a jump test, to determine the properties at different time points. These tests illustrate the time dependent properties in terms of rate of dissolution and strain rate. This data will show a relationship between the strength of PLG 10-90 and its dissolution which is required to build a constitutive model and determine the viability for ACL reconstruction.

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10:05  **Electrochemical Studies of Titanium Alloys for Dental Implants.**  
**JAEWAN BAE*, JACOB BENOUN, and VILUPANUR RAVI** (Department of Chemical and Materials Engineering, California State Polytechnic University, Pomona, Pomona, CA, 91768; jjbae@cpp.edu, jbenoun@cpp.edu, carlosp@cpp.edu, vravi@cpp.edu).  
(STUDENT PRESENTER)

Titanium and titanium alloys, in particular Ti-6Al-4V (wt%) (Ti64), are commonly used as dental implants due to their favorable strength-to-weight ratio, elastic modulus, biocompatibility and corrosion resistance. However, as the human lifespan increases, patients have begun to outlive the functional life of their implants. The long-term use of this alloy is associated with issues such as stress shielding and the release of harmful metal cations into the surrounding tissue. Stress shielding is the result of a mismatch between the elastic modulus of the implant and the surrounding bone, ultimately leading to bone loss and subsequent loosening of the implant. In addition, the release of aluminum and vanadium metal cations into the body results in deleterious health effects. Two promising alternative alloy systems, Titanium-Niobium-Zirconium (TNZ) and boron containing Ti64 alloys, present a potential solution to these issues. TNZ is a new class of beta-phase titanium alloys, which have a lower elastic moduli, as compared to conventional Ti64, thereby minimizing stress shielding. These alloys also have non-toxic constituents. Low levels of boron additions (< 0.04 wt%) increase the mechanical strength and improve the corrosion behavior of Ti64 alloys. In this study, the corrosion behavior of Ti-28Nb-20Zr, Ti-39Nb-6Zr, Ti-6Al-4V-0.01B and Ti-6Al-4V-0.04B were compared to Ti64 in phosphate buffered saline solution (PBS) and Fusayama/Meyer artificial saliva solution at 37°C. Cyclic polarization tests were used to evaluate the corrosion susceptibility of the titanium alloys to serve as implant devices (ASTM F2129-17). Linear polarization resistance measurements (ASTM G59-97), Tafel plots, electrochemical impedance spectroscopy (EIS) measurements and scanning electrochemical microscopy (SECM) were conducted to obtain deeper insights into corrosion behavior and surface passivation. Preliminary results in PBS show that the TNZ and boron containing Ti64 alloys have higher resistances to polarization and lower corrosion current densities in comparison to Ti64. Therefore, all of these alloys are expected to corrode at lower rates and last longer as dental implants. A more complicated picture emerged from the tests conducted in Fusayama/Meyer artificial saliva solution with some alloys following the same trend and some not.
Effects of Nitinol Purity and Surface Finish on Corrosion Susceptibility, GRAZZIELA SENA1*, ALAN PELTON2, CHRIS BRAEUNER1, MATTHEW DI PRIMA4, PHILIP STAFFORD5, SRINIDHI NAGARAJA2 and VILUPANUR RAVI1

Aortic stenosis is a serious cardiovascular condition affecting heart valves predominantly in the aged population. However, surgical aortic valve replacement is not always a possible option for high risk patients due to complications during open heart surgery. Transcatheter aortic-valve implantation (TAVI) is a less invasive treatment that is a good alternative for patients who are at high risk during surgeries. Transcatheter aortic valves are manufactured with valve leaflets usually made from a single layer of porcine pericardium and a self-expanding frame made of a nickel-titanium alloy (Nitinol). This bioprosthesis is responsible for maintaining unidirectional flow of blood from the heart to the rest of the body. The materials of construction of such a prosthesis should have excellent fatigue and corrosion resistance. Studies in the past have shown that reduction in both the size and area fraction of inclusions in Nitinol led to a better fatigue behavior. However, the effects of inclusion size and distribution on corrosion resistance have not been elucidated. The objective of this study is to determine the impact of different nitinol microstructural purities on pitting corrosion resistance and nickel ion release. In this study, a generic heart valve frame with three different nitinol microstructural purities and different surface finishes, e.g., electropolished, chemically etched and black oxide, were exposed to a simulated physiological environment, i.e. Phosphate Buffered Saline. The test protocol was in accordance with ASTM F2129. In addition, immersion tests were conducted for different periods of time (1, 2, 3, 5, 7, 14, 21 and 30 days) to evaluate its pitting and general corrosion behavior. Microstructural analysis was performed with optical and scanning electron microscopy.

Corrosion Behavior of 304L Stainless Steel Produced by Laser Powder Bed Fusion, CHRISTOPHER FARAJ1, JACOB BENOUN1*, ADAM TEOH1, HO LUN CHAN1, and ZACHARY HILTON2 (STUDENT PRESENTER)

Additive manufacturing (AM) is a process technology in which materials are usually joined layer by layer. Common issues in laser powder bed fusion AM of metals arise from poor particle fusion and porosity that compromise the overall integrity of the fabricated component. Likewise, the rapid cooling rates during AM of metals lead to heterogeneous microstructures with non-equilibrium phases, which raise concerns about their degradation. Consequently, the effect of various heat treatments (i.e., annealing, hot isostatic pressing and solutionizing) on the microstructure and corrosion behavior of laser powder bed fusion manufactured alloy 625 was studied. Test coupons were immersed in a 1N sulfuric acid solution and subjected to electrochemical testing in accordance with ASTM G59 and ASTM G61 protocol. Microstructural characterization was performed using optical and scanning electron microscopy. The detailed results of this study will be presented and discussed.
Agriculture, Food, and Renewable Resources Section

Poster # 1 A Bottleneck for Microbes in Seeds of Ventenata dubia, Bromus tectorum, and Boechera stricta, MARYAM MOHAMMED ALOMRAN1,3*, GEORGE NEWCOMBE2, and TIMOTHY PRATHER1 ¹Department of Plant Sciences and ²Department of Forest, Rangeland and Fire Sciences, University of Idaho, Moscow, ID, USA; ³College of Science, Department of Biology, Princess Nora Bint AbdulRahman University, Riyadh, Kingdom of Saudi Arabia; alom4874@vandals.uidaho.edu, georgen@uidaho.edu and tprather@uidaho.edu. (STUDENT PRESENTATION)

Plants host diverse, endophytic microbiomes in their roots, leaves, and stems, but seeds represent a bottleneck in terms of diversity and numbers of microbes per seed. Seeds are strongly defended against most microbes and those that can infect seeds are highly combative and commonly exclude one another. Testing of this hypothesis must involve more plant species. Here we determined isolation frequencies of culturable microbes of individual seeds in two invasive plants (Ventenata dubia, and Bromus tectorum) and one North American native plant, Boechera stricta. We varied age of seed, surface-sterilization protocol, and isolation medium to see if we could find any indication of a departure from the bottleneck of zero or one culturable microbe per seed. Seeds of V. dubia from 1984 to 2017 collections totaled 3,400 seeds, and they were plated in four types of medium (MGA 2.5, PDA, Kings, and filter paper). Seeds of B. tectorum from 1987 to 2017 collections throughout the invaded range, totaled 500 seeds and they were plated on PDA. In addition, 1080 seeds of North American native plant B. stricta were tested for the bottleneck and for exclusionary interactions that might be responsible. The overall, combined result was that of 4980 seeds 82.2% yielded zero culturable microbes. 17.1% of the seeds yielded one microbe per seed. Only 0.7% yielded two microbes per seed. This compares to a published, 98-plant species survey in which only 3% of nearly 7,000 seeds yielded two culturable isolates per seed, and the rest were either zero or one. It seems likely that virtually all plant seeds represent a bottleneck for culturable microbes.

Keywords: microbiome bottleneck, optimal defense of seeds, maternal transmission of microbes

Poster # 2 In-field Trench Composting, SCOTT GOODE (Desert Research Institute, Reno, NV; P.O. Box 5083, Central Point, OR 97502; nourishing.systems@gmail.com).

Composting is the mainstay of most organic food production. Since most farmers produce compost in hot piles separated some distance from their cropping operation, the transporting of the feedstocks for their compost, aeration and mixing of the compost, and the transport of finished compost to their cropping area, usually requires added time and expense.

There are several significant issues associated with this style of composting that make it problematic in the context of environmentally conscientious food production. First, composting generates the greenhouse gases carbon dioxide, water vapor, and volatile nitrogen compounds. Traditional compost management releases these products into the atmosphere, contributing to global warming. Second, animal manure is almost always the source of nitrogen used to create an appropriate carbon to nitrogen ratio necessary to generate the thermophilic temperatures required to completely decompose plant material and effectively control soil-borne pathogens and pests. Most of the nitrogen in the compost feedstock is lost to the atmosphere, wasting this valuable nutrient. And finally, using manure as a nitrogen source for composting, has the potential of introducing fecal-borne pathogens associated with manure. To mitigate these pathogens, composts have to be heated to a sufficient level to sterilize the compost. Additionally, the application of this compost has to be carefully managed to allow a sufficient period of time between the application of the compost and the harvest of the crop.

Across the Americas and Europe, civilizations had developed systems of composting that not only avoided releasing greenhouse gases into the atmosphere, but dramatically reduced the need to transport, both materials to the composting location, the finished compost to the cropping areas. This poster provides a description of how this technique can be implemented in the context of modern farmers-market scale agricultural production.

Keywords: climate change, diversification of local agriculture, impact and issues concerning pollinators, film.

Poster # 3 Metagenomic Analyses across Pest-Host Environments of Invasive Shot Hole Borer (Euwallacea sp.), ANDREW E. NEISESS3*, VALERIE J. MELLANO1, SHELDON E. MURINDA2, and AKIF ESKALEN1 ¹Departments of ¹Plant Science and ²Animal and Veterinary Sciences, California State Polytechnic University, Pomona, CA, USA, aeneissess@gmail.com, vjmellano@cpp.edu, semurinda@cpp.edu; ³Department of Plant Pathology, University of California, Davis, CA, USA, aeskalen@ucdavis.edu. (STUDENT PRESENTATION)
Invasive shot hole borer (*Euwallacea spp.*) are ambrosia beetles native to southeast Asia that have become established in California, Mexico, Israel and South Africa within the past decade. The beetle propagates a member of the fusaria grouping, Ambrosia Fusarium Clade (AFC), that is the etiological fungal agent for the disease fusarium dieback (FD). FD is a fatal disease in many native and horticulturally important tree species in southern California. Some combinations of injected fungicidal treatments show effectiveness for mitigating damages, but non-invasive and selective treatments are preferable in major commercial host species to reduce side-effects, cross-resistance and environmental impacts. One avenue of biological research unique to insect pest management focuses on endosymbiotic microbes and the effects they have on their insect hosts. Avocado is a relatively tolerant host species to FD disease symptoms. A case of avocado rhizobacteria associated with antifungal activity against AFC was found near the roots of the tree. It is unclear whether significant antibiotic producing microbes are present in localized infested cambium tissues. This experiment was designed to compare the metagenomic data and species abundance of microbial endosymbionts within the beetles, their galleries, and non-infested xylem tissue from field and laboratory colonies. Next generation MiSeq sequencing assays will be carried out to collect genomic data and laboratory cultures will be plated to quantify diversity and abundance. The QIIME 2 pipeline of bioinformatics tools will be used to analyse alpha- and beta-diversity of 16s/18s rRNA kmers and reconstruct the rudimentary microbial environment.

**Keywords:** metagenomics, invasive, insect, avocado, microbiome.

**Poster # 4** Sex-dependent Lifespan Extension by Curcumin Treatment in *Drosophila melanogaster*. T. REZENDES, J.C. DOUGLAS, A. ESQUIVEL, P. VIDEAU, and B.E. PADDOCK (Southern Oregon University, Ashland Oregon). (STUDENT PRESENTATION)

Turmeric, *Curcuma longa*, is a plant native to southeast India that belongs to the ginger family known commonly as curcumin. The rhizomes are ground into an orange-yellow power and used as spice in Indian cuisine. Curcumin has anti-oxidant and anti-inflammatory properties, can induce cell death in cancer cells while prohibiting their growth, and has antithrombotic effects. Curcumin is being investigated as a potential treatment for several diseases that exhibit sex-dependent differences. To investigate the role of curcumin in lifespan and neurological function *in vivo*, *Drosophila* were reared on a range of curcumin concentrations. While curcumin treatment extended the survival of all groups tested, sex-dependent differences were only observed in 0.25 mM and 2.5 mM curcumin, with no sex-dependent difference when treated with 25 mM curcumin. Reflexive motor function, as tested by the negative geotaxis assay, did not display the same pattern of improvement. Taken together, these data indicate that curcumin may work by two distinct mechanisms in extending survival and preserving neural function into old age.

**Anthropology and Archaeology Section**

Section chair and program organizer: Dr. Claudia Garcia-Des Lauriers, Department of Geography and Anthropology, Cal Poly Pomona, Pomona, CA; clauriers@cpp.edu.

**Poster # 5** Examining Evidence of Repurposing and Recycling of Milling Stone Equipment from San Clemente Island, DEBBIE BALAM (Department of Anthropology, California State University Northridge, Northridge, CA; debbiesue.balam@gmail.com). (STUDENT PRESENTATION)

Ground stone artifacts are the kitchenware of the past. Where plastic, disposable utensils were not available to Native Americans, ground stone items like metates, pestles and mortars were kept, valued and used every day. These tools played a fundamental role in the centrality of subsistence. These tools were capable of providing food by processing items like grains and seeds and the ability to cook these foods. Additionally, ground stone tools have the ability to process materials like leather and plants which are essential for material goods and medicinal items. However, even with the important role these tools played in Native American society, aspects like repurposing and recycling of ground stone items for precontact societies is not well researched. The research will focus on understanding the behavioral motivations that drive precontact Native American groups to repurpose and recycle ground stone tools. By focusing on a collection from San Clemente Island, explanations of how trade, material type, distance to quarries and the context in which the ground stone artifacts are found, encouraged people to reuse material can be detailed. Through use-wear analysis and petrographic thin sectioning both the number of different uses and origin of the stone can be determined. Studying the repurposing of ground stone artifacts allows for a better understanding of the important role that stone tools had and still has for Native American societies and other societies around the world.

**Keywords:** California archaeology, Native American, San Clemente Island, ground stone, repurposing.

**Poster # 6** Finding the Dirt of the Right Age: Uncovering the Late Pleistocene Landscape of the Oregon State University Campus, SAMUEL R BURNS** and LOREN WHITE (Department of Applied Anthropology, Oregon State University, Corvallis, OR; burnsam@oregonstate.edu, whitelo@oregonstate.edu). (STUDENT PRESENTATION)

In 2016, the discovery of mammoth bones beneath Oregon State University’s (OSU) Reser Stadium created a sensation on campus and attracted widespread media attention. This highlights the potential value of the cultural, paleontological, and geological resources that lie buried beneath the campus for public outreach, education, and marketing. We are assisting with the development of a hands-on, experiential undergraduate course that will explore the Late Pleistocene landscape of the OSU campus from an archaeological and earth sciences perspective. While the pedologic and geomorphic contexts of the Willamette
Valley have been extensively studied, there has been no synthesis of existing data from these fields to inform the search for archaeological evidence of late Pleistocene human occupation in the region. This poster documents a pilot study of geological coring and soil sampling that is designed to identify areas on campus where students can explore aspects of the Late Pleistocene landscape, as well as provide infrastructure to support the course. There are three major components to this pilot. After a review of research on the Late Pleistocene history of the region, we are building a predictive GIS model that uses soil, elevation, land use, and vegetation data to predict accessible areas on campus that are likely to have buried or exposed Late Pleistocene soil surfaces. Second, this model is ground-truthed using a Geoprobe and soil pits. The sediments are described, analyzed, and recorded using a simplified system we designed. Finally, we outline and implement a flexible geodatabase schema designed to manage all the data that this course is likely to generate. This database can be extended to manage data for potential future campus outreach programs on the Late Pleistocene landscape of campus, including public education programs, campus signage, mobile and web applications, and a variety of print, digital, and multimedia publications.

**Keywords:** geoarchaeology, Late Pleistocene landscapes, science communication, sediment coring

**Poster # 7 Geometric Morphometric Assessment of Skull Symmetry in 6-8.0 Year Old Humans, JESSICA M. CRONIN*, ANA SHAUGHNESSY2, JANE VANNAHEUANG3, LAURA E. CIRILLO4, GARY D. RICHARDS5, and REBECCA S. JABBOUR6 (1Department of Integrative Biology, jessc221@berkeley.edu, 2Department of Molecular and Cell Biology, ana.shaughnessy@berkeley.edu, and 3Department of Public Health, University of California, Berkeley, CA, janevannaheuang@berkeley.edu; 4Department of Anthropology, University of Nevada, Reno, NV; 5Department of Biomedical Sciences, A.A. Dugoni School of Dentistry, University of the Pacific, San Francisco CA, grichard@pacific.edu; 6Department of Biology, Saint Mary’s College of California, Moraga, CA. (STUDENT PRESENTATION)

Asymmetries of the skull are well-documented. However, little is known of the complex interplay between developmental rates and duration, functional components, and constraints that result in skull symmetry or asymmetry. Consequently, we are ill equipped to differentiate potentially problematic changes resulting from the current epidemic of asymmetric skulls (plagiocephaly) related to SIDS prevention. Here we provide a geometric morphometric assessment of normal children to establish the range of symmetry/asymmetry from which to address potentially problematic changes from the normal condition.

