PROCEEDINGS

OF THE

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PROCEEDINGS OF THE OREGON ACADEMY OF SCIENCE

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THE OREGON ACADEMY OF SCIENCE

Keynote Address

Climate, Grapes and Wine: Sustainability in a Variable and Changing Climate

Gregory Jones
Linfield College
Director, Evenstad Center for Wine Education

We are pleased to announce our plenary speaker is Greg Jones, Director of the Evenstad Center for Wine Education at Linfield College.

Greg is a scholar of climate structure as it relates to viticulture and conducts applied research for the grape and wine industry in Oregon as a Professor at Linfield College. Greg has led investigations related to wine cultivation in locations including France, Portugal and the Pacific Northwest. His contributions to the wine industry have been recognized locally and internationally—Greg was named the Oregon Wine Press's 2009 Wine Person of the Year, he was named to Decanter Magazine's 2009 Power List representing the 50 most influential persons in the world of wine, he was a contributing author to the 2008 Nobel Peace Prize-winning Intergovernmental Panel on Climate Change Report, and he has been bestowed with the Honorary Confrade with the Rank of Infanção (Nobleman) from the Confraria do Vinho do Porto for his work with the Portuguese wine industry.

OREGON ACADEMY OF SCIENCE LIFETIME ACHIEVEMENT AWARD

The Oregon Academy of Science is pleased to announce the introduction of a new annual award, beginning this year in 2019. The OAS Lifetime Achievement Award is designed to recognize a retired or Emeritus Oregon Scientist who has made significant transformative contributions to a field of science while performing work at an Oregon university, state agency, or company.

2019 Oregon Academy of Science Lifetime Achievement Award

Charles Kimmel

The Oregon Academy of Science is very happy to award the inaugural OAS Lifetime Achievement Award to Dr. Kimmel due to his outstanding career at the University of Oregon and his key role in the establishment of the zebrafish as a model organism. Following the tragic death of George Streisinger in 1984, the future of the zebrafish as a model organism for the study of vertebrate development and behavior faced uncertainty. Charles' research led to the worldwide adoption of the zebrafish in hundreds of labs as a vertebrate model organism. Charles mentored PhD students who have established independent careers at Princeton, Johns Hopkins, USC, UC Berkeley, UC Davis, and Stanford, among others. Several prestigious organizations have already recognized Charles: he is a fellow of the American Association for the Advancement of Science, a member of the American Academy of Arts and Sciences, and an honorary member of the Japanese Biochemical Society. Charles has published his work in world-class journals including Science, Nature, PNAS, and Cell. On the basis of his outstanding career as a researcher, mentor, and educator, Charles was selected to receive this lifetime achievement award from the OAS.

Awardees

2019 Charles Kimmel

OUTSTANDING OREGON SCIENTIST AWARD

The Oregon Academy of Science's Outstanding Oregon Scientist Award is bestowed in recognition of significant research contributions to the natural, physical, or social sciences, notable reputation in science education, and meaningful applications of science research. Recipients of this award must have been Oregon residents during the time they made the distinguished contributions for which they are recognized.

2019 Outstanding Oregon Scientist Award

Louis Kuo

Louis Kuo is a Professor of Chemistry at Lewis & Clark College and has worked there since 1991. Louis has established research programs in both the field of organometallic chemistry and of bioorganic chemistry. In the field of environmental toxin remediation, Louis's group primarily studies the application of transition metal complexes in the treatment of phosphorus- and sulfur-containing toxins in contaminated water. Louis's mechanistic work on the hydrolysis of organophosphates with metallocenes has been called foundational to the field by other preeminent researchers in that area. His research group also investigates the relationship between metal ions and RNA enzymes. Louis has received steady funding from the National Science Foundation, the Petroleum Research Fund of the ACS, the Research Corporation and the Medical Research Foundation of Oregon. His independent career has produced two patents and 20 papers featuring undergraduate co-authors. Louis is known as an outstanding mentor to undergraduates at Lewis & Clark both in the classroom and the research lab.

Awardees
2019 Louis Kuo
2018 Niles E. Lehman
2017 Marshall Gannett
2016 Mas Subramanian
2015 Vincent T. Remcho
2014 Scott F. Burns
2013 Eric U. Selker
2012 Janis Weeks
2011 Phil Mote
2010 Kent Thornburg
2009 Reinhold Rassmussen
2008 Andrew Fountain
2007 Richard Ellis
2006 David C. Johnson, James D. White
2005 Ewart M. Baldwin
2004 D. Aslam Khalil
2003 Joseph D. Matarazzo
2002 Carl Wamser
2001 Geraldine L. Richmond

2000 Kent L. Thornburg
1999 LeRoy Klemm
1998 Gertrude Rempfer
1997 William G. Loy
1996 A. Morrie Craig
1995 Michael Posner, Paul Slovik
1994 Jane Lubchenco
1993 Lynwood W. Swanson
1992 Beatrice Epperson
1991 Jack Ward Thomas
1990 C. Melvin Aikens
1988 Lewis Schaad
1987 Linus Pauling
1986 Paul Lutus
1984 Arthur J. Boucot
1983 Carl E. Bond
1982 Howard Vollum
1981 Ernst Dornfield
1980 Ken Van Holde
1979 G. Bodvarsson
1978 W. Taubeneck
1977 Robert Coleman
1976 Harold Enlows, Paul Elliker, Paul Weswig
1975 John Allen, Ralph Badgley, Ewart Baldwin, Winthrop Dolan, William Rockie, Howel Williams
1974 Larae Dennis, Joel Hedgpeth, Thomas P. Thayer, Norman S. Wagner, Aaron C. Waters
1973 George Birrel, Harold J. Evans, Anton Postl, Lloyd W. Staples
1972 Samuel N. Dicken, Helen M. Gilkey, R. Sinnhuber
1971 Andrew Moursund, Loren McKinley, Homer G. Barnett, Stephen Shelton
1970 James J. Brady, Bert Christensen, E. Ebbinghausen, Ralph W. Macy, Cecil R. Monk, Leo F. Simon
1969 Ira S Allison, Frank M. Beer, A.A. Groening, James A. McNab
1963 E. A. Gililan
1962 Joe Chamberlain, F. Gilchrist, Earl Gilbert, Arthur F. Scott, Edward S. West
1959 Walter Dyke, Henry P. Hansen, Alex Walker
1958 Phil F. Brogan, Vernon Cheldelin, Samuel L. Diack
1957 Luther S. Cressman, Leo Isaac, Adolph Kunz, E.E. Osgood
1956 Edwin T. Hodge, Ralph R. Huestis, E.J. Krause, J.P. Mehlig, Harry B. Yocum
1955 W.J. Kroll, F.W. Libbey, W.E. Milne
1954 Leo Friedman, Alonso W. Hancock, Willibald Weniger
1953 W.P. Boynton, Olaf Larsell, Rosalind Wulzen
1952 Helen M. Gilkey, L.E. Griffin, Ethel I. Sanborn
1951 Stanley W. Jewett, Morton E. Peck, J. Hugh Pruett
1950 A.A. Knowlton, Thornton Munger, Warren D. Smith
1949 F.L. Griffin, A.R. Moore, Earl L. Packard

OUTSTANDING EDUCATOR AWARDS

The Oregon Academy of Science's Outstanding Educator Awards are for Oregon educators with demonstrated records of excellence in teaching in any of the subject areas represented by the Academy. Recipients of the award must have been Oregon residents during the time they made the distinguished contributions for which they are recognized. Past recipients of the Outstanding Educator Award are listed below.