We compiled 38 normal skulls with developmental ages of 5.8-7.9 years. Ages are based solely on dental calcification patterns. With the mandible articulated on the cranium, we used a Microscribe to digitize 254 3D landmarks; 38 are employed.

Variation explained by PC1-4 is 18%, 13.2%, 9.9%, and 6.65%, respectively. PC1 relates to increased cranial base flexion and anteroposterior fronto-occipital expansion. PC2 relates to skull shortening and height increase. No individual is symmetrical on PC1-2 and only 16% of individuals approach coincidence of the right/left side plots. On PC1 13% and 24% of individuals show low to moderate right/left separation, respectively while 18% and 24% do so on PC2. Individuals with +PC1 and –PC2 scores show the highest degree of right/left asymmetry on PC1-2. Delineating the range of symmetry in this sample provides a basis from which to identify causative factors underlying asymmetry. Funding provided by Undergraduate Opportunity Fund Grants to Jessica Cronin, Ana Shaughnessy, and Jane Vannaheuang.

**Keywords:** human biology, asymmetry, development, skull, geometric morphometrics

**Poster # 8 New Age Colonialism: Biopiracy and Bioprospecting as Colonialism in the Global Order, CORINNE M. GIBSON (Department of Anthropology, California State University, Fresno, CA; corinnemarie@mail.fresnostate.edu). (STUDENT PRESENTATION)

Biopiracy is the theft, privatization, or commercialization of biological resources and the cultural knowledge surrounding them by multifarious colonial and corporate entities. This study argues that biopiracy, specifically of biomatter manufactured into recreational and pharmaceutical drugs and supplements, is a modern expression of colonial extraction. The process of biopiracy is driven by extractive entities as well as consumer capitalism’s tendency to essentialize and commodify other cultures. I address the colonial and neo-liberal roots of biopiracy, not as new phenomena, but as continuous with established institutions of imperialism and capitalist exploitation, while revealing the social, political, commercial, and aesthetic relationships between the economically dominant North and the peripheral South. By focusing on Macarena Gómez-Barris’s concept of the “extractive zone,” I synthesize the roles both production and consumption play in biopiracy to argue that the practice of biopiracy promulgates colonial capitalist values. To better understand the relationships between production and consumption in the practice of biopiracy, I examine three case studies in two regions of the globe: ayahuasca and maca in South America, and kava in the Pacific Islands. My findings are in part built on this synthesis of cases across these regions in conversation with new theoretical approaches on the continuing process of colonial extraction.

**Keywords:** biopiracy, bioprospecting, colonialism, indigenous knowledge, fostering inclusion of underrepresented minorities in science
Cell and Molecular Biology Section
(including Medical and Dental research in these areas)

Section chair and program organizer: Dr. Carolina Livi.

Poster #9 The Jekyll and Hyde of Inflammation: Cytokines as Metastatic Promoters with Suppressive Qualities in Breast Cancer, JOSEPH A. CHRISTIANSON* and CHERYL L. JORCYK2 (Department of Biological Sciences, Boise State University, Boise, ID; joechristianson@u.boisestate.edu) (STUDENT PRESENTATION)

The interactions between inflammation and tumor progression have been a source of contentious debate within the field of medicine for decades, and the mechanisms underlying tumor aggressiveness and metastasis as a result of inflammation have presented unique challenges for scientists ever since. Metastasis is the spread of a primary tumor to new sites within the body and is one of the main drivers of mortality for the vast majority of patients who develop cancer. As breast cancer is currently one of the leading causes of cancer related death in the United States, understanding how inflammation influences tumor progression and metastasis is of paramount importance to reducing cancer related death. Inflammatory cytokines, defined as the chemical drivers of inflammation, have been of particular interest within the study of breast cancer as they hold both a relationship with normal tissue development, as well as tumor progression and metastasis. These cytokines often work in tandem with one another to exert highly specific responses in host cells, with diverse and often overlapping functions in both native and pathophysiological contexts. Paradoxically, inflammatory cytokines have furthermore been demonstrated to play a role in the development of mammary tissue itself, specifically in the context of ductal elongation and involution, and seem to work in concert to either induce cell growth or cell death. This is only the proverbial tip of the iceberg with regards to the intrinsic complexity of these molecules, and only furthers the necessity for developing and implementing new strategies to study their activity in tumor progression and metastasis. It is thus of critical importance that we seek to delineate the specific roles of these cytokines within cancer biology, with the ultimate aim of providing better and more effective treatments to patients who develop this disease.

The project described was supported by NIH grants P20GM103408, P20GM109095, and R25GM123927, NSF-BSF 2017237, Murdock (M.J.) Charitable Trust 2000000722, the METAvivor Quinn Davis Northwest Arkansas METSquerade Fund, and the Smylie Family Cancer Fund. We also acknowledge the generosity of The Biomolecular Research Center at Boise State University.

Keywords: metastasis, inflammation, cytokines, tumor, breast cancer, metastasis suppressor

Poster #10 The Effect of Curcumin on Neural Function, Development and Response to Oxidative Stress in Drosophila, A.R. ESQUIVEL*, C. MORAN, P. VIDEAU, and B.E. PADDOCK (Department of Biology, Southern Oregon University, Ashland, OR; esquiveal@sou.edu, moranc@sou.edu, videaup@sou.edu, paddockb@sou.edu). (STUDENT PRESENTATION)

Reactive oxygen species (ROS) are oxygen derived free radicals typically produced during cellular respiration. The overabundance of ROS is often referred to as oxidative stress, due to the resulting alkaline and often toxic environment it can cause in a physiological system. ROS are known for damaging endogenous biomolecules, causing lipid peroxidation, especially in the brain. Oxidative stress notably influences the progression of Alzheimer’s and Parkinson’s disease, two well-known neurodegenerative diseases, and is involved in over 100 other diseases. ROS are known for damaging endogenous biomolecules, causing lipid peroxidation, especially in the brain. Curcumin, the active ingredient in turmeric, has been noted to have antioxidant properties, such as ROS-scavenging, and has become an interesting subject for pharmacological interventions due to its ability to cross the blood-brain barrier. Drosophila melanogaster is a useful tool in observing the effects of a chemical on many different behaviors, developmental components and morphological features. Preliminary results demonstrate that chronic treatment with curcumin does not increase peroxide lipid level and is associated with a FoxO dependent preparatory response that reduces impact of oxidative stressors. Curcumin treatment impacts neural function, possibly related to dose dependent changes to both the ventral nerve cord and brain lobe size. Taken together, these data suggest chronic curcumin treatment impacts neural function in the absence of an oxidative stressor.

Keywords: curcumin, oxidative stress, Drosophila, sexual dimorphism, neurological

Poster #11 Expression of Insulin Receptor Isoforms during the Reproductive Cycle in the American Mink, CHASELYN RHINEHART* and AYOKUNLE HODOUN* (Northwest Nazarene University, Nampa, ID; crhinehart@nnu.edu, ahoudoun@nnu.edu). (STUDENT PRESENTATION)

Before placentation occurs, uterine glycogen production is the predominant source of nutrients and energy for the developing embryo. During pro-estrus and estrus, mature female mink (Neovison vison) experience an increase in glycogen reserves by the actions of estradiol. After ovulation, glycogen reserves are subsequently mobilized by progesterone and metabolized for embryo survival during implantation and early pregnancy.

We recently showed via immortalized uterine epithelial cells (GMMs) in culture, that glycogen synthesis is stimulated only in the presence of insulin, and that this may have permissive effects on estradiol to increase glycogen synthesis. In addition, insulin receptor expression changes in response to ovarian hormones which regulate the reproductive cycle in mink. The temporal and localized expression of multiple isoforms of the insulin receptor in mink, human and horse uterine epithelial cells indicates a possible mechanism for glycogen regulation in the mink uterus, previously unknown.
We hypothesize that glucose supply to the developing embryo is primarily regulated by insulin via the insulin receptor B isoform and is modulated by the actions of estradiol and progesterone, ultimately promoting successful implantation and embryo survival.

Poster # 12 Potential for a Pro-Metastatic Prostate Tumor Microenvironment Created by the Generation of a Positive Feedback Loop from Cytokine-Induced CXCL1 Expression, CASSANDRA L. WIGFALL*, CODY L. WOLF, and CHERYL L. JORCYK (Department of Biological Sciences, Boise State University, ID; cassiewigfall@u.boisestate.edu, codywolf@u.boisestate.edu, jorcyk@boisestate.edu). (STUDENT PRESENTATION)

In the United States, prostate cancer is the most commonly diagnosed cancer and is currently the second leading cause of cancer-related deaths among men. The American Cancer Society estimates that there will be approximately 174,650 new cases of prostate cancer and 31,620 cancer-related deaths in 2019. While localized prostate cancer has a relatively high survival rate, distant metastasis, or spreading to other parts of the body, contributes to a worse prognosis and increased mortality for patients. Proinflammatory cytokines have been previously shown to increase metastasis in a multitude of cancers, including prostate. Recent evidence suggests they may also promote the expression of chemokines, small proteins involved in the chemoattraction of white blood cells. These expressed chemokines could potentially bring neutrophils to the site of the prostate tumor. Recruited neutrophils have already been shown previously to secrete additional proinflammatory cytokines into the tumor microenvironment of breast cancer. However, the potential for proinflammatory cytokines to aid in the formation of a feedback loop in prostate cancer has not yet been evaluated. Thus, we hypothesize that in the presence of proinflammatory cytokines, prostate cancer cells will increase chemokine secretion, which in turn further promotes prostate cancer metastasis through the recruitment of neutrophils leading to a positive feedback loop. To understand this relationship, cytokine-induced chemokine expression was measured using enzyme-linked immunosorbent assays (ELISAs) after treatment with or without proinflammatory cytokines. We found that proinflammatory cytokines induced CXCL1 secretion in human prostate cancer cells. To visualize neutrophil recruitment, trans-well invasion chambers were used, followed by membrane staining using crystal violet, and fixing of the membranes to slides for imaging under microscope. These results currently begin obtained. By exploring the role that pro-inflammatory cytokines play in promoting chemokine secretion, we can better understand the process of prostate tumor metastasis.

The project described was supported by NIH grants P20GM103408, P20GM109095, and R25GM123927, NSF-BSF 2017237, Murdock (M.J.) Charitable Trust 2000000722, the METAvisor Quinn Davis Northwest Arkansas METSqueraude Fund, and the Smylie Family Cancer Fund. We also acknowledge the generosity of The Biomolecular Research Center at Boise State University.

Keywords: chemokine, cytokine, metastasis, neutrophil, prostate cancer

Poster # 13 Computational Modeling of Carbohydrate Allocation in a Mink Endometrial Cell Line (GMMe) to Understand Hormone Regulation of Fertility, ANGELIQUE YANG*, HUNTER BAIN, and JENNIFER CHASE (Department of Biology, Northwest Nazarene University, Nampa, Idaho; ayang@nnu.edu). (STUDENT PRESENTATION)

The cells lining the uterus secrete a carbohydrate-rich metabolite broth to support early embryo development. Changes in the levels of hormones, including estrogen and progesterone, must shift the metabolism of these cells during the uterine cycle from storage of glucose as glycogen, to cell proliferation, and to releasing glucose and glycolytic products to the uterine lumen. Because most mammalian embryos are lost in this early stage, we need to understand how the nutrient supplies are regulated. While previous work in uterine cell lines and tissues has attempted to isolate to dissect the roles of particular steps in this system, we have been fully characterizing the system in mink uterine epithelial cells (GMMe cell line) and have used a computational systems approach, revising a model of HeLa metabolism to identify crucial controlling steps. GMMe cells, ~90% confluent, were treated for 24 hours at 5 mM in DMEM/F-12 with 10 μM progesterone (P4), or 10 nM estrogen (E2), or vehicle. Glycogen and lactate production (glycolytic flux), and steady-state metabolite levels were measured spectrophotometrically using standard coupled reactions in lysed cells. Glucose uptake and oxygen consumption were measured using assay kits (e.g., Glucose UptakeGlo, MitoXpress). Enzyme Vmax and Kms were measured spectrophotometrically in cell extracts. The model was constructed in COPASI 4.25 (copasi.org) and unknown parameters were fit to the fluxes or used HeLa values. Glycolytic flux was unchanged by hormone treatment (~19 nmol/min/mg protein). Estrogen treatment downregulated the Vmax of 9 enzymes, while progesterone affected 4 enzymes. Preliminary modeling results implicated the pentose phosphate pathway and glycogen synthesis/degradation fluxes as most flux controlling for glycolysis. A validated model of carbohydrate metabolism will be useful for identifying risk factors or therapeutic targets that affect fertility in mink and other mammals.

Keywords: the expanding role of computational modeling in basic science, estrogen, progesterone, carbohydrate metabolism, fertility

Poster # 14 Pancreatic Cancer Patient’s NK Cells and How They are Defective in the Production of IFN-γ, MARIANA AMARILLAS, LARRY WITCHER, MENG-WEI KO, TAHIJNEH SAFAEI, MAJED BAMATRAF, and ANAHID JEWETT (UCLA Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA, mariana.amarillas@hotmail.com, blackmagickid28@gmail.com; 2UCLA School of Dentistry, Los Angeles, CA, mengwei@g.ucla.edu, tahmineh_saf@yahoo.com, mbamatraf@ucla.edu, ajewett@ucla.edu). (STUDENT PRESENTATION)

Pancreatic cancer is difficult to cure due to its fast growing metastatic nature, and it is hard to diagnose in the early stages of the disease. Cancer stem cells (CSC)/undifferentiated tumor cells are chemo-resistant due to increased expression of multi-
drug resistance and their survival and selection after chemotherapy result in relapse, metastasis and invasion of tumors. NK cells are capable of targeting CSC and differentiating them through IFN-γ secretion. In this study, we assess the IFN-γ production of NK cells in pancreatic cancer patients. **Objective:** To show that NK cells in pancreatic cancer patients are dysfunctional and have decreased levels of IFN-γ secretion. **Methods:** Blood purification was performed using Ficoll-paque to obtained Peripheral Blood Mononuclear cells (PBMC) from both cancer patients and healthy donors. PBMCs, of both cancer patients and healthy donors were activated with IL-2, anti-CD16 and anti-CD3/28 antibodies for 18-24 hours. Supernatants were collected and tested with ELISA to determine IFN-γ secretion levels. **Results:** Patient PBMCs were unable to produce IFN-γ while treated with both IL-2 and anti-CD16 antibodies. However, they were capable of producing IFN-γ when treated with IL-2 with or without anti-CD3/28 antibody. **Discussion:** NK cells of pancreatic cancer patients were defective in producing IFN-γ when triggered with anti-CD16 antibody while T-cells are capable of producing IFN-γ when CD3 and CD28 receptors were triggered.

**Poster # 15 Inhibition of GRHL2 Protein Enhances Bortezomib-induced Apoptosis in Oral Squamous Cell Carcinoma (OSCC) by Reducing Autophagy,** AMALIA DE LEON1*, AMELIA LOPEZ1*, YATENDRA MULPURI2, TORU YAMAMOTO3, and IGOR SPIGELMAN2 (1UCLA Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA, amalialiasmine@leon@yahoo.com, amelia.lopez2598@gmail.com; 2UCLA School of Dentistry, Los Angeles, CA, yatendra@ucla.edu, toryyamamoto@ucla.edu). (STUDENT PRESENTATION)

Chronic migraine is a debilitating condition with an unmet need for effective clinical treatment without central nervous system (CNS)-mediated side effects. **Objective:** To determine if pretreatment with PrNMI, a synthetic peripherally restricted cannabinoid, will help alleviate mechanical hypersensitivity and photosensitivity in a mouse chronic migraine model. **Methods:** Chronic migraine-like symptoms were induced by injections of nitroglycerin (10 mg/kg, i.p) in C57/BL6 J mice every other day for two weeks. These mice were pretreated with either vehicle or PrNMI to determine whether peripherally restricted cannabinoids are effective in suppressing chronic migraine symptoms. Von Frey hairs method was used to determine hindpaw and head withdrawal responses to mechanical stimulation. Photosensitivity of mice was tested in a light-dark box. **Results:** Repeated injections of nitroglycerin resulted in significantly decreased hindpaw withdrawal thresholds in the vehicle but not PrNMI group. However, head withdrawal responses to Von Frey stimulation, and photosensitivity in were not altered in both PrNMI groups. **Discussion:** PrNMI can suppress the hypersensitivity in the hind paws of the mice chronic migraine model. However, similar administrations of nitroglycerin don’t seem to alter photosensitivity and mechanical sensitivity in the head region suggesting further methods optimization requirement. **Conclusion:** Peripherally restricted cannabinoid suppresses mechanical hypersensitivity associated with chronic migraine symptoms.

**Poster # 16 Inhibition of GRHL2 Protein Enhances Bortezomib-induced Apoptosis in Oral Squamous Cell Carcinoma (OSCC) by Reducing Autophagy,** TEMI JEKAYINFA1*, WEI CHEN2, ABDULLAH ALSHAIKH2, and MO KANG2 (1UCLA Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA, temijek@gmail.com; 2UCLA School of Dentistry, Los Angeles, CA, chenwei304@ucla.edu, abdullah.alshaikh@hotmail.com, mkang@dentistry.ucla.edu). (STUDENT PRESENTATION)

Head and Neck Squamous Cell Carcinoma is malignant neoplasm that arises in the head and neck region comprising nasal cavity, paranasal sinuses, oral cavity, salivary glands, pharynx and larynx. It is the 6th most common cancer worldwide. **Objective:** To determine the effect of Bortezomib (BTZ), a proteasome inhibitor, on cell proliferation and apoptosis of oral cancer cells in GRHL2 knockdown model. It is hypothesized that the inhibition of GRHL2 protein will enhance Bortezomib-induced apoptosis in head and neck squamous cell carcinoma by reducing autophagy. **Methods:** MTT assay, western blot, and PCR were used to assess cell proliferation and viability protein and gene expression. The endogenous GRHL2 of treatment group OSCC was knocked down with Sh-GRHL2. Both GRHL2 control and GRHL2-sh groups were introduced to different concentrations of BTZ. **Results:** BTZ treated OSCC of the experimental group with GRHL2-sh resulted in cell apoptosis, while the OSCC of the control group with functionally intact GRHL2 survived. **Discussion:** Knocking down the GRHL2 gene expression sensitizes OSCC to Bortezomib chemotherapy by inhibiting autophagy. **Conclusion:** GRHL2 seems to be a key factor in the development of chemoresistance through autophagy.

**Poster # 17 Stemness of Bone Marrow Stromal Cells for Regenerative Properties,** KAITLYN QUESADA1*, BRIAN CARTER1*, HIROKO OKAWA2, and ICHIRO NISHIMURA2 (1UCLA Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA, quesadakitylyn@gmail.com, brian1cartern0003@gmail.com; 2UCLA School of Dentistry, Los Angeles, CA, hiroko.okawa01@gmail.com, inishimura@dentistry.ucla.edu). (STUDENT PRESENTATION)

Stem cells are known for having the ability to self-renew and differentiate into various cell types, allowing them to regenerate tissues and replace damaged cells. Previous research was conducted regarding the effect on regeneration and stemness qualities in Bone Marrow Stromal Cells (BMSC) derived from NPAS2 knockout mice. In NPAS2 knockout mice, the NPAS2 gene, a component of the Circadian Clock, is removed. **Objective:** To further investigate stemness and osteogenic differentiation abilities of BMSC in NPAS2 knockout. **Methods:** WST-1 was used to assess proliferation and viability of cells in wild type and NPAS2 K/O mice. RT-PCR was used to find which stem cell markers were expressed in wild type and NPAS2 K/O mice BMSC. ALP staining was used for osteogenic differentiation potential in both wild type and NPAS2 K/O mice BMSC. **Results:** Stem cell markers NANOG and KLF4 were expressed more within NPAS2 K/O mice BMSC than wild type mice BMSC. NPAS2 K/O mice BMSC had a faster proliferation rate and underwent osteogenic differentiation faster than wild...
type mice BMSC. **Discussion:** After reviewing multiple experiments dealing with the suppression and knockout of NPAS2, reports indicate results that support our data. An article that claims “silencing NPAS2 expression [within tumor tissue] could promote cell proliferation, cell invasion and increase the wound healing ability (Xue X.).” **Conclusion:** We conclude that the lack of NPAS2 is able to keep FBMSC in a more stem-like state and rapidly increases recovery speeds of wounds on mice femur bone tissues.

**Poster # 18 The Role of NFAT in Ethanol-Treated Oral Cavity Squamous Cell Carcinoma,** EMILY SAAVEDRA*1, LELA BENNETT1*, CHARLOTTE MARTIN2, and KI-HYUK SHIN2 (1UCLA Pre-College Science Education Program, UCLA School of Dentistry, Los Angeles, CA, saavedreamily0@gmail.com, lcbpennett@gmail.com; 2UCLA School of Dentistry, Los Angeles, CA, lottemartin@ucla.edu, kshin@ucla.edu). (STUDENT PRESENTATION)

Oral Squamous Cell Carcinoma is the predominant Head and Neck Cancer with a 5-year survival rate that has remained at 50% for the last 40 years. Cancer Stem Cells (CSCs) are a cancer cell subpopulation with stem cell-like characteristics such as self-renewal, differentiation, and migration. Previous studies have shown Nuclear Factor of Activated T-Cells protein (NFAT) and Alcohol (EtOH) strongly correlate to oral cancer malignancies and enhance the oral CSC population. However, a small number of current studies have examined the connection between EtOH and NFAT in promoting the CSC phenotype. **Objective:** To examine the effect of NFAT inhibition on the EtOH-treated oral CSC phenotype, specifically their migratory and self-renewal abilities. **Methods:** SCC9 and UM6 cancer cell lines were used. Each cell line had an experimental group that was treated with EtOH for three months and a control group with no treatment. A transwell migration assay was used to measure the cancer cell migratory ability. The sphere formation assay isolated the CSC population and examined their self-renewal capability and for both assays, the experimental groups were treated with NFAT inhibitor cyclosporin A (CsA). **Results:** CsA treated groups had significantly less cell migration compared to the non-CsA-treated control groups. Similarly, the sphere formation assay demonstrated a remarkable decrease of spheres formed in the CsA-treated cells compared to the control groups. **Discussion:** The current data indicates that NFAT inhibition by CsA will lower the self-renewal and migratory ability of EtOH-Treated oral cancer cells. **Conclusion:** Inhibiting NFAT activity may prove to be a successful treatment option for oral cancer.

**Chemistry and Biochemistry Section**

Section chair and program organizer: Dr. Owen M. McDougal, Department of Chemistry and Biochemistry, Boise State University, Boise, ID; owenmcdougal@boisestate.edu

**Poster # 19 Histidine Protonation in Epoxide Hydrolase B,** DANIELLE ADLER* and GREG SMITH (Department of Chemistry, Southern Oregon University, Ashland, OR; danielle.adler21@gmail.com, smithg5@gmail.com). (STUDENT PRESENTATION)

*Mycobacterium tuberculosis* (Mtb’s) epoxide hydrolase (EH) enzymes are responsible for breaking down harmful oxygen radicals and may be important in establishing infections in their host. As a first step for understanding the mechanism, the protonation states of two histidine residues in the active-site were investigated *in silico*. PropKa was used to predict the protonation of all the histidines not in the active. Gaps in the structure were patched with Modeller, then simulated annealing was performed to find the lowest energy structure. Out of 100 structures, the lowest energy structure was used. The co-crystal inhibitor was removed and a known substance (TDPO) was docked. The structure was then prepared for molecular dynamics simulations using the AMBER software suite. The enzyme and docked substrate were placed in a solvated box with periodic boundary conditions and the 14SB force field. The GAFF force field was used on TDPO. Four separate models were analyzed for histidine residues 103 and 333: HIP/HID, HIP/HIE, HID/HIP, and HIE/HIP. Each model was minimized, heated to 300K and equilibrated for 20 ns and sampled for analysis for 100 ns. PropKa predicted that HIS 333 would have a protonation state of HIP and HIS 103 would have a protonation state of HID or HIE depending on whether a ligand was in the active site. The initial prediction of PropKa and results of the molecular dynamics simulations are compared. **Keywords:** computational chemistry, tuberculosis, molecular dynamics, epoxide hydrolase, protonation

**Poster # 20 Regulation of Glycolytic Enzymes by Progesterone and Estrogen in a Mink Uterine Cell Line Does Not Affect Glycolytic Flux,** JENNIFER CHASE* and HAYDEN HOLMLUND (Department of Biology, Northwest Nazarene University, Nampa, ID; jchase@nnu.edu).

Cells lining the uterus are responsible for both the storage and secretion of carbohydrates to support early embryonic development. Histiotrophic secretions contain glycolytic products such as lactate and pyruvate. Insufficient carbohydrate storage as glycogen, for example, has been correlated with infertility in women. While it is clear that changes in estrogen (E2) and progesterone (P4) affect the distribution of glucose in the cell and secretions, the biochemical mechanism(s) by which they affect this crucial metabolic shift is not well understood. We hypothesized that P4 and E2 decrease the rates of glycolytic enzymes and the glycolytic flux. We measured the rate of glycolysis in an immortalized epithelial (GMMe) cell line (GMMe) after 24 hours of exposure to 10 μM P4 and 10 nM E2 at 5 mM glucose and the kinetics (Vmax, Km) of all enzymes spectrophotometrically with coupled assays. Several glycolytic enzymes activities in GMMe cells were shown to be downregulated by E2, whereas their affinity constants were upregulated by P4. However, the glycolytic flux was unchanged by...
the treatments (~10 nmol glucose consumed/min/mg protein). These decreases in enzyme activity with constant pathway flux would lead to increase in the levels of intermediate metabolites, including pyruvate which is secreted in the histotroph. Thus, the hormones known to affect the preparatory and secretory phases of uterine epithelial cells may affect changes in metabolite levels by downregulation of enzymes, at least for the mink. This first study gives insights into the potential risk factors and therapeutic targets for infertility.

**Keywords:** kinetics, glycolysis, embryo development, estrogen, progesterone

**Poster # 21**

**Computational Analysis of Histidine Protonation in the Enzyme Human Soluble Epoxide Hydrolase**, BRIAN LEE* and GREG SMITH (Department of Chemistry, Southern Oregon University, Ashland, OR; lee.briannah@gmail.com).

(STUDENT PRESENTATION)

**Soluble Epoxide Hydrolase** (sEH) is a bi-functional enzyme found in humans. It consists of two domains- a hydrolase and phosphatase connected by a thin tether of mostly non-polar amino acids. sEH converts lipids into diols and has a role in regulating blood pressure and inflammatory responses in humans. Within the active site are two histidine residues (334 and 524). Histidine has a pKa value of 6.0 and thus is difficult to assign protonation. To better understand sEH and its’ active site, separate protonation models of His 334 and His 524 were made. Autodock Vina™ was used to dock 2-benzyl-3-phenyl-oxirane (TDPO) to the x-ray structure of sEH (5ai5). The docked complex was then minimized followed by an initial run of solvent dynamics using AMBER 16 on each protonation model.

**Keywords:** hydrolase, molecular, dynamics, amber16, enzyme.

**Poster # 22**

**Vasoactive Hormones Identified as Efficient Nitric Oxide Donors: Implications for Enhanced Opioid Induced Antinociception**, VUSUMUZI LEROY SIBANDA* and REUBEN H. SIMOYI1,2 (1Department of Chemistry, Portland State University, Portland, OR, vsibanda@pdx.edu; 2School of Chemistry and Physics, University of KwaZulu-Natal, Westville Campus, Durban, South Africa, rsimoyi@pdx.edu). (STUDENT PRESENTATION)

Opioid-related mortality rates have rapidly increased across the United States, a multidisciplinary approach is needed to enhance our understanding of the fundamental chemistry related to opioid addiction and tolerance. Nitric oxide (NO) is widely recognized as an important effector molecule in a variety of biological systems, it also is implicated in nociceptive neural pathways and inflammatory response. NO donors increase opioid effects, attenuate the effectiveness of opioid antagonists and diminish the frequency of the adverse effects related with high doses of opioids. Studies of the impact of opioids on the endocrine system have been largely limited to opioid-induced hypogonadism as a potential complication of therapeutic or illicit opioid use. Little is known about the effects of hormone S-nitrosation (addition of NO to sulfur) to produce NO donors (RSNOs) that may have synergistic interactions with an opioid agonist. This study is kinetic analysis of vasoactive hormones as potentially efficient nitric oxide carriers and donors. The cytosolic redox environment preserves cysteine sulfhydryl’s as dithiols, therefore we hypothesized that our hormone dithiols had half-lives ($t_{1/2}$) long enough to allow for subsequent S-nitrosation reactions. Results show that hormone dithiols had $t_{1/2} > 30$ mins at physiologically relevant pH and temperature. Stopped-flow derived rates of RSNO formation by nitrite were faster in acidic conditions, while peroxynitrite S-nitrosation rates were faster in neutral to basic conditions. Transnitrosation by SNAP was the fastest. Metal ions in vivo were shown to catalyze both formation and decomposition of RSNOs. Our results show that at pH 7.4 in the absence of metal ions, RSNO $t_{1/2} > 2$ mins which is ample time for the RSNOs to transport NO to neighboring molecules. We present vasoactive hormones as efficient carriers of NO, show that RSNO formation is associated with radical production and link hormone derived RSNOs to implications of co-localization with opioids.  

**Keywords:** hormones, reaction kinetics, nitric oxide, opioids

**Poster # 23**

**A Deep Recurrent Network Learns Complex Rules to Quantify Protein-Coding Potential and the Impact of Synonymous Codon Usage**, NATHAN WAUGH* and DAVID HENDRIX (Biochemistry and Biophysics, Oregon State University, Corvallis, OR; waughn@oregonstate.edu, David.Hendrix@oregonstate.edu). (STUDENT PRESENTER)

The protein-coding potential of RNA is traditionally seen as a binary function, corresponding to the question: Is the RNA transcript a messenger RNA (mRNA) or a long noncoding RNA (lncRNA)? Recently, this classification has come to be seen in more complex analog terms. The overall success of translation from RNA to protein is now known to be influenced by many features of living systems, such as tRNA abundance and mRNA secondary structure. However, the relative contributions of each feature to protein-coding potential remain largely unexplored, and there are likely additional features waiting to be identified. There is thus a clear need for general methods of predicting protein-coding potential, which do not rely on defined biochemical features or discrete classification of RNA type. Deep learning, which is capable of learning complex sequence patterns and making predictions absent prior knowledge of user-defined features, provides one path to such a general method. In particular, a recurrent neural network trained to distinguish classes of RNA in the human transcriptome may provide insight into the analog nature of protein-coding potential, and may assist in interpreting sequence-specific features that impact translation. One such feature of growing interest both medically and scientifically is synonymous codon usage, wherein one type of amino acid is coded by a multiplicity of nucleotide permutations in different ratios. The role of synonymous codon usage in determining protein-coding potential, and its relationship with other known coding features, is murky. We use a neural network to predict synonymous mutations that reduce protein-coding potential, and compare these to known disease-associated synonymous substitutions in the human transcriptome. The immune-system protein CD72, which we predict to have a coding potential that is highly sensitive to synonymous mutation, provides a test case for the predictive strength of our approach.

**Keywords:** codon, RNA, deep learning, protein coding, neural network
Section chair and program organizer: Position is currently open.

Poster # 24 Preliminary Comparison between a Novel Multilayer-Perceptron Ensemble Technique and the Mixture-of-Experts Algorithm, JOHN WILEY1*, MEHMET VURKAÇ2, SHUAI YUAN3 ( Independent Scholar, Grants Pass, OR, johnwprofessional@gmail.com; 2Department of Electrical and Computer Engineering, 3Department of Computer Science, Seattle University, Seattle, WA, vurkacm@seattle.edu, yuans2@seattle.edu).

Current ensemble methods in machine learning execute all member algorithms and weight the outputs according to relevance (gating). This presentation demonstrates a system that meets the performance of current ensemble methods while decreasing execution time. During preliminary multilayer perceptron (MLP) testing, different initial network weightings resulted in fully trained networks with usefully different performance on individual inputs. The proposed algorithm (“the system”) is intended to exploit this effect by training multiple MLPs, and retaining those that find novel solutions. All preliminary MLPs are trained, and the internal weights are extracted and clustered. Each cluster is assumed to have found a novel problem solution, and the best MLP from each is retained. Once all novel MLP solutions are isolated, the system creates a gating network to determine which solution is best for a given input. This results in only two MLP executions per input, as opposed to \( N \) executions as is usual in most ensemble algorithms. Comparisons were performed against the functionally similar mixture of experts (ME) while the simple MLP algorithm provided a baseline. Our experiments used the Iris and MNIST datasets. The average error across all test inputs was used to compare algorithms. Preliminary tests show that accuracy can exceed that of the ME on our chosen datasets. Due to fewer internal component executions, execution time on the Iris Dataset was improved by just over 25% relative to the ME algorithm. This system is therefore a good choice for time-limited applications (and those where many executions are required) at the cost of increased initial training time. Further testing will establish performance beyond these datasets. A metric to optimize the number of trained MLPs is desired to further improve training efficiency. Keywords: Computational Modeling, AI, multilayer perceptron, ensemble learning, mixture of experts.