2019 Outstanding Educator Awards – Higher Education

Todd Duncan

Todd Duncan is a Visiting Professor of Physics at Pacific University, an Adjunct Physics Instructor at Portland Community College, and the Founding Director of the Science Integration Institute. Todd is being recognized for his creativity in physics education, providing insights into the connections between physics and everyday life to university students and members of the public. Todd is a vibrant, enthusiastic colleague to his peers at Pacific University and has led efforts to integrate physics into the Music and Theater departments there, most recently in the form of a highly reviewed and attended "Cosmic Concert" and by providing scientific expertise and star-viewing opportunities during the 2018 production of "Silent Sky" written by Lauren Gunderson. Outside Pacific University, Todd reaches out to the general public by discussing the benefits of a scientific "cosmic perspective" by presenting TEDx talks, hosting star parties, and primarily reaching the public via his nonprofit, the Science Integration Institute.

Stephanie Salomone

Stephanie Salomone is an Associate Professor of Mathematics and the Director of the STEM Education and Outreach Center at the University of Portland and has worked there since 2005. Stephanie is being recognized for her innovation in classroom mathematics education at the university and K-12 levels and for her leadership in community STEM outreach and training to colleagues and K-12 teachers. Stephanie is a driven classroom educator who has consistently modified her teaching style to feature inquiry-driven instruction, and her leadership in this area has extended to the classrooms of many colleagues, providing measurable successes in student learning outcomes. Outside University of Portland, Stephanie has engaged in outreach via the Noyce Program, training STEM teachers who serve students in high-need areas. This work serves as a key element of providing access to STEM education to students who otherwise would drop out of STEM pathways.

Awardees

2019 Todd Duncan & Stephanie Salomone
2018 Jacquie Van Hoomissen
2017 Richard L. Nafshun
2016 Corinne Manogue & Tevian Dray
2015 David Foster
2014 Angela Hoffman

2013 Robert T Butler
2011 Lauren Roscoe, Jim Hartman
2010 Charles (Kip) Ault, Jean Ames
2009 Charles Kunert
2008 April Ann Fong
2007 Tamina Toray
2003 Kenneth M. Doxsee

2018 Outstanding Educator Awards – K-12

Sarah Hocken

Sarah Hocken teaches Science at South Eugene High School in Eugene, Oregon. Sarah is being recognized for her excellence in teaching, primarily Chemistry and AP Chemistry courses. High school students from Sarah's classes gain an excitement and proclivity for solving problems in chemistry that makes them easy to spot in introductory college-level chemistry classes and labs due to their dedication and success. Sarah's own passion for understanding chemistry is passed on in her classroom to her students due to her dedication to providing a student-centric classroom environment. Students from all backgrounds are openly welcomed to learn chemistry in Sarah's classroom, and she strives to provide equity in her educational approach. She is known by former students, parents of former students, and colleagues in higher education as an exemplary K-12 educator in the sciences.

Kathleen Thomas

Kathleen Thomas teaches Science at North Medford High School in Medford, Oregon, and formerly taught at South Medford High School. Kathleen is being recognized for her excellence in teaching Chemistry and Biology (and honors versions of each class) at South Medford High School and primarily AP Chemistry, Honors Chemistry, and Chemistry I at North Medford High School. Kathleen is known for her strong emphasis on using data-driven reasoning to approach questions both in chemistry and in daily life. Kathleen is highly active in regional pedagogy conferences including the Teaching Argument Writing Collaborative, the Southern Oregon NGSS Working Group and has brought information back to her institution and used it to improve teaching practices. She is the coach for the Brain Bowl, Science Bowl, and Academic Challenge teams and uses her leadership in these activities to enrich the education of her students outside the classroom.

Awardees

2019 Sarah Hocken & Kathleen Thomas
2018 Cara Benfield, Adam Kirsch, Shari Read
2017 W. Jason Niedermeyer
2016 Bradford Hill
2015 Stuart Perlmeter
2014 Kerry Morton
2013 Kathryn McDermott
2011 Lauren Roscoe, Jim Hartman
2010 Jean Eames
2009 Michael Geisen
2008 Terry Tucker

2007 Daniel Jamsa
2006 Peter Langley
2003 Ralph Schubothe
2002 David Damcke
2001 Patty Toccalino, Kathleen Wick, & Samual L. Diack
2000 Becky A. Houck & Richard Dunca
1999 Dwight Kimberly & Bill Lamb
1998 Rose Hemphill, Joel Kuyper & Diane Neslon
1997 Mary Omberg & Terry Favero
1996 Edith Anderson & Pamela Lopez
1995 Ford Morishita
1994 Roy Chambers, Andrea Hylsop, Elizabeth Nirschel, & Jan Heaton
1993 Stephen Boyarsky
1992 Bea Epperson

OREGON ACADEMY OF SCIENCE

BIOLOGY

Section Chairs:

Andrew W. Baggett
Linfield College

Sreerupa Ray
Linfield College

ORAL PRESENTATIONS

Use of evaporation and post-hovering behavior to dissipate accumulated heat in hummingbirds during hovering

Natalie F. Amodei[1], Bret W. Tobalske[2], and Donald R. Powers[1] / [1]Department of Biology. George Fox University, Newberg, OR 97132, [2]Division of Biological Science. University of Montana, Missoula, MT 59812

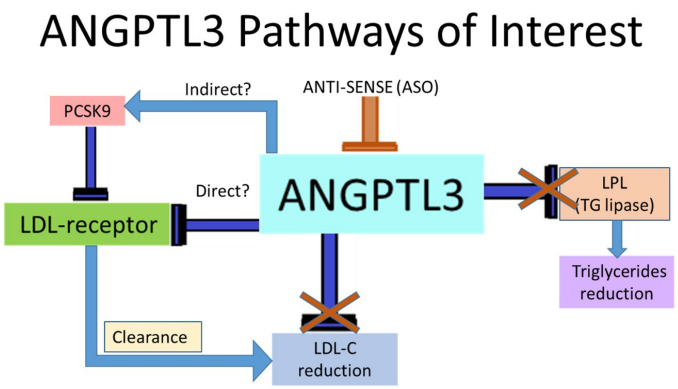
Hummingbirds generate a large amount of heat during flight due to the low mechanical efficiency of their flight muscles and they must dissipate that heat to avoid overheating. Heat can be dissipated passively (convection, conduction, and radiation) and by evaporation (respiratory and cutaneous). When environmental temperatures are high, passive heat dissipation is eliminated, leaving evaporation as the only option for thermoregulation. In hummingbirds, respiratory evaporation accounts for less than 40% of metabolic heat production, requiring the balance of metabolic heat production to be dissipated by cutaneous evaporation. Aerodynamically positioned feathers restrict passive heat dissipation during flight, but it is unknown if cutaneous evaporation will be affected as well. We studied evaporative heat dissipation at temperatures near the limits for passive heat dissipation in hovering calliope (*Selasphorus calliope*), Rivoli's (*Eugenes fulgens*), and black-chinned (*Archilocus alexandri*) hummingbirds using open-flow respirometry and video recordings. Cutaneous evaporation was estimated as total evaporation minus respiratory evaporation. Our measurements in calliope hummingbirds suggest that they are unable to sufficiently upregulate cutaneous evaporative water loss to compensate for the extra heat produced during hovering. Observations of all species studied suggest that post-hovering behaviors might be important for rapidly dumping heat following a hovering bout in warm conditions.

ANGPTL3 affects serum lipid through LDL-receptor dependent and independent pathways

Emma Arndt [1,2], and Hagai Tavori [2] / [1]Division of Natural Sciences and Health, Warner Pacific University, Portland OR 97215, [2] Knight Cardiovascular Institute, Center for Preventive Cardiology, Oregon Health & Science University, Portland OR 97239

Familial combined hypolipdemia type 2 (FHBL2) is caused by a loss of function (LOF) mutation in the *ANGPTL3* gene resulting in low levels of all serum lipids and reduced risk of cardiovascular disease. Low-density lipoprotein (LDL) receptor (LDLr) is the major internalizing receptor for both cholesterol and triglyceride rich lipoproteins. ANGPTL3 effect on serum triglyceride levels is mediated through its role as a lipoprotein lipase inhibitor. The mechanism by which ANGPTL3 affect serum cholesterol is not fully understood. We aim to study whether reduction of serum triglycerides and cholesterol through ANGPTL3 inhibition is affected by the presence of LDLr.
Wild type (Wt) or *Ldlr*$^{-/-}$ mice were injected with ANGPTL3 or sham antisense (ASO) once per week over a six-week period. Serum was collected at baseline and one week after each injection. ANGPTL3-ASO significantly reduced ANGPTL3 serum levels after a single injection in both Wt and *Ldlr*$^{-/-}$ mice. Maximal reduction in triglyceride and cholesterol in both groups was obtained after 3 weeks of ANGPTL3-ASO injection. By the third week, triglyceride levels demonstrated a significant (-72.6%, $p<0.001$) reduction in Wt mice, and a more moderate (-42.6%, $p<0.001$) reduction in *Ldlr*$^{-/-}$ mice. Following ANGPTL3 injection, triglyceride reduction in Wt mice was significantly greater compare to that of *Ldlr*$^{-/-}$ mice ($p<0.01$). By the third week cholesterol levels also demonstrated a significant (-20.6%, $p<0.01$) reduction in Wt mice, and a more moderate reduction (-10.2%, $p<0.05$) in *Ldlr*$^{-/-}$. Following ANGPTL3 injection, cholesterol reduction in

Wt mice was significantly greater compare to that of *Ldlr*$^{-/-}$ mice ($p<0.05$). Studies are ongoing to determine the effect of ANGPTL3 on PCSK9, a key modulator of LDLr levels.
Our interim conclusion supports a scenario where LDLr is not necessary for the effect of ANGPTL3 inhibition on serum triglycerides and cholesterol, however the presence of LDLr amplifies these effects. Our ongoing studies will help determine whether changes in PCSK9 action serves as a mechanism to explain the role of LDLr in the inhibition of ANGPTL3.



Mapping AAV2 conformational epitopes of polyclonal human antibodies to make stealth AAV vectors.

Helen Rappe Baggett[1], Xiao Lan Chang[1], Kei Adachi[1], and Hiroyuki Nakai[1,2] / [1]Department of Medical and Molecular Genetics, [2]Department of Molecular Microbiology and Immunology, Oregon Health and Sciences University, Portland, OR, 97239

Adeno-associated virus (AAV) is a proven gene therapy vector; however, many obstacles to therapy optimization still remain. Overcoming the host immune response to AAV is one such challenge. Rational design of an antibody-evading "stealth" vector can be accomplished by mutation of specific epitope regions on the AAV capsid. Here, we demonstrate proof of principle of two techniques used to map conformation epitopes of AAV serotype 2 for polyclonal human neutralizing antibodies (NAbs), IP-Seq (Immunoprecipitation-Sequencing) and PK-Seq (Pharmacokinetic-Sequencing). We made peptide scanning libraries of AAV2 peptides replacements on an AAV9 capsid platform, and immunoprecipitated these libraries with individual human sera. We used Next-Generation Sequencing (NGS) analysis to determine which peptide mutants were pulled down, indicating the presence of a conformational epitope within the peptide replacement. The PK-Seq technique was used to determine whether the epitopes mapped from IP-Seq experiments were those of NAbs. Human serum was incubated with the AAV capsid peptide scanning library, then the mixture was injected into mice. Blood clearance of the AAV library over time was used as a measure of NAb activity. Finally, we made a library of AAV2 capsids containing randomized versions of three common epitopes. We then did directed evolution in HEK293 cells to determine which of these mutants could best evade pooled human immunoglobulins (IVIG). One mutant displayed an IVIG-escaping ability between 3- and 10-fold higher than AAV2, demonstrating the successful application of IP-Seq epitope mapping for making stealth vectors. These techniques provide an easy and effective way to map AAV epitopes.

Differential effect of various sugars on the development of non-alcoholic fatty liver disease in obese mice

Brogan Boen, James Donnell, Levi Miles, and Dallyce Vetter. Advisor: Dr. Sarah Comstock / Department of Math and Science, Corban University, Salem, OR 97317

Obesity is a significant risk factor for the development of nonalcoholic fatty liver disease (NAFLD). Additionally, increased liver adiposity is often linked to high sugar consumption. This study examined the correlation between the consumption of various sugars and the development of NAFLD. Female C57Bl/6 mice were given *ad libitum* access to 30% sucrose (SUC), glucose (GLC), or fructose (FRT) solutions in place of water (CTR) for 27 weeks. At the termination of the study liver triglyceride levels were significantly elevated in all groups in comparison to (CTR) groups. Oil Red O staining confirmed these results, showing observable lipid droplet accumulation in the livers of all experimental groups. This lipid accumulation was most pronounced in SUC and GLC groups while the FRT mice showed a more limited increase. Two-

step RT-qPCR on liver tissue indicated changes in the regulation of genes in glycolysis, fructolysis, and fatty acid synthesis pathways. Interestingly, while SUC mice show upregulation in all three pathways and GLC mice showed upregulation in glycolysis and fructolysis, FRT mice showed no upregulation in any of these pathways. These results indicate unique effects of high sugar diets on mouse physiology and gene expression.