Ecology, Environmental Sciences, and Sustainability Section

Section chair and program organizer: Dr. Richard Van Buskirk, Environmental Studies, Pacific University, Forest Grove, OR; vanbuskirk@pacificu.edu.

Poster # 25 Marine Bacterioplankton Consortia Follow Deterministic, Non-Neutral Community Assembly Rules, KEVIN L VERGIN1**, NICHOLAS JHIRAD1, JONATHON DODGE2, CRAIG A CARLSON3, and STEPHEN J GIOVANNONI1 (1Department of Microbiology and 2Department of Computer Sciences, Oregon State University, Corvallis, OR, kevin_vergin@yahoo.com, shapenaji@gmail.com, dodgej@onid.orst.edu, steve.giovannoni@oregonstate.edu; 3Department of Ecology, Evolution, and Marine Biology, University of California, Santa Barbara, Santa Barbara, CA, craig_carlson@ucsb.edu).

The Bermuda Atlantic Time-series Study site provided an opportunity to study bacterial community assembly processes at 2 different depths, the surface and 200 m, in the upper mesopelagic, just below the euphotic zone. Over 100 monthly bacterioplankton DNA samples, from each depth, were analyzed using 16S rRNA gene sequences parsed with the custom software package PhyloAssigner. Co-occurrence networks, filtered for potential autocorrelation artifacts, were constructed for each depth. Network characteristics for the 2 depths were remarkably similar, and network parameters, such as connectance, were in the same range as previously published for ecological networks. Spectral clustering applied to similarity matrices based on exact connections revealed clusters of nodal taxonomic units (NTUs) that peaked at similar times, supporting deterministic, niche-based assembly. An algorithm that used hierarchical Dirichlet processes (HDPs) to model neutral communities based on learned parameters indicated that community assembly processes fit niche-based models at the metacommunity level for both depths. However, HDP analyses restricted to SAR11, SAR86, or SAR202 NTUs supported the neutral assembly hypothesis, suggesting that neutral process models may apply within some phyllogenetic domains. To understand whether phylogenetically related taxa can substitute for one another in networks, we created a new metric, phylogenetically weighted connectivity, which considered the similarity of connections among near phylogenetic neighbors. This analysis suggested that phylogenetically similar lineages share similar network connections. Overall, our findings show that niche-based community assembly models are the best fit at both depths but that the neutral model may apply at some phylogenetic scales. Keywords: community assembly, co-occurrence network analysis, marine bacterioplankton, Bermuda Atlantic Time-series Study, Hubbells Unified Neutral Theory of Biodiversity

Poster # 26 Effects of Baycrete Texture and Tidal Elevation on Recruitment of Native Ostrea lurida and Nonindigenous Balanus amphitrite in San Diego Bay, CA, SABRINA L1*, BRYCE PEROG2, and DANIELLE C. ZACHERL2 (1Walnut High School, Walnut, CA, sl3321876@gmail.com; 2Department of Biological Science, California State University, Fullerton, Fullerton, CA, bryceperog@csu.fullerton.edu, dzacherl@fullerton.edu). (STUDENT PRESENTATION)

Globally invasive Balanus amphitrite is a common fouling barnacle in harbors worldwide; it is found on many non-living substrates including ships, pilings, and seawalls but can also settle on the shells of living oysters, mussels, and crabs. B.
**amphitrite** causes ships to burn more fuel due to increased drag; they can also negatively impact native species that they settle upon. *Ostrea lurida*, the Olympia oyster, is a foundational species native to the North American Pacific coast; it provides habitat for other species and filters the water. Extant Olympia oyster abundances are a fraction of their abundance a century ago. Resource managers are interested in restoring Olympia oysters using baycrete, a concrete mixture incorporating oyster shells, as a base for oyster beds. Baycrete recruits native oysters but may also recruit nonindigenous species. We explored baycrete characteristics that might promote native species recruitment while discouraging nonindigenous species recruitment. From May to September 2018, we deployed replicate baycrete tiles of two textures (rough, smooth) at two tidal elevations (0 m MLLW, +0.6 m MLLW) in San Diego Bay, CA. We used 2-way ANOVA to test whether the difference between native *O. lurida* and nonindigenous *B. amphitrite* percent covers was affected by rugosity and elevation. We detected no significant effect of rugosity on the difference in recruitment between species, but *O. lurida* cover was significantly higher at 0 m MLLW; *B. amphitrite* cover was higher at +0.6 m MLLW. Baycrete deployed at 0 m MLLW will promote native species recruitment without promoting *B. amphitrite*.

**Keywords:** *Ostrea lurida*, *Balanus amphitrite*, settlement, nonindigenous species, oyster restoration

**Poster # 27** Thermal Dependence of Metabolic Rate in Ringed Crayfish, MARIANA STOWASSER (Biology Department, Southern Oregon University, Ashland, OR; satlerm@sou.edu). (STUDENT PRESENTATION)

The native crayfish *Pasifastacus leniusculus* population in the Rogue River Basin, in Oregon has been quickly diminishing over the last 10-12 years and an invasive species *Orconectes neglectus* seems to be thriving. Temperatures can range from 5°C to 27°C in Bear Creek. The higher end of this range can cause metabolic stress to ectotherms which play significant roles in aquatic food webs. This could be what is behind the decline of *P. leniusculus*. We hypothesized that *O. neglectus* would have a lower metabolic rate than *P. leniusculus* at one or more of 3 temperatures of 12°C, 20°C and 28°C with the biggest difference at 28°C showing *O. neglectus* can inhabit warmer waters while for *P. leniusculus* the same waters cause high metabolic stress. We set out traps in Bear Creek and Elk Creek, checked them over the course of 1 to 5 weeks, collected crayfish and measured their oxygen consumption for 3 hours in a chamber with a Vernier O2 sensor. Without enough *P. leniusculus* our focus shifted to the data for *O. neglectus*. Mass and metabolic rate (MR) were found to have an overall weak correlation therefore whole-body metabolic rate was used for analysis. We found a significant increase between the MR at 12°C and the MR at 28°C demonstrating *O. neglectus* metabolism is temperature dependent and with only one fatality out of 8, the critical temperature for this species must be above 28°C. This demonstrated *O. neglectus* can tolerate higher temperatures than have been recorded at Bear Creek and possibly how they may be displacing *P. leniusculus*.

**Keywords:** crayfish, metabolism, temperature, invasive, native

**Education Section**

Section chair and program organizer: James M. Bower, Southern Oregon University (bowerj@sou.edu)

**Poster # 28** A Comparison of Two Styles of Flipped Classrooms in an Undergraduate Statistics Course, TRISTEN ASAY GORDER*, PAUL CONDON, and JOHN TAYLOR (Department of Psychology, Southern Oregon University, Ashland, OR; condonp@sou.edu). (STUDENT PRESENTATION)

Many college instructors and centers for learning and teaching excellence are adopting active learning strategies and flipped classroom approaches to overcome challenges with traditional lecture formats. In the flipped classroom approach, students are exposed to material outside of class and spend time in class on interactive activities. However, some students may experience discomfort with the flipped classroom approach given that it deviates from traditional lecture format. An instructional strategy called Team-Based-Learning (TBL) attempts to overcome challenges of they flipped classroom by placing students in strategically-formed groups that last the entire term, in which students then take group quizzes together. This format encourages student interaction and energized dialogue around the class material. Initial research has shown a significant boost in student enjoyment of the classes employing TBL. To our knowledge, however, no extant study has compared the efficacy of a TBL flipped classroom approach with a non-TBL flipped classroom approach. The current study aims to fill this gap by comparing the a TBL flipped classroom with a non-TBL flipped classroom across two sections of an undergraduate statistics lab. Contrary to prediction, our results indicated that both the non-TBL and TBL classes improved students self-efficacy to learn statistics and students comfort in asking for help with statistics. These results suggest that the TBL course may not differentially affect the students’ experience in the compared with a non-TBL flipped classroom.
**Engineering, Technology and Applied Sciences Section**

Section chair and program organizer: **Dr. Frank Jacobitz**, Department of Engineering, University of San Diego, San Diego, CA; jacobitz@sandiego.edu.

Poster #29 **Exoskeleton Leg Brace, EVELYN ORTIZ*, MILENKA SERRANO*, KONNY ZAVALA*, and FARHANA ABEDIN** (Department of Electromechanical Engineering Technology, California State Polytechnic University, Pomona, CA; fabedin@cpp.edu). (STUDENT PRESENTATION)

A low cost exoskeleton leg support was designed to assist in gait. A prototype of the leg support was built and tested. The leg support was composed of carbon fiber reinforced composite and foam sandwiched in between which yielded a lighter brace. The leg support would assist in motion such as walking with the help of servomotor. The material property of the sandwiched structure was determined using 3-point bend test. It was observed that the fracture strength of the sandwiched material was higher compared to the maximum stress on the leg during walking for a person with an average weight of 130 lbf and height of 5’2”.

**Keywords:** leg support, composite sandwiched structure

**Evolution, Organismal Biology, and Biodiversity Section**

Section chair and program organizer: **Dr. Julia Ruppell**, Department of Biology, University of Portland, Department of Biology, Portland, OR; ruppell@up.edu.

Poster #30 **The Effects of Larval Population Density and Social Interactions on Adult Fecundity in Drosophila melanogaster, EVA BATENHORST*, GRACE KNAPP*, NICHOLAS WANDERSHEID, SYDNEY THOMAS, MICHAEL BALTZLEY, and KRISTIN LATHAM-SCOTT** (Department of Biology, Western Oregon University, Monmouth, Oregon; baltzleyw@wou.edu, lathamk@wou.edu). (STUDENT PRESENTATION)

*Drosophila melanogaster* is a model organism for studying sexual and mating behaviors. Previous research has suggested that raising flies in isolation affects the development of olfactory and visual systems. Because changes to the olfactory and visual systems could affect mating behavior, we hypothesized that population density and social interactions as larvae will affect the fecundity of adult flies. To test this, we raised larvae in high density (40 larvae/mL food), medium density (5 larvae/mL food), and in isolation. None of the population densities were food-limited. After eclosion, we set up nine different pairwise crosses of the adults (high density female x high density male, medium density female x high density male, etc.). We are recording the effect of larval density on eclosion patterns, body size, and fecundity. Our preliminary data suggest that isolated larvae have a lower eclosion rate than larvae raised at medium and high densities. However, when they eclose, flies raised in isolation are similar in size to flies raised at the medium density and are larger than flies raised at the high density. We have also found that females raised in isolation are less fecund than females raised at medium and high densities. We will continue to run these crosses for a total of 10 replicates of each pairwise cross to gather more data for analysis. This research will contribute to the understanding of the effects of population density and social interactions on fruit fly behavior.

**Keywords:** population, density, fecundity, interactions, eclosion

Poster #31 **Aging Hawaiian Spinner Dolphins (Stenella longirostris longirostris, HSD) with Two Techniques of Densal Aging, the Sanding Method and Decalcification & Staining Method, to Gain Population Demographic Information, JESSIE HOFFMAN1*, ILSE SILVA-KROTT2, and KRISTI WEST3** (1Department of Natural Sciences, Hawai‘i Pacific University, Kailua, HI; jhoffma4@my.hpu.edu; 2University of Phoenix, Hawaii Campus, Kapolei, HI; isilvakrott@email.phoenix.edu; 3Hawai‘i Institute of Marine Biology, University of Hawai‘i Mānoa, Honolulu, HI, kristiw@hawaii.edu). (STUDENT PRESENTATION)

Hawaiian spinner dolphins (Stenella longirostris longirostris, HSD) are distributed throughout the Main and Northwest Hawaiian Islands, subdivided into five separate populations, resting in the shallow waters surrounding the islands. Though these odontocetes (toothed whales) are the most studied small cetacean within Hawaiian waters, very little is known about their population demographics and biology. Currently, many of these subpopulations are susceptible, and extremely sensitive, to anthropogenic pressures every single day due to increased tourism in their resting grounds. With the synergistic effects of climate change and these anthropogenic pressures, aging the HSD population is needed to determine basic parameters of population dynamics, which are crucial to their future success and maintaining/increasing their survivorship. Determining absolute age can be done through multiple techniques, the most common for odontocetes being dentinal aging through the counting of growth layer groups (GLGs). There are multiple techniques for preparing teeth, the most reliable being decalcifying and staining thin sections of the tooth. However, a newly developed method consists of manually sanding each tooth with no staining. This study focuses on aging stranded HSD (of varying sizes) between the years of 2008–2019, to determine: i) ages of the 17 individuals stranded within the U.S. jurisdiction of the Pacific Ocean, ii) generate a growth curve for the HSD population, iii) estimate longevity of HSD, iv) estimate age of sexual maturity for both males and females, and v) look at the viability of the sanding method of dentinal aging, as compared to the decalcification and staining technique.

**Keywords:** aging, dentin, decalcification, spinner dolphins, demographics
Section chair and program organizer: Ms. Crystal Goldman, UC San Diego Library University of California, San Diego, La Jolla, CA; elgoldman@ucsd.edu.

Poster # 32 Broader Impacts: The NSF-CREST Center for Cellular and Biomolecular Machines at UC Merced, CARRIE KOUDIO1*, VICTOR MUÑOZ1,2, AJAY GOPINATHAN1,3, SAYANTANI GHOSH1,3, KARA McCLOSKEY1,4, and NORA M. COLE1 (NSF-CREST Center for Cellular and Biomolecular Machines (CCBM), 1Bioengineering Department, 2Physics Department, 3Materials Science and Engineering Department, University of California, Merced, Merced, CA; ckouadio@ucmerced.edu, vmunu03@ucmerced.edu, agopinathan@ucmerced.edu, sghosh@ucmerced.edu, kmccloskey@ucmerced.edu, ncole2@ucmerced.edu).

The Center for Cellular and Biomolecular Machines (CCBM), established with a $5 million grant from the National Science Foundation, is a Center of Research Excellence in Science and Technology (NSF-CREST) at the University of California, Merced, with a focus on biophysics, bioengineering and biochemistry. The center brings together more than twenty faculty members from multiple units across campus, including bioengineering, physics, chemistry and chemical biology, materials science and engineering, mechanical engineering and molecular cell biology. The center uses an interdisciplinary approach combining physical, biological and engineering methods to understand and control the functioning of multi-scale assemblies of biomolecules and cells, and to design and develop novel bio-inspired functioning machines ranging from designer cells and tissue to diagnostic and therapeutic devices. The center’s active broader impacts efforts—focused on graduate, undergraduate, K-12 and community levels—have generated and integrated new activities both at UC Merced and in the community.

The center hosts an integrated, interdisciplinary training program for graduate students that emphasizes physical and biological components and research/training experiences for undergraduate and high school students, to enhance the recruitment of underrepresented groups into Science, Technology, Engineering and Mathematics (STEM) fields. In addition, the center leads STEM-focused broadening participation efforts, outreach and science communication activities aimed at K-12 students and the community. The center has built a well-developed infrastructure that faculty, staff and students can utilize and leverage in their broader impacts efforts and is bringing benefits to the UC Merced and wider community. https://ccbm.ucmerced.edu. With funding from the National Science Foundation / NSF-CREST: Center for Cellular and Biomolecular Machines at the University of California, Merced (NSF-HRD-1547848).

Keywords: broader impacts, broadening participation, science communication, engaging the public in science, inclusion of underrepresented groups

Materials Science Section

Section chair and program organizer: Dr. Vilupanur Ravi, Department of Chemical and Materials Engineering, California Polytechnic University, Pomona, CA; vravi@cpp.edu.

Poster # 33 Effect of Heat Treatment on Selective Laser Melted Alloy 625: Microstructure and Corrosion Behavior, CHRISTOPHER FARAJ1*, SAMAD FIRDOSY2 and VILUPANUR RAVI1 (1Department of Chemical and Materials Engineering, California State Polytechnic University, Pomona, Pomona, CA, cifaraj@cpp.edu, Samad.A.Firdosy@jpl.nasa.gov, vravi@cpp.edu; 2Jet Propulsion Laboratory / California Institute of Technology, Pasadena, CA) (STUDENT PRESENTER)

Additive manufacturing (AM) is a process technology in which materials are usually joined layer by layer. Common issues in laser powder bed fusion AM of metals arise from poor particle fusion and porosity that compromise the overall integrity of the fabricated component. Likewise, the rapid cooling rates during AM of metals lead to heterogeneous microstructures with non-equilibrium phases, which raise concerns about their degradation. Consequently, the effect of various heat treatments (i.e., annealing, hot isostatic pressing and solutionizing) on the microstructure and corrosion behavior of laser powder bed fusion manufactured alloy 625 was studied. Test coupons were immersed in a 1N sulfuric acid solution and subjected to electrochemical testing in accordance with ASTM G59 and ASTM G61 protocol. Microstructural characterization was performed using optical and scanning electron microscopy. The detailed results of this study will be presented and discussed.