The role of MARCKS gene as a targeted treatment of Acute Myeloid Leukemia

Anupriya Agarwal[1], Mona Mohammadhosseni[1], and Gabrielle Dewson[1,2] / [1]Knight Cancer Research Institution, Oregon Health and Science University, Portland, OR 97239, [1]Willamette University, Salem, OR 97301

Typical treatment of Acute Myeloid Leukemia is cytotoxic chemotherapy, and while this is usually effective, greater than one-third of patients end up having a treatment resistant mutation. With the advancement of genome sequencing researchers have been able to identify and create targeted therapies to halt AML's progression. In order to determine these therapies, in-depth research must be conducted surrounding the mechanism of the growth patterns. Myristoylated alanine-rich C-kinase Substrate (MARCKS) controls processes like cytoskeletal control, mediation of the inflammatory response, secretion and exocytosis, chemotaxis and motility, neurological function and development. Recently, the MARCKS gene has been found to have a major role in the development and progression of many tumor cells. Due to its connection to cancer growth it is a prime focus for targeted therapies. To determine the outcome from these experiments we will be using both AML primary samples, cell lines, and murine models. This study used cell lines to determine the role of MARCKS in AML; it also used a series of assays to determine viability of mutations and western blot techniques. Also, to determine MARCKS role in AML a knockdown murine model was used. Overall, the study looked to discover a mechanism for MARCKS role in AML.

Examining the effect of maternal obesity on vitamin D metabolism in the placenta.

Nora Hendricks[1], Matthew Bucher[2], and Alina Maloyan[1], PhD, FAHA / Knight Cardiovascular Institute, [2]Department of OB/GYN. Oregon Health and Science University, Portland, OR 97239

Obesity is becoming an increasing health problem in the United States, and over 65% of women entering pregnancy in the United States are either overweight or obese. Previous studies have shown that obese people have less circulating vitamin D than lean people, which can lead to poor calcium absorption, increased inflammation, and less protection against bacterial diseases. This study focused on determining if obese mothers pass less vitamin D through their placenta to their offspring than lean mothers do and whether vitamin D receptor expression can be restored in cytotrophoblasts by the treatment of cells with both the active and inactive forms of vitamin D. Western blots were run on homogenates of placental tissue collected from lean and obese women to measure the protein expression of vitamin D. Placentas of both males and females from lean mothers were seen to have higher levels of vitamin D receptors than placentas of obese mothers. Cytotrophoblasts were isolated and cultured from placental samples and were treated with serial dilutions of active and inactive forms of vitamin D. Cytotrophoblasts treated with increasing amounts of the active form of vitamin D had increasing levels of vitamin D receptors in a dose-dependent manner. No trend was observed for cells treated with the inactive form of vitamin D. These results show that maternal obesity likely affects how much vitamin D is passed through the placenta and that vitamin D receptor expression can likely be restored in cells by treatment with the active form of vitamin D.

Lens proteostasis and cataract development in a sugar induced obese mouse model

Trevor Peterson, Kateleen Vetter, and Samuel Wheeler. Advisor: Dr. Sarah Comstock / Department of Math and Science, Corban University, Salem, OR 97317

Obesity is a significant risk factor for cataract development; however, few studies investigate its mechanism. The purpose of this research is to discover connections betwen obesity and protein modifications in the lens that result in cataract development. A mouse model of sugar induced obesity (SIO) via sucrose, glucose, and fructose consumption was used. We hypothesized that SIO causes lens protein modifications that increases susceptibility to cataract formation in mice. Crystallin proteins, which make up 90% of the dry mass of the lens, are susceptible to various modifications which cause protein insolubility, resulting in cataracts. Tandem mass tag mass spectrometry (TMT-MS/MS) revealed that deamidations affecting Asparagine (Asn) and Glutamine (Gln) were significantly increased in the sucrose mice at eight months of age. We also demonstrated an upregulation of chaperone proteins in the sucrose lenses. While the mice did not have visible cataracts at the termination of this study, there was a trend toward increased lens opacity resulting from sucrose consumption. Furthermore, deamidations indicate an increase in misfolded proteins which likely led to the increased

chaperone activity. This suggests that proteostatic mechanisms may be upregulated to repair the damage caused by sucrose consumption. Ongoing studies have focused on the role of the various sugars in mice that are older (16 months at termination), to determine whether sugar consumption will accelerate opacity and lens protein modifications. Additionally, an in vitro model, sugar incubation of lenses, has been developed to investigate molecular changes occurring in response to sugar.

Identifying mutations within the ROS1 kinase domain that confer resistance to tyrosine kinase inhibitors

Clare Keddy[1], Monika Davare[2], and Sudarshan Iyer[2] / [1]Department of Biochemistry and Molecular Biology, Lewis & Clark College, Portland, OR 97219; [1,2] Department of Pediatrics, Oregon Health & Science University, Portland, OR 97239

Chromosomal translocations can cause the end-to-end joining of coding segments resulting in fusion proteins. These fusions have been shown to promote tumorigenesis by inactivating tumor suppressors or operating as hyper-active oncogenic drivers. ROS1 is a human receptor tyrosine kinase that has been identified in fusion proteins found in many human cancers, including glioblastoma, lung adenocarcinoma, and non-small cell lung cancer. While targeted tyrosine kinase inhibitors are available, patients often develop mutations within the kinase domain of ROS1 that confer resistance to one or more of the available inhibitors. Resistance to these targeted therapies can force patients to seek other, often more invasive, treatment options. In order to combat resistance to available inhibitors, we are working to identify mutations within the kinase domain of ROS1 that confer resistance to a panel of tyrosine kinase inhibitors. Using Ba/F3 cells expressing CD74-ROS1, we performed a mutagenesis assay and used available inhibitors to select for resistant clones. The ROS1 kinase domain of each clone was sequenced in order to identify potentially resistant mutations. Mutations found within the kinase domain will be re-engineered into stable cell lines in order to perform functional validation that the mutation is the causative mechanism of resistance to the inhibitor and to examine potential effects of the mutation on the activity of ROS1. By pre-emptively identifying these mutations, we will be able to contribute to the profile of ROS1 activity as well as help to aim further drug development.