Poster # 34 Electrochemical Evaluation of Ti-13Nb-13Zr-B Alloys for Knee Implants, JACOB GIACOMI1*, THU NGUYEN, ARMANDO SHEHI, and VILUPANUR RAVI (Department of Chemical and Materials Engineering, California State Polytechnic University, Pomona, Pomona, CA; jggiacomi@cpp.edu, tanguyen@cpp.edu, ashehi@cpp.edu, vravi@cpp.edu). (STUDENT PRESENTER)

There has been a significant rise in knee replacement revision surgeries due to an aging population and an increase in patients diagnosed with osteoarthritis, also known as chronic knee pain. Therefore, a biocompatible alloy with long-term physiological stability and optimal mechanical properties is desired to reduce the number of revision surgeries for patients. To increase the longevity and to optimize the performance of biomedical implants, a new class of near β-phase titanium alloys, specifically Ti-Nb-Zr (TNZ) is being explored. TNZ alloys demonstrate advantageous properties including non-toxicity,
biocompatibility and low elastic modulii. Moreover, previous studies have shown that the addition of trace amounts of boron (0-1 wt.%) in titanium alloys increases the tensile strength and corrosion resistance of the alloys. The corrosion behavior of boron-containing TNZ alloys will be reported and discussed.

Poster # 35 High Temperature Corrosion of High Entropy Alloys, STEVEN PIERCE*, DOMINIC DINH, SAMUEL NAVARRETE, and VILUPANUR RAVI (Department of Chemical and Materials Engineering, California State Polytechnic University, Pomona, Pomona, CA; stpierce@cpp.edu, dddinh@cpp.edu, sjnavarrete@cpp.edu, vravi@cpp.edu). (STUDENT PRESENTER)

Interest in high entropy alloys (HEAs) are a relatively new class of alloys with promising mechanical properties. Turbine blades for gas and steam turbines are one of the many potential applications being explored for the utilization of HEAs due to their high temperature strengths and lower densities than their superalloy counterparts. Gas turbines operating in the 650-900°C range in marine environments can be subjected to accelerated corrosion beneath a thin molten eutectic salt film consisting of sodium chloride and sodium sulfate. The AlxCoCrFeNi high entropy alloy was produced with various aluminum contents (x=0, 0.3, 0.6) and tested in a range of 700-800°C under a molten sodium chloride-sodium sulfate eutectic salt mixture. In the current study, HEAs with different aluminum contents were subjected to dry and wet (steam) oxidation testing under isothermal conditions to obtain insights into oxidative behavior in salt-free environments. Molten salt tests were conducted in an argon environment and compared to previous testing in a sulfur dioxide/oxygen environment. DC electrochemical testing and immersion test techniques were utilized. The morphology of attack was studied using scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS).

Pharmaceutical Sciences Section

Section chair and program organizer: Dr. Jozef Stec, Department of Pharmaceutical Sciences, College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA; jstec@ketchum.edu.

Poster # 36 An Indigenous Approach to Studying the Medicinal Effects of 'Awa (Piper methysticum), TIFAINE N. CRIVELLO1*, DANA-LYNN KO‘OMOA-LANGE1, KERRI INGLIS2, and INGO KO‘OMOA-LANGE1 (1Department of Pharmaceutical Sciences and 2Department of History, University of Hawai‘i at Hilo, Hilo, HI; tifaine@hawaii.edu, danalynn@hawaii.edu, inglis@hawaii.edu, ingo@hawaii.edu). (STUDENT PRESENTER)

The misuse of indigenous knowledge without the consent of the people has led to indigenous people having an overall lack of trust in non-indigenous people, including researchers. This form of biological theft has led to the misuse of indigenous cultural knowledge as well as misinterpreted or falsely represented data. ‘Awa (piper methysticum), an essential resource used traditionally for numerous forms of healing in Hawai‘i and other Pacific Islands, has been labeled as hepatotoxic. Although such studies are based on traditional applications of ‘awa, they were done under modern, western scientific protocol utilizing chemical solvent-based extraction methods.

The purpose of our research was to accurately replicate the ways that native Hawaiian kāhuna lā‘au lapa‘au (Hawaiian medical practitioners) prepared ‘awa for healing, and explore the medicinal effects of these traditional preparations. We started by studying the literature and archival manuscripts available and have found that most medicinal preparations of ‘awa was used in combination with coconut milk and or saltwater. In addition, preliminary experiments suggest that traditional preparations of ‘awa induced calcium signaling in immune cells, suggesting a role in regulating inflammation.

From these preliminary findings we hypothesized that the traditional preparation and application of ‘awa will have more potent anti-inflammatory effects and less hepatic toxicity than isolated kavalactones prepared using organic solvents. Our next steps in this study will be to elucidate the pharmacodynamic properties of ‘awa, and to evaluate the pharmacokinetic properties of ‘awa, particularly the effects it has on the activity of P450 cytochrome enzymes.

Poster # 37 Analysis of the Antimicrobial Properties of Zinc Oxide Nanoparticles, CORRINAH SCHAEFER*, KOURTNEY GWIN, and JAMEE C. NIXON (Department of Biology, Northwest Nazarene University, Nampa, ID; cschaefer@nnu.edu, kgwin@nnu.edu, jnixon@nnu.edu). (STUDENT PRESENTER)

Each year in the United States, an estimated two million people contract nosocomial bacterial infections from unsterile techniques, improper wound cleaning, or other hospital malpractices. With bacteria becoming increasingly resistant to antibiotics, it is paramount to establish new methods to inhibit their growth. The use of metal nanoparticles have previously been shown to act in bacteriostatic or bactericidal fashion. The goal of this project was to determine the effect of different zinc oxide (ZnO) nanoparticles on the growth of E. coli (ATCC 25922). By identifying the minimum inhibitory concentration of the ZnO nanoparticles and determining the growth curve for E. coli in the presence of the different ZnO nanoparticles, the data suggests that ZnO nanoparticles can be used to slow, if not kill, E. coli. These results reveal that, in respect to E. coli, the toxicity of different ZnO nanoparticles are not the same. Moving forward to the goal of identifying new antimicrobials, it is important to understand that the nanoparticles of a compound may have different effects due to characteristics such as size, shape, and synthesis method.

Keywords: antimicrobial, E. coli, ZnO, Nanoparticles, MIC
Poster # 38 Translating the Testing Effect: From Lab to Neuroscience Classroom. MELISSA BIRKETT* and NATASHA DMITRIEVA 1,2 (1Department of Psychology, Southern Oregon University, Ashland, OR, birkettn@sou.edu; 2Department of Psychological Sciences, Northern Arizona University, Flagstaff, AZ, Natasha.Dmitrieva@nau.edu).

Despite promising laboratory findings, classroom studies yield mixed results on achievement improvements due to the testing effect (enhanced information retrieval following testing). In laboratory literature, interim tests (e.g., quizzes) administered before criterion assessments (e.g., exams) improve retrieval performance, with further increased performance under conditions of higher testing attempts and conceptual alignment between interim and criterion items. However, ecologically-valid classroom adaptations of the testing effect have yielded mixed results. In light of the assumed benefits and frequent use of classroom testing, it is important to address the inconsistent replication of the testing effect in ecologically-valid classroom settings. Our previous work has failed to replicate the testing effect among students in a neuroscience course when testing items were randomly drawn from a publisher-provided test bank. The present study extended those findings by assessing the testing effect using conceptually-aligned quizzes prior to cumulative midterm and final exams. Participants (N=67) were undergraduate neuroscience students attending a public university in the southwestern United States. Regression analyses demonstrated that the cumulative number of testing attempts did not predict midterm (B=-0.019, SE=0.037, p=0.820) or final (B=0.005, SE=0.021, p=0.997) exam grades. Our results suggest that the testing effect may be difficult to replicate in a neuroscience classroom, and conceptual alignment between test and exam items does not appear to be sufficient to replicate the testing effect in this context.

Keywords: testing effect, student learning, online testing, higher education, STEM education

Poster # 39 The Effect of Varying Reward Treatments on Performance and Learning Acquisition in Mice. JOHN J FRANCIS*, PAUL STEFFAN, LAURA BODDINGTON, and DAVID MCCORMICK. (Department of Biology and Institute of Neuroscience, University of Oregon, 1585 E 13th Ave, Eugene, OR, 97403, jfranci2@uoregon.edu). (STUDENT PRESENTER)

An animal’s ability to learn and perform perceptual tasks is highly variable, depending on factors such as reward type. Using a more favorable reward is expected to positively influence motivation and performance. The present study examined the effects of using a highly palatable caloric reward in lieu of standard water reward. It was hypothesized that a high caloric reward solution would facilitate a faster learning rate on an auditory discrimination task. Mice were water-restricted and subjected to one of two reward treatment conditions upon correct licking behaviors during a target interval. While the present study determined that a 10% sucrose solution has the capacity to act as a reward stimulus due to its positive reinforcement properties (d’=2.02), further experiments and larger sample sizes are required to fully quantify the efficacy of sucrose solution compared to traditional fluid rewards. By examining the effects of alternative reward treatments on performance in an auditory discrimination task, we can determine optimal treatment conditions in which mice learn most efficiently. These results could further elucidate the relationship between caloric intake, nutrition, and arousal.

Keywords: neuroscience, behavior, learning acquisition, arousal, reward

Poster # 40 Chemosensory Responses to Chemical Prey Cues in Checkered Garter Snakes (Thamnophis marcianus). ARLENE SIELER*, XAVIER ARTHUR1, MARK DAVIS III1, VIRGINIA FUHRMARK2, and MARK KRAUSE1 (Departments of 1Psychology and 2Biology, Southern Oregon University, Ashland OR; sieler@ou.edu, arthurx@ou.edu, davism3@ou.edu, krauseama@ou.edu, fuhrmarkv@ou.edu). (STUDENT PRESENTER)

Detecting chemical cues is crucial for successful foraging efforts in many species of snakes. Snakes have a highly specialized tongue-vomeronasal organ system that is used for detecting prey chemical cues. Tongue-flicking functions to detect andtrail prey, andchemical cues alone eliciting striking responses toward prey in many species. In this study we examined chemosensory-mediated responses to prey in checkered garter snakes (Thamnophis marcianus). This species is an active forager that consumes a wide variety of prey types, including amphibians, fish, and rodents. Predatory encounters with prey involve multiple sensory cues (chemical, visual, tactile), but are chemical cues alone sufficient to elicit chemosensory responding in adult garter snakes? Furthermore, do checkered garter snakes discriminate among classes of prey stimuli? To answer these questions we tested 20 adult garter snakes on chemosensory responses (tongue licking rate) to rodent, worm, fish, and frog surface chemical cues in comparison to control stimuli (distilled water and hexane). Stimulus presentation order was counterbalanced across subjects and test blocks were repeated to test for response consistency and stability. Our results show that chemical cues are sufficient to elicit predatory interest in adult garter snakes, and that prey types elicit different response profiles, and response profiles across prey types differ among individual snakes. These data are consistent with those reported in a closely related dietary generalist garter snake species, Thamnophis sirtalis. In this presentation we will make comparisons with other snakes of the genus Thamnophis, and explore the ecological and evolutionary significance of chemosensory-mediated foraging behavior in snakes.
Section chair and program organizer: Dr. Robert L. Chianese, Department of English, California State University, Northridge, Northridge, CA; richianese@gmail.com.

Poster # 41 Stress Response and Resiliency of Circus Performers, ELLIOTT GITTELSON* and MELISSA BIRKETT-GREENE (Department of Psychology, Southern Oregon University, Ashland, OR; ellgitt@gmail.com, birkettm@sou.edu). (STUDENT PRESENTER)

Circus performance has received little attention in academia. Circus is generally a non-competitive art form combining extreme athletic abilities, artistic expression, and a strong communal aspect. Even though this field is growing in popularity, it lacks research in the physiological stress response of the performers, and, therefore, requires examination. This paper reviews the academic literature available on the wellbeing of circus performers and on the stress response of dancers during performance. This literature review is in preparation for future studies into the stress response and resiliency of circus artists during training versus performance using heart rate variability (HRV) as a biological marker and the Recovery-Stress Questionnaire for Athletes (REST-Q Sport) survey. By examining changes in heart rhythm over time, HRV has emerged as a physiological indicator of resiliency to stress. Most of the existing studies of circus artists focuses on injury rates and have been conducted in-house by larger circus companies. Attention has been given to the stress response of dancers during performance and competition and found that dancers respond to performance in a similar fashion to athletes in intense competition. However, gaps exist in the understanding of psychological and neurological effects of training and performance of circus artists. Social circus, which focuses on teaching circus skills to at-risk communities, is also an area of expanding interest which requires research to establish a more accurate knowledge base. Overall, the research in this paper will inform circus companies and social circus forums on the effects of stress on their performers and may inform those in the health fields of the use of circus arts as a possible health intervention and beneficial recreation.

Keywords: circus performance, stress response, heart rate variability, theater, art

Social, Economic and Political Sciences Section
(including Health Services)

Section chair and program organizer: Dr. Carl A. Maida, UCLA Schools of Dentistry and Medicine, University of California, Los Angeles, CA; cmaida@ucla.edu.

Poster # 42 Effects of the Cambodian Genocide Regarding Disparities in Public Healthcare and Cancer Treatment: Seeking Solution, CAITLIN DIEFENDORF (Honors College, Southern Oregon University, Ashland, OR; cmdiefendorf@gmail.com). (STUDENT PRESENTER)

Less than half a century ago, Cambodia suffered a mass genocide following the Vietnam War. This Honors College Capstone literary research discusses the lasting effects of genocide on the current state of public healthcare in Cambodia, while specifically focusing on cancer treatment and diagnosis in rural and urban settings. Historical background and current healthcare statistics are presented in order to inform the audience about the repercussions caused by genocide and the prevailing healthcare disparities. Different solutions are critically examined in order to provide insight for future successful improvement. It was concluded that some key components likely to improve the current conditions include cultural competency, gaining a level of trust, improving public health education, increasing provider compensation, and improving rural infrastructure.

Keywords: healthcare, Cambodia, genocide, disparity, fostering inclusion of underrepresented minorities in science

Poster # 43 Urbanization and its Effects on the Processes of Globalization and Associated Social Alienation, RAAM RAVI (Sociology Department, California State University, Los Angeles, Los Angeles, CA; rravi2@calstatela.edu). (STUDENT PRESENTER)

Social alienation, in an urban context, that comes about due to the disconnect between human beings and the outside environment and between human beings themselves, occurs primarily due to the seeming lack of egalitarian principles in the construction and planning of urban spaces. Urbanization in a global context is increasingly shaping the way how human beings consume, what they produce, and where they live. In order to find the link between inequality in the construction of urban spaces and social alienation, I am going to be using an analysis of scholarly literature in the field of urban sociology, particularly focusing on literature that is published in the 21st century and examines topics such as city planning and environmental degradation. The literature strongly points towards a new direction for the future direction of urban spaces, suggesting a radically different approach from the dominant neoliberal free-market paradigm. The construction of urban spaces that prioritize local needs and local communities would be a step towards a globalization that is in the interest of the vast majority of people in the world rather than a globalization that is profit-driven and benefits a small upper class.

Keywords: sociology, urbanization, social alienation, inequality, social stratification
Poster # 44 Factors Influencing Trust Underserved Populations Place on Artificial Intelligence, SRIHARI YAMANOOR\textsuperscript{41} and NARASIMHA SAI YAMANOOR\textsuperscript{2a} (\textsuperscript{1}DesignAbly, San Jose, CA, yamanoor@stanfordalumni.org; \textsuperscript{2}DesignAbly, Kenmore, NY, yamanoolsai@gmail.com).

Narrow Artificial Intelligence has emerged from a long winter with a growing set of paradigms such as machine learning, deep learning, reinforcement learning and others. Applications of AI techniques are expanding rapidly, and it is expected that AI will emerge as a key tool for higher level functions such as policy, planning and resource allocation. This will impact both well-served as well as underserved populations of many classifications, such as developing nations, societies and groups as minorities, women, the aging, children, populations at risk or affected by specific health conditions, poverty levels and other cohorts.

It might be highly desirable to implement AI based solutions and recommendations for the benefit of various underserved populations. The applications and recommendations will require the acceptance of the target populations and trust is the foundation for this acceptance. Lack of trust can result in passive resistance or more acutely active resistance with dire consequences.

Factors that contribute to the build up or breakdown of trust start at transparency. The degree of influence of the various factors will vary with the cohorts and careful examination, planning and execution can vastly improve the chances of success with AI. The level to which goals are delineated, biases in data collection, data preparation, algorithm training, the specific algorithm(s) and techniques used, the presence of Humans In The Loop (HITL), Explainability, Comprehensibility, Complexity, Privacy and other factors are discussed. The factors may contribute positively or negatively to the level of trust and acceptance of AI. HITL, for instance, can be perceived as a positive or negative factor, depending on how it is applied. Traditional factors such as political and cultural influences as well as hype and negative propaganda, fears of loss of employment or influence also contribute to the erosion of trust in AI and are discussed.