CD47 blockade enhances macrophage efferocytosis via a process requiring low-density lipoprotein receptor-related protein 1

Richard Maldonado[1], Paul Mueller[2], and Sergio Fazio[2] / [1]Department of Math and Science, Concordia University, Portland, OR. [2]Center for Preventive Cardiology, Knight Cardiovascular Institute, Oregon Health & Science University, Portland, OR

Vulnerable atherosclerotic plaques are characterized by large necrotic cores caused by impaired clearance of apoptotic cells (efferocytosis) in the artery wall. Targeted antibody blockade of CD47, an anti-efferocytosis protein, enhances efferocytosis and reduces plaque area in mouse models of atherosclerosis. LDL receptor-related protein-1 (LRP1) is a pro-efferocytosis receptor whose deletion from macrophages accelerates atherogenesis. We have recently found that CD47 blocking antibodies require macrophage LRP1 to limit atherosclerosis and thus we hypothesize that the enhanced efferocytosis caused by CD47 blocking antibody also requires macrophage LRP1. We conducted *in vitro* studies using wildtype (WT) and $LRP1^{-/-}$ macrophages as efferocytes and either Jurkat cells (T lymphocyte strain) or WT and $LRP1^{-/-}$ murine macrophages as apoptotic cell substrates (ACs). To stimulate efferocytosis, violet fluorescent-labeled apoptotic cells were co-incubated with green fluorescent-labeled efferocytes for 2 hours in the presence of anti-CD47 antibody (10μg/mL) or IgG control. Phagocytic index (PI) is determined using confocal microscopy and flow cytometry as the percent of efferocytes with internalized ACs. In experiments using Jurkat cells as ACs, anti-CD47 antibody increased PI 2.4-fold and 2.0-fold in WT and $LRP1^{-/-}$ efferocytes, respectively, compared to IgG control ($P<0.01$). No differences in PI were observed between WT and $LRP1^{-/-}$ efferocytes treated with anti-CD47 or IgG control. In experiments using WT and $LRP1^{-/-}$ macrophages as ACs, we observed no differences in PI between WT and $LRP1^{-/-}$ efferocytes. Interestingly, the use of $LRP1^{-/-}$ macrophages as ACs reduced the PI of WT efferocytes by 44.7% relative to WT macrophage ACs ($P<0.05$) and independently of anti-CD47 antibody. These data suggest that the loss of LRP1 on ACs, not on the efferocyte, impairs efferocytosis independently of anti-CD47 antibody by rendering the dying cells a poor substrate for clearance.

Characterization of *Mre11* gene variants in cancer

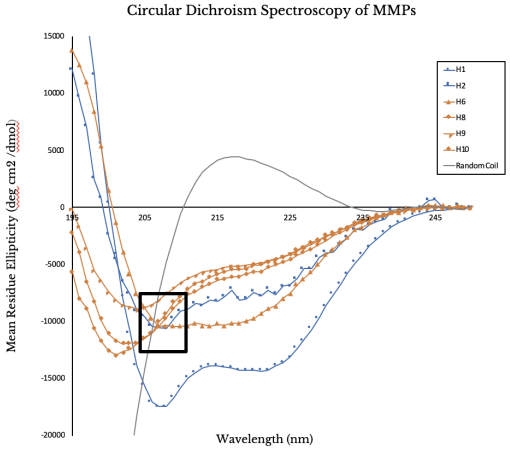
Sydney Kuehn, Cristina Ortiz Mateos, Ashley Headrick, Itzel Romero, and Sreerupa Ray / Biology Department, Linfield College, McMinnville, OR 97128

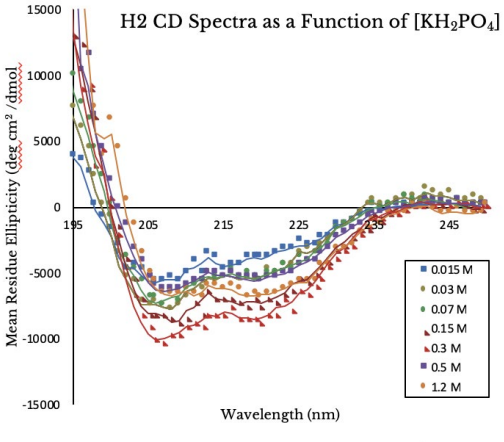
Among the different damages that a cell can undergo, DNA double-strand break (DSB) is the most detrimental one. DNA contains all the necessary information for a cell's proper functioning and replication, therefore a break that damages both of its strands completely destabilizes the DNA molecules. If not properly repaired this could lead to genomic instability and tumorigenesis. Cells repair DSBs by two repair pathways- homology-directed repair (HDR) and non-homologous end-joining (NHEJ). Recently a back-up NHEJ pathway has been reported and is referred to as alternate-NHEJ (Alt-NHEJ). Although Alt-NHEJ is advantageous for damaged cells, it can mutate the DNA sequences at the junctions, which may lead to an altered genome that can have severe biological consequences. Mre11 is an essential component of the MRN complex and plays a key role in DSB repair pathways as HDR, NHEJ and Alt-NHEJ. Mre11 possesses single-strand endonuclease activity and double-strand-specific 3'-5' exonuclease activity which are essential for DNA end-processing. Recently Mre11 is shown to be overexpressed in breast cancer and high Mre11 expression was associated with a more malignant behavior in breast cancer. Furthermore, germline mutations of the Mre11 gene was identified in a recent screening of hereditary susceptibility to breast and/or ovarian cancer. Mutations in DNA repair genes can have a significant impact on cancer prognosis and treatment. We are focusing to determine whether germline and somatic mutations of Mre11 can lead to tumorigenesis and alter responses to chemotherapies.

Protein fold switch in high-identity sequence space?

Andrew Muñoz[1,3], James O. Wrabl[1], Keila Sheetz[1], Miranda Russo[1,2], and Vincent J. Hilser [1,2] / [1]Department of Biology and [2] T.C. Jenkins Department of Biophysics, The Johns Hopkins University, Baltimore, MD, 21218 USA [3] Present Address: Department of Biology and Chemistry, George Fox University, Newberg, OR, 97132 USA

We are interested in the functionality and characteristics of metamorphic proteins, single amino acid sequences that can adopt more than one folded structure. Towards this goal, two distinct Streptococcus Protein G domains have been engineered to contain a 95% residue similarity but fold differently into either a-helix or ß-sheet structures: these proteins were named GA95 and GB95 respectively. We predict that a single amino acid point mutation within GA95 or GB95 could result in an alteration of its secondary structure and give us insight to its metamorphic properties. Glycine was chosen to be the specific point mutation for our experimental proteins due to its large conformational entropy and its potential to deliver a large free energy change. Proteins were expressed through auto-induced minimal media and purified through cobalt affinity columns where his-tag binding occurred. Analysis of four such mutants, as well as the two parent proteins, were conducted using CD spectroscopy. Our results show an isodichroic point at 207 nm (Figure 1) between four of the mutations, the ß-sheet parent protein, and random coil. This suggests that all four mutants are in equilibrium between ß-sheet and random coil. Curiously, one mutant within the ß-sheet equilibrium originated from the GA95 parent protein, implying that it underwent a conformational transition from alpha to beta. To test this hypothesis, we changed the ionic strength of the GA95 mutant (Figure 2) and observed a direct relationship between alpha percentage and salt concentration, consistent with the mutant removing favorable charge- charge interactions that originally stabilized the alpha fold. NMR testing is underway to confirm these findings.





Beta-amyloid species in Alzheimer's disease and Lewy body dementia.