Poster # 45 Understanding behaviors and attitudes towards snakes in rural northeastern Tanzania, SAMANTHA L. THOMAS and DADAIRE ALPHAR (2610 Beaver Ave, Des Moines Iowa, 50312 Sam.paints1313@gmail.com).

In 2019 a new effort launched to create and organize educational programs, first aid and snake awareness campaigns in rural Northeastern Tanzania, an area where snake bites are very common and pose a very serious public health problem. In addition to snakes being regarded as sacred to different cultures and religions, Tanzanian farmers also need snakes, as they play a natural and vital role in agriculture. However, the lack of knowledge, first aid measures, medical treatment, and access to quality care results in the loss of limbs and a high mortality rate, further resulting in the ostracization, discrimination, and violation of basic human rights.

This venture is working to help empower rural communities and provide educational trainings that will help improve attitudes and behaviors towards snakes. Fieldwork is being conducted through villages and provinces within the districts of Same and Mwanga. Along with meeting local community leaders, medicine men and community health workers, the team also aims to create a network of herpetologists and healthcare professionals that are willing to assist and help improve the survival rate of snake bite victims.

This project hopes to bridge the gap between herpetologists, healthcare professionals, local snake keepers, traditional healers and community health workers to ensure collaborative efforts are made to reduce the impact of snakebite while also conserving the lives of snakes throughout the region. The overarching goal of this project is to provide easy to use materials that can be wide spread and help assist those that are fearful of snakes. This is a public health initiative that seeks to help provide education and create less reliance on antivenin.

The span of this project is two years and will continue to evolve as baseline data is discovered and analyzed. Using a bottom up low intervention proactive approach to educating communities about snakebite education.

Keywords: public health, venom, snakebite, interventions, Tanzania.

Poster # 46. Driving Sustainability with Fungi, BASHIRA MUHAMMAD* and KATHARINE MATTALIANO (Zoom Out Mycology, 1565 Siskiyou Blvd #27 Ashland, OR 97520, shroom@zoomoutmycology.com).

Our mission at Zoom Out Mycology is to drive environmental, social, and economic sustainability with fuels reduction by restoration thinning, environmental education, and food production. In this poster presentation you will learn about mycorestoration and the benefits of mycorrhizal fungi in soil health. We have done three case studies where we examined the impact of mycorrhizal fungi in a diseased backyard, the application of compost tea’s effects on moisture retention, and the outcome of adding blewit mycelium to compost. The purpose of our research is to protect biodiversity helping to build a conservation attitude around fungi and soil ecosystems.

Keywords: Mycology, Mycorrhizal, Mycorestoration, Compost tea , Mycelium
Field Trips
Submitted Biographies

Laura Ackley holds graduate degrees from the Harvard University Graduate School of Design and the University of California at Berkeley College of Environmental design, as well as an undergraduate degree in architecture from Berkeley. She has worked for such diverse firms as Lucasfilm, Bechtel Engineering, and Autodesk, and taught 3D computer modeling for more than a decade. Her book, *San Francisco’s Jewel City: The Panama-Pacific International Exposition of 1915* was co-published by Heyday and the California Historical Society. Accolades for *San Francisco’s Jewel City*: The Gold Medal at the 2015 California Book Awards in Californiana sponsored by the Commonwealth Club; The National Independent Publisher Book Awards; Bronze Medal for United States History; The Oscar Lewis Award from the California History Association; Finalist for the Northern California Book Award for General Nonfiction; Finalist for the NCIBA Book of the Year Award Currently Ms. Ackley is an independent researcher in the San Francisco Bay Area.

Dr. Pierre Baldi earned MS degrees in Mathematics and Psychology from the University of Paris, and a PhD in Mathematics from the California Institute of Technology. He is currently Distinguished Professor in the Department of Computer Science, and serves as Director of the Institute for Genomics and Bioinformatics and Associate Director of the Center for Machine Learning and Intelligent Systems, at the University of California Irvine. The long-term focus of his research is on understanding intelligence in brains and machines. He has made several contributions to the theory of deep learning, and developed and applied deep learning methods for problems in the natural sciences such as the detection of exotic particles in physics, the prediction of reactions in chemistry, and the prediction of protein secondary and tertiary structure in biology. He has written four books and over 300 peer-reviewed articles. He is the recipient of the 1993 Lew Allen Award at JPL, the 2010 E. R. Caianiello Prize for research in machine learning, and a 2014 Google Faculty Research Award. He is an Elected Fellow of the AAAS, AAAI, IEEE, ACM, and ISCB.

Roxane Beigel-Coryell was hired as Southern Oregon University as it’s first sustainability coordinator in 2012. During her time at the institution she has coordinated efforts to increase waste diversion and reduce the university’s carbon footprint. She also serves on the City of Ashland’s Conservation Commission and was a member of the first Climate and Energy Action Plan Ad Hoc Committee that developed the City of Ashland’s Climate Plan.

Dr. Mia Bertagnolli Ph.D, Professor of Biology, is Chair of the Chemistry & Biochemistry Department and Interim Associate Dean, College of Arts and Sciences at Gonzaga University. She has a Ph.D. in cellular biology (University of Utah), was Clare Boothe Luce Professor of Biochemistry, and received an Exemplary Faculty Award (2008). As Chair of Biology, she worked to: a) recruit, retain and support the advancement of a diverse STEM faculty through hiring practices, including a position gained through Gonzaga’s Underrepresented Minority Post-Doc Program, mentoring of colleagues, and advocacy for fair and clear policies; b) support underrepresented STEM students through the creation of a Biology Living and Learning Community and collaboration with Gonzaga’s HHMI Program Director on initiatives to increase diversity among science students; and c) promote a culture of inclusivity within the department. She co-organized a Faculty Enrichment Workshop at the 2016 Murdock College Science Research Conference on supporting women faculty in STEM fields. She is CoPI on the recently submitted NSF ADVANCE Partnership proposal, “ASCEND: Advancing STEM Careers by Empowering Network Development,” to develop peer-mentor networks and administrative allies to increase the advancement of mid-career women STEM faculty and drive institutional transformation to promote diversity and inclusivity in STEM fields.

Associate Judge William D. Bowers II, Yurok Tribe. Mr. Bowers is a Yurok citizen and Southern Oregon University Alumni, who became an Associate Judge after 30 years of public service with the State of Oregon, first as a case worker then as a parole and probation officer. Mr. Bowers served as a consultant with the State of Oregon as they implemented the Indian Child Welfare Act and provided ongoing trainings regarding looking at Native Families through a Historical Perspective. As a Requa Village descendant, Mr. Bowers is a ceremonial leader and traditional fisherman. He coached Ashland High School wrestling and has been an active community volunteer through youth activities throughout his life. His current interests involve preserving the wellness of the tribal community through the development of preventative and restorative services based on cultural and spiritual foundations.

Mark Bransom, Chief Executive Officer of the KRRC, brings more than 20 years of planning, engineering, and construction experience in water resources and environmental management for state and local governments, federal agencies, Tribal Nations, NGOs, and private sector clients throughout the Western United States. In addition to his technical expertise, Mark is a skilled facilitator with experience building consensus among diverse project stakeholders and developing highly collaborative and transparent processes. Mark comes to KRRC from CH2M Hill where he worked as a Senior Vice President in Water Resources & Environmental Management and oversaw a variety of large water infrastructure and environmental restoration projects. He was also previously a member of the faculty at Oregon State University, where he taught, conducted
research, and consulted on natural resources management and infrastructure projects. Mark holds a BS in Natural Resources Planning from Humboldt State University and earned his PhD in Civil and Environmental Engineering from Oregon State University.

Rich Cameron is a co-founder of Nonscriptum LLC, a maker tech and 3D printing consulting and training company based in Pasadena, CA. He has collaborated with Joan Horvath on eight books (so far!) and on courses for Lynda.com/LinkedIn Learning Rich is a pioneer in low-cost 3D printer design.

Walter Gino Carlini, MD. PhD. Born in Italy. Raised in Ohio and southern California – the oldest of 8 children. Graduated from Harvard University with a Honors BA in Biochemistry. PhD in Neurosciences from Stanford University. MD from Stanford University Post-doctoral work at Yale University. Internship in General Medicine at Oregon Health Sciences University. Residency in Neurology at Stanford University. Fellowship in Clinical Electrophysiology at Stanford University Total schooling / training = 30 years. 25 years of clinical practice in Neurology in Medford, Oregon Investigator for 77 clinical trials in various subdisciplines of neurology. 26 publications. Married to one wife for 28 years. Father of 4 children

Andy Chitty is currently the Director of University Shared Resources at OHSU (the Oregon Health and Science University) in Portland Oregon. He is also serving as President of the Association of Biomolecular Resource Facilities (www.ABRF.org). Andy spent sixteen years at scientific equipment designer and manufacturer – Optimize Technologies, Inc, developing custom devices for commercial laboratory instrumentation for liquid chromatography, mass spectrometry, combinatorial chemistry, clinical diagnostic, bio-defense and nuclear pharmacy industries. Later, as Senior Manager, he also had responsibility for R&D, engineering, and sales and marketing. After receiving his MBA, he was recruited to the Oregon Health and Science University (OHSU), and now serves as Director of University Shared Resources. His primary responsibilities are to develop efficient core operating models and maintain cutting-edge research facilities in a scientific portfolio that benefit all scientists at OHSU. This portfolio of cores evolves as needed to support OHSU’s goals and strategic plan. As President of ABRF, Andy leads a unique society dedicated to advancing cores and shared resources world-wide. Although most of the society is made up of core directors from academic institutions, members also represent laboratories and administrative offices in government, research, industry and commercial settings. The ABRF promotes the education and career advancement of scientists who manage shared research facilities through conferences, a quarterly journal, publications of research group studies and collaborations with like-minded groups world-wide. The society also sponsors multi-center research studies designed to help members incorporate new technology into their laboratories.

Juan-Carlos Ciscar coordinates the team on the economic analysis of climate policies (both mitigation and adaptation policies) in the Economics of Climate Change, Energy and Transport Unit of the Joint Research Center (JRC), European Commission. He holds a graduate degree in economics (Universidad de Valencia), a postgraduate degree in finance and monetary economics at CEMFI (Bank of Spain) and earned a PhD in economics from University of Valencia. Before joining the European Commission, he taught economic theory at Universidad de Valencia and worked for the Ministry of Economics & Finance of Spain in Madrid. At JRC he does research on the analysis of climate change impacts and adaptation through the integration of high-resolution climate data with economic and biophysical impact models, using computable general equilibrium (CGE) models and other economic tools, like growth models. He has coordinated the various PESETA studies on the impacts of climate change in Europe. His current research relates to the economics of climate impacts and adaptation policy (in the context of the European adaptation policy; JRC PESETA III and IV projects) and the simulation of global climate change impacts in a broad set of climate impact categories.

Angelina Cook has been building capacity for renewable economy in source water communities for 13 years. Preventing degradation while advancing restoration in retired timber towns, she contributes toward resilient resource management in ecologically significant areas. Having worked with multiple grassroots organizations, taught Environmental Sustainability at community college, and facilitated initiatives to protect the Public Trust over the past decade, she has established relationships with a significant network of key stakeholders in northern California. She currently directs the McCloud Watershed Council, coordinates the Upper Sacramento Regional Water Action Group (RWAG) www.uppersacirwm.org, and volunteers to defend the City of Weed against a corporate water grab. Angelina loves to ski, bike, swim, hike, practice yoga, dance to live music, climb trees, eat local food and spend time with her 12 year-old son, Rio.

Rocky Cowie I have been involved in agriculture since the mid 70’s and have done extensive research regarding applications of soil technologies and restoration. I have seen the transformation of depleted soils into high productivity, yielding nutritious crops and have been able to raise the organic matter content of soils to 10.34%, working with compost and soil microbes and their food sources. (Jackson County organic matter average is 2-3%) In 1980 I went to medical college and subsequently
entered the field of emergency medicine for 32 years. I saw the symbiotic relationship between soil chemistry and biology and livestock chemistry and biology, similarities between the minerals that made our heartbeat and the exact same minerals that make what I concluded to be the “heartbeat” of the soil. Soil microbes are the immune system of the earth and they can work for us in any application - unbalanced pH, toxic soils, contaminated water, controlling insects and plant or livestock problems/imbalance.

**Dr. Dominick A. DellaSala** is President and Chief Scientist of the Geos Institute in Ashland, Oregon and former President of the Society for Conservation Biology, North America. He is an internationally renowned author of over 200 publications on forest ecology, endangered species, conservation biology, and climate change. Dominick has given keynote talks ranging from academic conferences to the United Nations Earth Summit. He has been featured in hundreds of news stories and documentaries, testified in the US congress on climate change and endangered species, cofounded organizations, and received conservation leadership and book writing awards. He is co-editor of Encyclopedia of the Anthropocene (Elsevier) and The World’s Biomes (Elsevier), co-editor of "The Ecological Importance of Mixed-Severity Fire" (Elsevier), author/editor of Temperate and Boreal Rainforests of the World (Island Press), and editor of several scientific journals. Dominick is motivated by his work to leave a living planet for his daughters, grandkids and all that follow.

**Catie Faryl** is a well-known West Coast artist and activist who has lived in the Rogue Valley for 30 years. Her artwork and writings are about the human condition, social, environmental and political topics and the times in which we live. She’s had a lifelong love of nature and is still working to protect the rights of people, sentient beings and the natural world. Catie attributes her ability to find solutions and embrace ambiguity to having a diverse background and experiences. She worked in Alameda to stop the transport of nuclear waste, managed the City of Alameda’s paratransit program and Public Housing Authority and worked in real estate sales and development. She used her Realtor title to direct early attention to issues of climate change, irresponsible lending and land and resources exploitation. Moving to the Rogue Valley in 1989 to raise her children, she taught art, social studies, history and language in many Rogue Valley schools and worked for Oregon Shakespeare Festival, Ashland Gallery Association and with community arts, activists and theatre groups. In 2015 she was named Volunteer of the Year for Our Family Farms for her work in helping ban GMOs in Jackson County. Catie is dedicated to creating and supporting actions to reverse climate change and is the Chairperson for Bellview Grange Legislative Committee. She serves as the Southern Oregon Drawdown Action Groups Coordinator to facilitate regional implementation of many of the 100+ Project Drawdown solutions; she’s even added an eighth local sector called “Art and Activism”. You can contact Catie at centerforcreativechange107@gmail.com

**Laura Bee Ferguson** is the Founding Director of the College of the Melissae – an online and on-the-ground sacred beekeeping school and activism platform based in Oregon, West Coast USA. In her work, Laura blends her heart’s desire for activism with her soul’s sensitivity to the world and she speaks internationally on sacred beekeeping and how we can and must save the bee to save ourselves. She is an educator, teacher, speaker and activist and draws on her dual degree in Anthropology and Religious Studies (BA Macalester College) as well as 15 years as a beekeeper. She blends together cutting-edge natural beekeeping methodology and practices with cross-cultural, spiritual and mythological perspectives. For fun Laura Bee works on her novel, paints, wildcrafts, creates herbal medicines and probably spends too much time canoodling with her chickens on her ¼ acre farm. For more information about her program: collegeofthemelissae.com

**Dr. Kathleen Fischer** studied rainforest canopy ecology in the remote mountains of Papua New Guinea (PNG), where she worked with local villagers and mining companies to establish the Mekil wildlife management area. Following her work in PNG, the Wildlife Conservation Society asked her to perform a marine survey of Lampi Is. and write a management plan for the Mergui Archipelago. The plan was designed to protect natural resources and the traditional resource use of the nomadic Moken people who have lived in the region since time immemorial. Lampi Marine National Park is the first marine park in Myanmar. She has also worked on conservation with indigenous communities in Indonesia and Brasil. As a graduate student, Dr. Fischer studied the evolution of aging; she returned to aging research in 2010, when she joined the Physiology Department and the Barshop Institute for Longevity and Aging Research at the University of Texas Health Science Center, San Antonio. She joined the Department of Biology at the University of Alabama at Birmingham in 2014 and retired in 2017. She remains Adjunct Research Professor at UAB. Dr. Fischer is currently the Director of Planning and Community Development at the Yurok Tribe.

**Sean Gallagher** joined AAAS as a Senior Government Relations Officer in March 2015. He handles a wide range of policy issues and focuses on engaging and encouraging scientists to demonstrate their value to their peers, the media and policy makers. He spearheads grassroots efforts and serves as a liaison to congress and the executive branch. Prior to joining AAAS Sean spent over 7 years on Capitol Hill as a legislative aide to five Members of Congress, helping represent districts in Pennsylvania,
New York, Virginia, California, and most recently was a policy advisor to Representative Rush Holt from central New Jersey. Sean specialized in science and technology issues, and also has experience in military and veterans affairs as well health care reform. Sean has a Master’s Degree in Public Policy from Georgetown University and received his Bachelor’s in Political Science from Villanova University.

Emily Gogol, PhD. is a founder and the CEO of Infinite Tree, an agricultural firm focused on setting the standard for the Hemp and Marijuana nursery industry. As a scientist and business leader, Emily enjoys the rapidly changing Cannabis industry and is passionate about growing the next generation of quality plants with an emphasis on responsible, sustainable practices developed through scientific research. An accomplished scientist at Genentech, Emily worked to scale-up, standardize, and automate research programs for drug discovery. Emily is also a recognized leader by the State of California, having created three community organizations and two public parks from the ground up leveraging public-private partnerships.

Eli Goldwyn. Having grown up in Portland, Eli recently returned after graduate school at UC Davis and several post-doctoral positions scattered around the country. Eli is an assistant professor at the University of Portland in the math dept. His research focuses on using mathematical tools and statistical inference to better understand the mechanisms driving ecological and epidemiological systems over different spatial and temporal scales. Specific examples include the causes of spatial-synchrony in predator-prey systems, the spread of influenza on a college campus, fungal and viral transmission in the North American gypsy moth, and the opioid epidemic. Outside of academia, Eli enjoys swimming and going to parks with his kids in the summer and skiing in the winter.

Scott Goode earned a Bachelor’s degree in Geosciences from Texas A&M University and continued studies in Civil and Environmental Engineering at the University of Texas in Austin. He held a research assistantship at the Bureau of Economic Geology working in computer modeling and Geographic Information Systems. He worked as a government contractor in computer modeling and environmental science for the Department of Defense and the Department of Energy based in Albuquerque, New Mexico, and then as a private contractor in environmental sciences, and water treatment in Boulder, Colorado and Ashland, Oregon. Currently, as an Hourly Staff Research Scientist with the Desert Research Institute in Reno, Nevada and an instructor with Southern Oregon Research and Extension Center and Rogue Farm Corps, his work is focused on teaching Regenerative Agriculture and Agroecology, and carrying out research in agricultural methods for the sequestration of atmospheric carbon.

Tonya Graham leads the Geos Institute’s community-based climate resilience program. A veteran of the climate adaptation and resilience field, Tonya is one of the primary architects of the Whole Community Resilience planning framework that integrates the needs of human and natural communities while creating multiple benefits across sectors. She is a co-author of a Practical Guide to Building Climate Resilience, a key element of the Geos Institute’s new Climate Ready Communities program for small to mid-sized communities. Tonya co-founded an effort to develop a nation-wide system of adaptation services that is developing a vetted registry of service providers. She served on the Project Advisory Committee for the field-wide assessment Community-Based Adaptation in the United States: Understanding How and Why Communities are Taking Action. Tonya assisted the Association of Climate Change Officers in developing their climate adaptation credentialing program curriculum. In 2012 she co-organized the first national gathering of climate adaptation professionals with the Kresge Foundation. As a member of the ClimateWise team, Tonya has helped communities adapt to changing climate conditions in Oregon, California, Montana, Kentucky, Texas, Colorado, and Alaska. Tonya holds a B.S. in Biophysical Environmental Studies from Northland College and a M.A. in Community Development from Goddard College.

Peter Halt, MD Degree in Physiology UC Berkeley 1985, Research Scientist Center for Neural Injury UCSF 1985-1991, Medical Degree Columbia University 1995, Residency and Radiology residency and fellowship Brigham and Woman’s Hospital, Harvard Medical School 1995-2001, Turned down offer to be Medical Director of an AI startup in Boston 2001, Medical Director in Radiology of 4 small rural hospitals in Northern California. 2001-present, Runs four hospital Picture Archiving and Communication Systems and 2 voice recognition systems simultaneously from a $300 workstation and a $25,000 monitor while watching Netflix, Raising 4 teenagers with his lovely radiologist wife and 3 dogs.

Chris Hardy is inspired to connect people to their food from seed to table. Generations of farming in his family and his extensive travels abroad have kept his passion high for organic agriculture, education and growing a vision for thriving seed culture and regenerative, living soils. He was the initiator of the historic campaign in Southern Oregon to ban genetically engineered crops by helping bring farmers and citizens together to protect traditional seed saving practices. For more than 20 years he has advocated for supporting local farmers, helped organize regional seed swaps and worked with area farm to school programs to connect kids to seeds and their food. He has launched a local seed company and oversees the production
of more than 300 unique types of vegetable and herb seeds. Chris is a founding board member of the Southern Oregon Seed Growers Association and is actively engaged in building a network of seed growers to strengthen diversity in the food system.

**Alan Hickenbottom, Founder and Principal Latitude45 Associates** An experienced NW energy and technology entrepreneur recognized for developing extensive alliances in for-profit, non-profit, utility and government sectors. Alan been involved in the NW energy and clean tech sectors for over 25 years. He was a co-founder of Common Energy, a Hood River, Oregon-based solar energy and green building firm as well as founder and president of Tanner Creek Energy, a Portland-based commercial and industrial solar integration firm. Additional client work includes wind, EV infrastructure, energy storage and hydrogen. He currently the project manager for Oregon’s Community Choice Aggregation effort with LEAN Energy US. He is a current or former member of the board of directors of the Build Local Alliance, NW Environmental Business Council, Clean Energy Works Oregon, Oregon Natural Desert Association and the Oregon Business Association.

**Michael Hoch** works for the City of Talent as their Energy Efficiency Coordinator and Recourse Assistant for Rural Environments (RARE) participant. RARE is a joint program with AmeriCorps and the University of Oregon, working on improving the social, environmental, and economic quality in rural Oregon. Michael received his BS in Economics from the University of Oregon in 2015, before going on to complete his MS in Environmental and Developmental Economics from SOAS, University of London in 2016. His Master’s dissertation focused on how the United States legislative framework affected the social and environmental quality on society. Michael is an outdoorsman, and his passion for the great outdoors is the basis of his professional mission to normalize sustainable development and sound environmental policy. During his free time, you can find him hiking, kayaking, fishing, camping or backpacking. He also enjoys teaching trail building, maintenance and crosscut sawyer classes for volunteers and professionals, through the Pacific Crest Trail Association and Trailkeepers of Oregon.

**Dr. Ulrich Hoffmann.** My academic career started with studies in applied physics at the TU München in 1987. There I received my PhD in 1996 in (bio)physics with work on bio-hybrid semiconductor sensors and ultra thin organic layers. I undertook post-doctoral research at the Åbo Akademi in Turku, Finland and at the California Institute of Technology, Pasadena, CA as a Feodor-Lynen-Fellow till 1998. From there I moved to the University of Lübeck to found my own research group on biosignal processing and neural engineering, where I was habilitated in the Computer Science Department 2003 with projects on silicon multisite micro electrodes and personal health monitoring systems. It was there, where I was awarded the title „Professor“ in 2008. Since 2012 I am heading the Section for Neuroelectronic Systems of the University Medical Center Freiburg as endowed Peter-Osypka-Professor. In 2015 I was honored by the FRIAS-USIAS fellowship and the University of Rhode Island’s „Distinguished International Scholar“. The Cluster of Excellence „Brainlinks-Braintools“ and the Sperman Graduate School for Medicine and Biology both list me as principal investigator in some of their projects. I am currently co-editor for „Frontiers in Neuroscience: Section Neural Technology“, was co-editing „Cognitive Neurodynamics“ for seven years and act as reviewer for numerous journals and funding agencies. My mentoring encompassed more than 60 master thesis, 16 PhD thesis and 4 startup companies.

**Joan Horvath** is a co-founder of Nonscriptum LLC, a maker tech and 3D printing consulting and training company based in Pasadena, CA. She has collaborated with Rich Cameron on eight books (so far!) and on courses for Lynda.com/LinkedIn Learning. Joan is a recovering rocket scientist.

**Dr. Darryl Inaba** is Director of Clinical and Behavioral Health Services for the Addictions Recovery Center and Director of Research and Education of CNS Productions in Medford, Oregon. He is an associate Clinical Professor at the University of California in San Francisco, CA., and a Lifetime Fellow at Haight Ashbury Free Clinics, Inc., in San Francisco, CA. Dr. Inaba has authored several papers, award winning educational films and is co-author of *Uppers, Downers, All Around* a text on substance-related and addictive disorders that is used in more than 400 colleges and universities. He has been honored with over 90 individual awards for his work in the areas of prevention and treatment of substance abuse problems. For more information, visit: http://www.cnsproductions.com/46.html.

**Dr. Alan Journet** retired from Southeast Missouri State University in 2010 after a career teaching Biology and Environmental Science: mostly process of science, ecology, and conservation biology. Alan relocated to Southern Oregon the same year with his wife, Dr. Kathy Conway. Once here, they built an energy efficient passive/active solar home in the Applegate Valley where they are grid-tied while trying to achieve zero net energy (i.e. they generate as much energy as they use). In 2012, Kathy and Alan, along with a few concerned area residents, formed what is now Southern Oregon Climate Action Now - a science-based grassroots, volunteer organization dedicated to promoting awareness and understanding about global warming and its climate change consequences among residents of the region while motivating them to take action to address it. They serve as SOCAN Co-Facilitators.
Rianna Koppel is the Sustainability Coordinator at the Ashland Food Co-op. She works towards the Co-op’s four goals of zero waste, carbon neutrality, eliminating toxic chemicals, and being a sustainable relations leader. She is one of the authors of the City of Talent’s Clean Energy Action Plan, adopted in 2017. She is the Clean Energy Team Lead on the city committee Together for Talent. She recently graduated from the 2018 Fellowship Program offered by We Own It, focusing her campaign on researching electric utility municipalization and Community Choice Aggregation legislation for Oregon. She served on the board for Rogue Climate for two years and has represented Pacific Power’s Blue Sky program throughout Jackson County. She is committed to seeing a real world shift to local clean energy that decentralizes Investor Owned Utilities owned by billionaires, and empowers all communities with democracy, equity, and climate justice. She supports the No LNG campaign and encourages you to take action today to stop Pembina’s Jordan Cove LNG project.

Tom Landis: is a forester who retired after 30 years of working as a nursery specialist for the US Forest Service, and has spent the last 5 years creating pollinator habitat in southern Oregon. He is a co-founder of the Southern Oregon Monarch Advocates (SOMA), which works to inform people about the plight of western monarchs and create pollinator habitat. Habitat for pollinators means native milkweeds, the only host plant for monarch butterflies, and nectar plants which monarchs and other pollinators use for food. Using his nursery experience, Tom has been growing our 3 native milkweeds as well as an increasing number of nectar plants. Due to a continuing interest in monarch restoration, Tom has given over 100 monarachs and milkweeds workshops in the Northwestern US but as far away as a Society of Ecological Restoration meeting in Manchester, England. To encourage the use of local native milkweeds and other pollinator plants, Tom helped write a booklet Native Pollinator Plants for Southern Oregon. He also co-authored an article which was published in the Spring 2018 issue of the Native Plants Journal entitled “Using native plants to create pollinator habitat in southwest Oregon: lessons learned”.

Kristina Lefever moved to the Rogue Valley in 2012 and immediately became enamored with the region’s flora and fauna, especially our pollinators. At the same time, she began learning about the unprecedented decline of all pollinators and the associated implications for our food system and ecosystem. She and her husband turned their barren property in Ashland into a pollinator garden, with many native plants, trees - and dandelions - but of course it’s never finished. She intends to leave more bare (unmulched) soil to provide nesting areas for native bees! Kristina loves teaching about our native bees, butterflies, flies, wasps, beetles, and hummingbirds, and the plants and habitats that best support them. Kristina is president of Pollinator Project Rogue Valley, chair of Bee City USA Ashland, a board member of Beyond Toxics, and a certified Jackson County Master Gardener. Her dream is that everyone’s yard will include a little or a lot of pollinator habitat, even if it’s just a pot of nepeta (catmint) on the porch.

Dr. Carolina Livi received a doctorate in Molecular Developmental Biology from the California Institute of Technology. She was a Research Assistant Professor at the University of Texas Health Science Center at San Antonio (UTHSCSA) in the department of Molecular Medicine. Her research focused on molecular mechanisms of rapamycin treatment in murine cancer models. Dr. Livi currently works at Agilent Technologies, a biotech company, and has joined SOU as Affiliate Professor of Biology.

Alex Mawla is a PhD candidate in the Integrative Genetics & Genomics program at UC Davis. His background prior was in in Neurobiology during his bachelors, but he switched gears and ended up in the field of genetics and computational biology. Alex is a part of the Huisning lab, which explores diabetes research from a basic biology angle. The lab studies various aspects related to cross-talk within pancreatic islets, and heterogeneity within major islet cell types – beta and alpha cells. Alex’s work focuses on elucidating the epigenetic and regulatory mechanisms that drive cell fate switching and maintenance within islet cells, primarily focused on beta cell maturation and cell maintenance. Alex does this through the use of integrative -omics, computer programming, and an understanding of pancreatic islet biology. In his free time, Alex likes cooking new French and seafood dishes, playing guitar, and hosting themed parties.

Jim McGinnis – James holds a BA in Forestry and a MS in Forest Ecology. He has worked for the US Forest Service for 40 years in forest planning, as a field ecologist, GIS analyst, project manager for software development, project manager for the Forest Service sustainable operations and climate change program areas.  Here at home James is currently the chair of the Conservation and Climate Outreach Commission. He was also a member of the Climate and Energy Plan AdHoc committees supporting the development and implementation of the Ashland Climate and Energy Action Plan.

Dave Meurer serves as Community Liaison for the Klamath River Renewal Corporation (KRRC). Dave is no stranger to the troubled history of the Klamath Basin. As a legislative field staff member, first for Congressman Wally Herger (R-CA 02) and then for State Senator Ted Gaines (R-SD 1), Dave has worked extensively in the Basin for more than two decades. Having witnessed firsthand the economic, environmental and social problems that have plagued Northern California and Southern
Oregon’s Basin communities, Dave holds a keen interest in bringing solutions to bear on the numerous complex and interrelated issues. Dave admits to once being part of the problem. He relishes now being part of the solution. Dave believes that removing four dams on the Klamath River is the foundation for healing the river and a vital first step to resolving the revolving water crises in the region. Dave holds a Bachelor of Arts Degree from California State University Chico in Political Science and Communications. This is a fancy way of saying that Dave was not good at biology. But if you have a technical or scientific question, he knows where to go for answers. Reach him at dave@klamathrenewal.org.

**Nicholas GE Morales,** is a 2017 graduate of Oregon State University with a BS in Zoology and is currently completing a BS in Computer Science at Southern Oregon University. He is a distinguished AP scholar and a recipient of the Gates Millennium Scholarship. He is a member of the Purhepecha people of Michoacán Mexico. He interned in 2017 with the Oregon Department of Fish and Wildlife performing field studies on lamprey populations and restoration of habitat on local rivers for native salmonids. He has been involved in Farm Worker organizing for most of his life and is currently employed as an Environmental Justice Organizer with Unite, Center for Farm Worker Advocacy. He and his colleagues are working to create LOCAL, a coalition of people of color residing in southern Oregon. It will help address environmental problems that impact their wellbeing. They are also working towards having a strong voice in legislative actions to assist those most impacted by environmental issues. His interests include mathematics, network security, programming and zoology.

**Dr. Philip Mote** is vice provost and dean of the Graduate School and remains active in the Oregon Climate Change Research Institute (OCCRI) and the NOAA-funded Climate Impacts Research Consortium (CIRC) for the Northwest. He is very active in leadership of the 60,000-member American Geophysical Union, as President of Global Environmental Change, member of the Council, Vice Chair of the Council Leadership Team, and a member of the Board. Philip was the founding director (2009-19) of OCCRI and remains involved in communicating climate science within Oregon. He earned a B.A. in Physics from Harvard University and a Ph.D. in Atmospheric Sciences from the University of Washington.

**Jeanine Moy** BS Applied Ecology Cornell University, MS Environmental Education Southern Oregon University. As a naturalist, educator, creative, activist, and backcountry adventurer, Jeanine loves to spend time outside observing living things. She has devoted the last two decades to the study of natural ecosystems and serving as an educator. Her range of experiences include managing an agroforestry research and demonstration site in upstate New York, conducting plant field studies in the greater Yellowstone region, guiding rock climbing in Colorado, and teaching outdoor science to youth in Oregon. After a decade of living in southern Oregon she has found a home among other naturalists, and enjoyment of the intricate landscape. Most recently she worked as the Outreach Director for the Klamath-Siskiyou Wildlands Center, and in 2018 was awarded a Cascade-Siskiyou National Monument Artist-in-residency. During 2018 she launched the Vesper Meadow Restoration and Education Program, based in a wet meadow habitat in the Cascade-Siskiyou hills. Read more about the community-powered restoration, science and art programs at VesperMeadow.org

**Ichiro Nishimura** is Professor of Dentistry and Bioengineering at UCLA and serves as Co-Director of NeuroEngineering Graduate Program and Director of the Dental Specialty PhD Program (DSPP). Nishimura received his clinical training from Tokyo Dental College (DDS, 1981) and Harvard School of Dental Medicine (DMD, 1993). He received the Doctor of Medical Sciences degree (DMSc) and the Prosthodontics Specialty Certificate from Harvard in 1986. Nishimura joined UCLA in 1997 and established the Weintraub Center for Reconstructive Biotechnology, supported by the National Center for Research Resources/NIH and philanthropic contributions from the Weintraub Family and film/entertainment industry. Nishimura has served as a reviewing consultant for NIH, NSF, and Biotechnology and Biological Sciences Research Council (UK). He received scientific/academic awards including Distinguished Faculty Award (Harvard, 1993), Distinguished Service Award (American Association for Dental Research, 1999), Appreciation of Services (US Department of Health & Human Services, 2000 & 2005), Distinguished Scientist Award (International Association for Dental Research, 2004) and Distinguished Alumnus Award (Harvard School of Dental Medicine, 2018). He is an elected Fellow of Academy of Prosthodontics (2000) and American Association for Advancement of Science (AAAS, 2017). He published over 300 papers and conference abstracts and 20 book chapters. His current research investigates rare diseases of bone, skin, oral mucosa and facial nerves, using small animal models and bio/nanotechnology for drug discovery and delivery.