Emily Muth, Vy Nguyen, Naly Satthavongsack, Daphne Garcia, Victoria Krajbich, and Randall Woltjer / Department of Pathology, OHSU, Portland, OR 97239

Alzheimer's disease (AD) and Lewy body disease (LBD) are age-related neurodegenerative diseases that share similar pathologic features. Lewy body disease often emerges in younger subjects and coexists with earlier pathologic stages of AD. The association of AD and LBD is found in 20-30% of patients with AD and is surely not due to chance, but rather reflects shared pathogenetic features of these diseases. We hypothesize that the abnormal metabolism of different forms of beta-amyloid protein leads to the accumulation of intercellular and extracellular deposits, which are pathologic features of both AD and LBD. Specifically, the 42-amino acid form of beta-amyloid (Aβ42) which forms neuritic plaques and promotes the accumulation of tau protein, which leads to the build up of neurofibrillary tangles in AD. The abnormal metabolism of the 40-amino acid form of beta-amyloid protein (Aβ40) is thought to lead to the formation of diffuse plaques and the accumulation of alpha synuclein protein which leads to the Lewy bodies, a characteristic of LBD. We will use cases of AD and LBD autopsy tissues from the Oregon Brain Bank to develop slides using immunohistochemistry. Quantitative analysis using a photography image-based technique will allow for the assessment of Aβ42, Aβ40, tau, and alpha-synuclein proteins.

Regulation of hERG isoform expression by PABPN1 and PABPC1

Andrea Reichle[1], Qiuming Gong[2], Zhengfeng Zhou[2] and Matthew Stump[1] / [1]Department of Biology and Chemistry, George Fox University, Newberg, OR, 97132, [2]Knight Cardiovascular Institute, Oregon Health & Science University, Portland, OR, 97239

The *human ether-à-go-go-related gene 1* (*hERG1*) encodes the hERG K^+ channel, which is responsible for the rapidly activating delayed rectifier current (I_{Kr}) in the heart. Mutations in *hERG1* cause long QT syndrome, a cardiac disorder characterized by an increased risk of severe ventricular arrhythmias and can cause sudden death. The alternative processing of *hERG1* results in the expression of two C-terminal isoforms, hERG1 and hERG1-USO. hERG1 is expressed following polyadenylation at a poly(A) site in exon 15 and hERG1-USO is expressed following polyadenylation at a poly(A) site within intron 9. hERG1 contains a unique 25-nt adenosine stretch immediately downstream of the intron 9 poly(A) site. In this study, we tested the hypothesis that the RNA binding proteins, poly(A) binding protein N1 (PABPN1) and poly(A) binding protein C1, would interact with the 25-nt adenosine site and prevent intronic polyadenylation and decrease the expression of the non-functional hERG1-USO isoform. In the present study we transiently transfected HEK293 cells with a full-length, splicing competent hERG gene construct and cDNA constructs of PABPN1, PABPC1 or vector control. We used luciferase reporter assays, RNase protection assays (RPA), and immunoblot assays to demonstrate that PABPN1 and PABPC1 were able to increase the expression of the functional hERG1 isoform RNA and protein levels. The results support PABPN1 and PABPC1 interact with *hERG1*, increasing the expression of the functional hERGa expression.

Contributions of climate and microsite to seedling recruitment patterns in Pacific Northwest forests

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Seedling recruitment is a key bottleneck in forest demography, potentially generating mismatches between regional climate and species demography and resultant range dynamics. Climate-recruitment relationships may be strongly modulated at local scales by climatic buffering by the forest canopy, or by variation in local competitive environments. The objective of this study was to evaluate the relative influences of regional climate and local microsite conditions on recruitment patterns of two abundant Pacific Northwest conifer species across their ranges by quantifying the effects of temperature, precipitation, light availability, and conspecific basal area on seedling density. To address this objective, we conducted seedling censuses in five long-term monitoring plots that span the full elevational and latitudinal range of our focal species. A hierarchical Bayesian Poisson regression model was constructed and fitted to seedling counts for individual species to directly quantify relationships between regional climate, microsite conditions, and seedling densities. Across many combinations of climate variables evaluated within the models, regional climate consistently showed weak or nonsignificant effects on seedling density. However, random site effects explained a substantial portion of the variance in seedling counts, indicating that additional site-level processes may have important effects on recruitment. For both species, seedling densities were strongly limited by conspecific basal area, implicating conspecific negative density dependence as an important local limitation on recruitment. Collectively, these findings suggest that climate change impacts on recruitment are likely to be strongly attenuated by variation in forest structure.

How changes in plant community structure affect ant communities

Chadwick V. Tillberg, Alena Salazar, and Austin Hilton / Biology Department, Linfield College, McMinnville, OR, 97128.

We investigated how change in plant community composition and vegetative structure brought about by annual grass-specific herbicide application affects terrestrial arthropod communities, with special emphasis on the potential of the endangered Fender's blue butterfly, *Plebejus icarioides fenderi* (Family: Lycaenidae). Larvae of this species form facultative protective mutualisms with ants, who chase away potential predators of the larvae. We used pitfall trapping to compare ant community structure between control and herbicide-treated plots through time. The extent to which major changes in plant community composition affect the mutualistic ant community may have relevance for management decisions if the focus of the conservation effort has strong ecological interactions with greatly affected non-target species.

Creating a FoxG1 model in C57BL/6 mice

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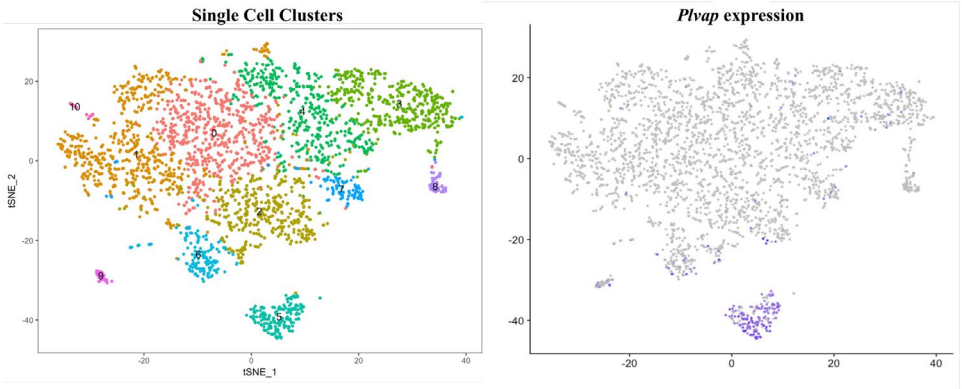
FoxG1 is a transcription factor critical for proper brain development. Currently, there are more than one hundred cases of individuals carrying FoxG1 mutations that cause the gene to malfunction, leading to severe motor and cognitive impairments and requiring affected individuals to have constant care. Very little is known about this rare genetic disease; as such, we attempted to characterize the phenotype of a possible mouse model of this disease for future therapeutic studies on FoxG1 mutations. Using a cre-recombinase mouse line, a heterozygous cre/FoxG1 mouse model was created. Cre-recombinase was used to replace one of the FoxG1 genes with a non-transcribing region of DNA, mimicking the human condition. Open field novel object, wire hang, cued fear conditioning, and contextual fear conditioning paradigms were used to test potential phenotype of the cre/FoxG1 mouse line. During open field and novel object testing, cre/FoxG1 mice were more hyperactive than wild-type littermates and showed significant impairment when attempting to discern the difference between familiar and novel objects. Male cre/FoxG1 mice showed impaired grip strength during wire hang testing and all cre/FoxG1 mice showed increased difficulty in climbing to the edge of the wire. Cre/FoxG1 mice showed impaired contextual and cued fear memory. The phenotypes observed in the cre/FoxG1 mice are similar to the phenotypes observed in the human condition, suggesting that this mouse line can be a useful model for future FoxG1 therapeutic studies.