**Sam Rivas** Sam will be an incoming senior at the University of Portland and is a current mathematics major with a chemistry, spanish, and biology minor. Sam recently took the MCAT and is planning on matriculating into medical school in the Fall of 2021 to pursue her goal of becoming a surgeon. Coming into college, she always knew she wanted to research, but never thought it would be in math. She began by performing the statistical analysis for a research project conducted by professors in the school of nursing. She then began a new project that used graph theory to study and determine optimal vaccination strategies for Small World Networks. Afterwards, Sam began working alongside Dr. Goldyn and four other students to research into the opioid epidemic. She has enjoyed being able to apply her biology and chemistry background to help enhance
these mathematical models. In her free time Sam is a medical scribe at a local hospital, an organic chemistry teacher’s assistant and enjoys spending time and cooking with her friends.

**Dan Ruby** has been at the helm of ScienceWorks Hands-On Museum since July 2018; He comes from the University of Nevada, Reno and led a planetarium and science center on that campus for 12 years. He has a background in fine art digital media & communications as well as science education, and loves museums for the societal roles they play. He has been involved in NASA- and NSF-funded research projects on flying telescopes, studying Mars caves, and finding rings and moons of minor planets beyond Neptune. He is particularly interested in the impact that hands-on projects have on students with regard to increased performance in math, science, and language. He lives in Ashland with his partner, two school-aged children, and a Scottie dog.

**Michael Savelli** joined AAAS in January 2011 in the technology group as the Director of Systems & Programming and rapidly advanced within the organization taking on additional responsibilities culminating in his current role as Chief Operating Officer for AAAS. In this role, Michael provides strategic leadership to the organization as a whole and direct oversight of a number of departments including Membership, EurekAlert!, Project Management, Marketing, Human Resources, and Information Technology. Since taking over the Office of Membership in August of 2016, Michael has transformed the operations of the Office into an agile, digitally-focused team with an innovative spirit that has led to 40% growth in the membership ranks for the Association. Prior to joining AAAS, Michael spent over 20 years in software development both as an engineer and as an entrepreneur in tech start-ups. Michael has an MBA from George Mason University and received his Bachelor’s in Mathematics from Edinboro University of Pennsylvania.

**Dr. Hala G. Schepmann**, Ph.D Professor of Chemistry, is Chair of the Chemistry Department and Physics Program at Southern Oregon University. Dr. Schepmann earned an MS in Synthetic Organic Chemistry from University of California at Berkeley and a PhD in Bioorganic Chemistry from Rice University. Her research focuses on isolation and characterization of plant natural products. Dr. Schepmann’s efforts to advance STEM education include implementing 2D NMR spectroscopy, peer-led team learning, and guided-inquiry methods into the chemistry curriculum; developing professional development workshops for STEM undergraduates; and leading chemistry outreach efforts for K-12 and community college students and instructors. Dr. Schepmann, the only foreign-born woman faculty in the STEM Division, co-founded and leads a university faculty alliance that promotes the advancement of underrepresented faculty groups. Among other products, this work has led to the formation of a faculty ombuds office, a faculty mentoring program, tenure clock extension policies, distinguished teaching and service faculty awards, workplace flexibility policies, and a university-wide sick leave sharing policy. In 2016, Dr. Schepmann received SOU’s Presidential Recognition Award, acknowledging her efforts to advance diversity and equity. In pursuit of effecting multi-institutional transformation, Dr. Schepmann (CoPI) recently submitted an NSF ADVANCE Partnership proposal to improve sociocultural environments and remove obstacles to advancement for diverse faculty.

**Dr. Sharon Schmidt Ph.D.** is fond of saying that “Honey was my Gateway Drug into Beekeeping”. It triggered all the memories of her childhood fascination with bees. She came by that fascination honestly as she is the granddaughter of midwestern farmer/ dairy producers who were also beekeepers. She earned her Masters Degree in Nursing at the University of Illinois Medical Center. Her doctoral degree in Clinical Psychology was earned at the Chicago School of Professional Psychology and she taught in University settings. Her practice and research interests lie in the areas of ethical beekeeping, honey sensory analysis, mindfulness, education of underserved populations, soil health, honeybee nutrition, recognizing and minimizing the effects of pesticides, regenerative agriculture, regenerative beekeeping and opportunities for women in beekeeping. More at [www.cascadegirl.org](http://www.cascadegirl.org).

**Howie Seay** graduated in 2014 with a M.Sc. in Biomedical Informatics from Nova Southeastern University. Having always been passionate about the application of meta-analysis to improve system performance, he has worked in the fields of molecular genetics, cancer, autoimmunity, and bioinformatics, at the Scripps Research Institute, the University of Florida Diabetes Institute, and now, BD Biosciences. He strives to achieve protocol efficiency, ease of replication, and translation to the clinic. As the Core Research Facility Manager at UFDI, he developed a novel protocol for isolating, expanding, and infusing regulatory T cells (Tregs) from autologous umbilical cord blood units (CBU) cryopreserved at birth for the treatment of chronic autoimmune conditions. This protocol is currently being applied to a Phase I clinical trial. Later work with samples collected from human organ donors eventually became the largest dataset of B-cell and T-cell receptor sequences publicly available and showed that autoreactive sequences could be localized to the pancreatic-draining lymph nodes in donors with type 1 diabetes. His current work at BDB Informatics is focused on the creation of a public platform for crowd-sourcing foundational datasets for Quality Assurance/Quality Control practices and experimental design standards in Flow Cytometry and single-cell RNA-sequencing technologies.
Paul Sheldon As a private Development Consultant, Paul Sheldon specializes in the realization of dreams through organizational development, green jobs development, real estate development, energy efficiency planning, implementing sustainability, staff training, and the greening of jails, prisons, and other correctional institutions. His 2018 book, Wisdom of Dreaming: A Guide to an Effective Dream Life is the basis for training programs in prisons and jails throughout the United States (www.Dreamosophy.com). Paul has written reports on Coal Plants in Transition—Economic and Energy Alternatives; Solar Potential on Black Mesa (Navajo Nation); and the REEL in Alaska Roadmap to energy efficiency in the Railbelt Region around Anchorage, Alaska, as well as scholarly articles on Sustainable Management, and greening prisons and jails. He is the primary author of the National Institute of Justice Greening Corrections Technology Guidebook, as well as the American Correctional Association’s policy and standard on sustainability-oriented and environmentally responsible practices in correctional institutions. Paul serves as Manager of JLMJ, LLC, a small, private real estate development group based in Ashland, Oregon, and as Development Consultant for the Laura X Institute, as Member of the board of directors of Planting Justice, an Oakland-based NGO dedicated to food justice, economic justice, and sustainable local food systems, and as Senior Advisor to www.GreenPrisons.org. He has previously served as a Senior Advisor to Natural Capitalism Solutions, and has worked closely with his older sister, Hunter Lovins, co-teaching "Principles of Sustainable Business Management," at Presidio Graduate School. Paul and Hunter also helped to start the Los Angeles-based TreePeople, and the Boulder-based Rocky Mountain Institute. His other clients have included U.S. EPA, U.S. Department of State, Natural Resources Canada, Alaska Conservation Association, California Energy and Public Utility Commissions, General Motors, Bank of America, Muzak, Suzuki Motors, as well as many prisons, jails, cities companies, and local organizations. Paul holds B.A. and M.A. degrees in Human Development, a lifetime college teaching credential in Business and Industrial Psychology, is a certified business analyst, an Honorary Member of Rocky Mountain Association of Energy Engineers; and a founding member of the Sustainability-Oriented and Environmentally-Responsible Practices Committee of the American Correctional Association. Paul lives with his wife Anne and their friendly dog, Bailey, in Ashland, Oregon, where he is an avid folk dancer, hiker, and follower of the Sant Math yoga tradition.

Rhianna Simes M.S.Ed., grew up on a 100 acre farm in Central Texas where she developed her love of horticulture and farming. Rhianna recently retired from 10 years with Oregon State University Extension Service. She has a Masters of Science in Education and Botany from Southern Oregon University, and is currently the Executive Director of Our Family Farms. Rhianna also serves on the board of the Southern Oregon Seed Growers Association and the Rogue Valley Food System Network. In her spare time, Rhianna works on her own organic, one-acre mini farm called Verdant Phoenix, where she lives with her husband, two young children, dogs, chickens, and beautiful, silty loam soil!

Dr. Brian Smith is a Trustees of ASU Professor in the School of Life Sciences at Arizona State University. He feels fortunate to have been able to turn a lifelong interest in biology into a career. Brian participated in the first Earth Day in April 1970 by helping to clean up discarded trash in local neighborhoods. That experience, and the concerns about the effects of human activity on our environment, instilled in him the importance of making biological studies relevant to issues that impact humans and all life. Since then he has been driven by an excitement in investigating fundamental biological processes from behavioral ecology through recent endeavors in behavioral neuroscience and agricultural research. Much of this work centers around studies of how animals learn. There is always an excitement in watching an animal with a relatively smaller brain do something that seems intelligent. In addition to its relevance for human health, learning behavior has proven to be a sensitive assay for sublethal effects of environmental toxins. On a personal level, he now enjoys watching and helping his grown-up children develop their own lives. He and his wife also love travel, reading, swimming and almost any outdoor activity.

Gerlinde Smith was born in Austria, Europe. Her family embraced anthroposophy, the teachings of Dr. Rudolf Steiner which gave her an early exposure to appreciate nature and an awareness what stewardship of our planet might entail. Growing up with biodynamic gardening principles, she had her own first 16 sq.ft. garden at the age of 3 years. Her formal education took place in Austria, UK and Australia. While working on her Ph.D. in eastern philosophy, Gerlinde partook in an advanced gardening course, in Melbourne Australia, as a lifestyle balance. Later she spent time at the Findhorn Community (in Northern Scotland) a pioneer in partnering with the intelligence of nature, a practice called co-creation. Gerlinde lived with her family for many years in Boulder Colorado before moving to Talent, Oregon. In her community, she has spearheaded the creation of 5 public pollinator gardens and a monarch waystation, her own garden was the first certified pollinator garden in town. Her primary concerns pertain to environmental issues and therefore has been promoting carbon sequestration, trench composting, etc. through proper garden/land stewardship.

Dr. Mike Stadnisky, Ph.D. is CEO of Phitonex, a company changing the way we use light and interact with our consumables in life science. He is the former VP/GM Informatics Becton, Dickinson and Company Life Sciences and CEO of FlowJo, LLC. He led FlowJo in its transformation to become the leading single cell informatics company, including bringing a gene expression analysis platform from idea to scientists in 9 months in partnership with Illumina. During his tenure, FlowJo beat all peers in
the Inc. 500 and joined Becton Dickinson and Company in 2017. As VP/GM, Mike played a lead role in transforming the strategy of the >$1B Biosciences business. Mike is passionate about building small, high performance teams who can focus and execute and currently advises life science technology companies in how to drive market-beating success. He received his Ph.D. in in Microbiology from the University of Virginia.

Alex Tessner Alex will be an incoming senior at the University of Portland as of Fall 2019, she is a mathematics major with a neuroscience minor. She would love to continue her education in mathematics by going to graduate school with the hopes of becoming a professor one day. Alex has been a part of Dr. Goldwyn's research group for the last year now and has really enjoyed learning the thought process behind crafting their own mathematical models to describe biological processes. In her spare time, she is a captain on the Pilots Dance Team and loves watching The Office. :)

Don Tipping has been farming and offering hands on, practical workshops at Seven Seeds Farm since 1997. Seven Seeds is a small, organic family farm in the Siskiyou Mountains of SW Oregon that produces fruits, vegetables, seeds, flowers and herbs, while raising sheep, poultry and people. The farm has been designed to function as a self-contained, life regenerating organism with waste products being recycled and feeding other elements of the system. Lauded as one of the best examples of a small productive Biodynamic and Permaculture farms in the northwest by many, Seven Seeds helps to mentor new farmers through internships and workshops. In 2009 we began Siskiyou Seeds, a bioregional organic seed company that grows and stewards a collection of over 700 open pollinated flower, vegetable and herb seeds and is constantly breeding new varieties that we distribute nationally. Don is active in the Seed Stewardship movement and educates regionally on seed saving through the Seed Academy, the Student Organic Seed Symposium, Seed Schools and numerous conferences. He sits on the board of the Rocky Mountain Seed Alliance and contributes to the Open Source Seed Initiative.

Joseph Vaile is the Executive Director at the conservation group KS Wild, stewarding conservation policy and advocacy programs throughout southwest Oregon and northwest California. For over 20 years, he has helped secure protection for threatened roadless areas, old-growth forests, and wild rivers by overseeing KS Wild protection campaigns for special places and wild rivers in the Klamath-Siskiyou Region. In this role he has serves on over a dozen boards and project teams, including the board of directors of local restoration non-profits, the Ashland Forest Lands Commission, the Southwest Oregon Resource Advisory Council, and technical team for the Ashland Forest Lands Resiliency Project. Joseph's job is made easy by the incomparable beauty and diversity of nature in the region where KS Wild does its work. He loves camping, getting out in nature with his family,

Deb Van Poolen has been a painter for 25 years, exhibiting her work in Washington D.C., Oregon, Montana, Michigan and occupied Palestine. When Van Poolen began painting in 1995, veteran artist Harriet Rex Smith gave Deb a table to use for five months in her large mountain studio of Southern Oregon. Harriet’s mentoring of Deb jump started her early art career of creating and marketing landscape, floral and portrait paintings. Deb’s most recent works have integrated science and art with the aim to help people grasp the global significance of the biodiversity present in this northwest region where the Cascade, Siskiyou and Klamath mountains converge. She makes large paintings illustrating profound diversity in species.

Jamie Vernon is executive director and CEO at Sigma Xi, The Scientific Research Honor Society and publisher of American Scientist. From 2014 to 2017, he served as Sigma Xi's director of science communications and publications and editor-in-chief of American Scientist. He was also Sigma Xi's co-director of operations from 2014 to 2015. A molecular biologist by training, he transitioned away from research in 2011 to serve as an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow and an Oak Ridge Institute for Science and Education (ORISE) Fellow at the U.S. Department of Energy. In 2012, he was appointed co-chair of digital media for the interagency climate education and communications working group within the U.S. Global Change Research Program. He holds a B.S. in zoology from North Carolina State University, M.S. in biotechnology from East Carolina University, and Ph.D. in cell and molecular biology from The University of Texas at Austin.

DOLLY (JOSEPHINE ) WARDEN. I was born in Ohio 82 years ago. As a child, I worked in my father’s garden and helped him in the apiary. I received my library science master’s degree and librarialed for a while in Oklahoma. I also received my master of divinity of degree and volunteered as a minister in both Florida and Oregon. But most of my work life was focused on immigrants, refugees, and asylum seekers. I received my legal assistant degree from Oklahoma City University and became an accredited representative certified by the Board of Immigration Appeals. I helped battered immigrant women, abandoned immigrant children, trafficking survivors, and torture survivors. I helped establish a center for torture survivors in Dallas, Texas and started an organization for trafficking survivors. I retired twice, the last time moving to Southern Oregon where I studied permaculture, biodynamic agriculture (Steiner), and beekeeping. I took up beekeeping and last month my honey won the first prize for the best honey at the Oregon Honey Festival. In 2014, upon my urging, my little city of 6,000 people, Talent,
Oregon, became the second Bee City USA in the nation. I continue to work on behalf of pollinators with like-minded people. We now have certified 32 public and private pollinator gardens in Talent. We have also adopted an Integrated Pest Management Policy to limit use of nonorganic pesticides.

Lindsay Yazzolino is an audio/tactile design consultant with diverse professional experiences which range from brains to trains. She leverages her professional background in cognitive neuroscience research as well as personal experience as a totally blind scientist to create multisensory interfaces which incorporate touch and sound in addition to vision.