Constructing a transgene reporter to understand endothelial heterogeneity

Garrett Yarter[1], Uchenna Emechebe[2], Jonathan Nelson[2], James Smart[1], and Anthony Paul Barnes[2] / [1]Department of Biology, George Fox University, Newberg, OR, 97132. [2]Knight Cardiovascular Institute, Oregon Health and Sciences University, Portland, OR, 97239

Endothelial cells can be found in arteries, capillaries, and veins throughout the body and have a number of functions including control of blood cell trafficking, permeability, adaptive immunity, and hemostatic balance. As a result of the variety of functions seen within the endothelial vasculature the cells exhibit remarkable heterogeneity in regard to phenotypes. With recent technological advancements, studying the heterogeneity of these cell types has become a possibility, and developing a tool to aid in these studies serves as a central focus of this project.
By generating a transcriptomic profile for these cells, they can then be categorized into groups by similar expression patters using computer algorithms. Through the use of the single-cell method, a particular gene named Plasmalemma vesicle associated protein (PLVAP) was found to mark a very distinct subpopulation of cardiac endothelial cells (Figure 1). This gene became a topic of interest for the project and dictated much of the experiments thereafter. The aim of this project was to generate a transgenic mouse that will express the jelly fish gene green fluorescent protein (GFP) in all cells that would normally express PLVAP. This was accomplished by replacing the coding sequence of PLVAP with GFP and allow us to use microscopy techniques that can see precisely where PLVAP is normally expressed within the heart and other organs. The resulting "reporter" animal will be very helpful in future studies of the function of the PLVAP-positive cells in blood vessels.



Testing selective FDA-approved drugs in a cardiomyopathy mouse model.

Jessenya Mil, Karthikeyan Bose, and Dhandapany Perundurai / Department of Molecular and Medical Genetics. Oregon Health and Sciences University, Portland, OR 97239

Cardiomyopathy is a general term for the diseases of heart muscles that essentially make it difficult for the heart to pump blood to the rest of the body. For the purpose of this research, a condition of the abnormal thickening of the heart muscles known as hypertrophic cardiomyopathy, is examined specifically. While the molecular mechanisms that govern hypertrophic cardiomyopathy are still being studied, it is known that certain forms of genetic cardiomyopathies are caused by genetic mutation and irregular signaling kinase activation. This study established a transgenic model for hypertrophic cardiomyopathy by incorporating a mutation in the SHOC2 (S2G) gene that is known to cause the disease. The objectives of this study are (1) to assess FDA-approved drugs, such as rapamycin and dasatinib, and analyzing its effects on the cardiac morphology of a transgenic S2G mutant mouse model, and (2) to continue identifying proteins involved in the pathway that expresses hypertrophic cardiomyopathy. As a result, echocardiographs have presented a decrease in the ejection fraction percentage as well as the fractional shortening percentage of the transgenic S2G mutant mice after being treated with rapamycin and dasatinib. Many proteins have also been identified via western blots that contribute to the irregular signaling kinase activation. Thus, the results have confirmed that both rapamycin and dasatinib are promising drugs in reducing hypertrophy in a mouse model.

POSTER PRESENTATIONS

Use of evaporation and post-hovering behavior to dissipate accumulated heat in hummingbirds during hovering

Natalie F. Amodei[1], Bret W. Tobalske[2], and Donald R. Powers[1] / [1]Department of Biology. George Fox University, Newberg, OR 97132, [2]Division of Biological Science. University of Montana, Missoula, MT 59812

Hummingbirds generate a large amount of heat during flight due to the low mechanical efficiency of their flight muscles and they must dissipate that heat to avoid overheating. Heat can be dissipated passively (convection, conduction, and radiation) and by evaporation (respiratory and cutaneous). When environmental temperatures are high, passive heat dissipation is eliminated, leaving evaporation as the only option for thermoregulation. In hummingbirds, respiratory evaporation accounts for less than 40% of metabolic heat production, requiring the balance of metabolic heat production to be dissipated by cutaneous evaporation. Aerodynamically positioned feathers restrict passive heat dissipation during flight, but it is unknown if cutaneous evaporation will be affected as well. We studied evaporative heat dissipation at temperatures near the limits for passive heat dissipation in hovering calliope (*Selasphorus calliope*), Rivoli's (*Eugenes fulgens*), and black-chinned (*Archilocus alexandri*) hummingbirds using open-flow respirometry and video recordings. Cutaneous evaporation was estimated as total evaporation minus respiratory evaporation. Our measurements in calliope hummingbirds suggest that they are unable to sufficiently upregulate cutaneous evaporative water loss to compensate for the extra heat produced during hovering. Observations of all species studied suggest that post-hovering behaviors might be important for rapidly dumping heat following a hovering bout in warm conditions.

Physiological effects of sucrose consumption in male versus female mice

Katareanna Coen, Cassandra Davis, and Tessa Nelson. Faculty Advisor: Dr. Sarah Comstock / Department of Math and Science, Corban University, Salem, OR 97317

Obesity is a significant health concern associated with the development of diseases and conditions such as nonalcoholic fatty liver disease (NAFLD), diabetes mellitus, glucose intolerance, and hyperinsulinemia. Increased incidence of these conditions is often linked to sugar consumption associated with sugar-sweetened beverages. There are many common physiological changes affiliated with increased sugar consumption, but not many studies have been conducted to consider the differences that result between the male and female genders. We hypothesized that sucrose consumption in male and female mice will lead to different physiological effects. This study investigates those physiological differences by measuring food and water consumption, overall weight gain, and glucose tolerance testing (GTTs). An obese mouse model using C57Bl/6 male and female mice was developed by providing mice with *ad libitum* access to a 30% sucrose (SUC) solution in place of water for 27 weeks in addition to standard mouse chow. These results indicate that there are gender-related metabolic differences between male and female mice that lead to different physiological outcomes.

Differential effect of various sugars on the development of non-alcoholic fatty liver disease in obese mice

Brogan Boen, James Donnell, Levi Miles, and Dallyce Vetter. Advisor: Dr. Sarah Comstock / Department of Math and Science, Corban University, Salem, OR 97317

Obesity is a significant risk factor for the development of nonalcoholic fatty liver disease (NAFLD). Additionally, increased liver adiposity is often linked to high sugar consumption. This study examined the correlation between the consumption of various sugars and the development of NAFLD. Female C57Bl/6 mice were given *ad libitum* access to 30% sucrose (SUC), glucose (GLC), or fructose (FRT) solutions in place of water (CTR) for 27 weeks. At the termination of the study liver triglyceride levels were significantly elevated in all groups in comparison to (CTR) groups. Oil Red O staining confirmed these results, showing observable lipid droplet accumulation in the livers of all experimental groups. This lipid accumulation was most pronounced in SUC and GLC groups while the FRT mice showed a more limited increase. Two-step RT-qPCR on liver tissue indicated changes in the regulation of genes in glycolysis, fructolysis, and fatty acid synthesis pathways. Interestingly, while SUC mice show upregulation in all three pathways and GLC mice showed upregulation in glycolysis and fructolysis, FRT mice showed no upregulation in any of these pathways. These results indicate unique effects of high sugar diets on mouse physiology and gene expression.

Phylogenetic analysis of the novel *Wolbachia* strain *w*NBre from carabid beetle *Nebria brevicollis*

Wyatt Eng, and Joanne Odden / Department of Biology, Pacific University, Forest Grove, OR 97116

Arthropod/bacterial symbioses are prevalent and affect host reproduction, viral resistance, and in some cases, habitat invasion. *Wolbachia* bacteria form symbiotic associations with a wide range of arthropod hosts. Our lab recently discovered the ground beetle species, *Nebria brevicollis*, is infected with *Wolbachia*. *N. brevicollis* has recently invaded the Pacific Northwest. The objectives of this study were (1) to characterize the *Wolbachia* strain infecting *N. brevicollis* and (2) phylogenetically compare this *Wolbachia* strain to previously described strains. Five housekeeping genes located on the bacterial chromosome are used as a universal genotyping tool to characterize *Wolbachia* strains. Bayesian analysis of the concatenated multi-locus sequence typing (MLST) genes was performed over a large data set of *Wolbachia* infected hosts. We identified the novel *Wolbachia* strain extracted from *N. brevicollis* is most closely related to a *Wolbachia* strain found in the lepidopteran host *Aphantopus hyperanthus*. The phylogenetic analysis distinguished many shared MLST alleles with certain *Wolbachia* strains infecting Coleoptera and Lepidoptera, indicating possible horizontal transmission across these host lineages. This study contributes to our understanding of host-symbiont evolution. Moreover, strain identification is the first step in implementing *Wolbachia* based biocontrol for conservation, including for the invasive *N. brevicollis* reported herein.

Lens proteostasis and cataract development in a sugar induced obese mouse dodel

Trevor Peterson, Kateleen and Vetter, Samuel Wheeler. Advisor: Dr. Sarah Comstock / Department of Math and Science, Corban University, Salem, OR 97317

Obesity is a significant risk factor for cataract development; however, few studies investigate its mechanism. The purpose of this research is to discover connections between obesity and protein modifications in the lens that result in cataract development. A mouse model of sugar induced obesity (SIO) via sucrose, glucose, and fructose consumption was used. We hypothesized that SIO causes lens protein modifications that increases susceptibility to cataract formation in mice. Crystallin proteins, which make up 90% of the dry mass of the lens, are susceptible to various modifications which cause protein insolubility, resulting in cataracts. Tandem mass tag mass spectrometry (TMT-MS/MS) revealed that deamidations affecting Asparagine (Asn) and Glutamine (Gln) were significantly increased in the sucrose mice at eight months of age. We also demonstrated an upregulation of chaperone proteins in the sucrose lenses. While the mice did not have visible cataracts at the termination of this study, there was a trend toward increased lens opacity resulting from sucrose consumption. Furthermore, deamidations indicate an increase in misfolded proteins which likely led to the increased chaperone activity. This suggests that proteostatic mechanisms may be upregulated to repair the damage caused by sucrose consumption. Ongoing studies have focused on the role of the various sugars in mice that are older (16 months at termination), to determine whether sugar consumption will accelerate opacity and lens protein modifications. Additionally, an in vitro model, sugar incubation of lenses, has been developed to investigate molecular changes occurring in response to sugar.

Characterization of *Mre11* gene variants in cancer

Sydney Kuehn, Cristina Ortiz Mateos, Ashley Headrick, Itzel Romero, Sreerupa Ray / Biology Department, Linfield College, McMinnville, Oregon 97128

Among the different damages that a cell can undergo, DNA double-strand break (DSB) is the most detrimental one. DNA contains all the necessary information for a cell's proper functioning and replication, therefore a break that damages both of its strands completely destabilizes the DNA molecules. If not properly repaired this could lead to genomic instability and tumorigenesis. Cells repair DSBs by two repair pathways- homology-directed repair (HDR) and non-homologous end-joining (NHEJ). Recently a back-up NHEJ pathway has been reported and is referred to as alternate-NHEJ (Alt-NHEJ). Although Alt-NHEJ is advantageous for damaged cells, it can mutate the DNA sequences at the junctions, which may lead to an altered genome that can have severe biological consequences. Mre11 is an essential component of the MRN complex and plays a key role in DSB repair pathways as HDR, NHEJ and Alt-NHEJ. Mre11 possesses single-strand endonuclease activity and double-strand-specific 3'-5' exonuclease activity which are essential for DNA end-processing. Recently Mre11 is shown to be overexpressed in breast cancer and high Mre11 expression was associated with a more malignant behavior in breast cancer. Furthermore, germline mutations of the Mre11 gene was identified in a recent screening of hereditary susceptibility to breast and/or ovarian cancer. Mutations in DNA repair genes can have a significant impact on cancer prognosis and treatment. We are focusing to determine whether germline and somatic mutations of Mre11 can lead to tumorigenesis and alter responses to chemotherapies.

Vitamin D control of breast cancer cell growth requires CaM kinase phosphatase

Quinlan Morrow and John M. Schmitt / Department of Biology, George Fox University, Newberg, OR

Calcium/Calmodulin-dependent protein Kinases (CaM Kinases) have been shown to participate in calcium-mediated signaling in various cell types including cancer cells. In breast cancer cells, carbachol and the hormone estrogen (E2) may increase intracellular calcium, resulting in the activation of CaM Kinase Kinase (CaM KK) and its substrates including AKT, CaM KIV and CaM KI leading to growth or survival. CaM KK has been shown to activate CaM KI, ERK and the transcription factor, Elk-1. In contrast, the hormones Vitamin D (VitD) and thyroid hormone (T3) have been suggested to antagonize ERK activation and growth of certain cells, although the mechanism remains unknown. CaM Kinase Phosphatase (CaM KP) inactivates CaM KK and CaM KI, so we hypothesized that it may mediate the inhibitory effects of VitD and T3. The specific role for CaM KP in regulating E2 signaling in breast cancer cells has not been examined. Our results suggest that calcium-mediated activation of CaM KK, CaM KI, and ERK leads to the growth of MDA-MB- 231

(MDA) and MCF-7 cells. Pretreatment of cells with VitD and T3 appear to inhibit E2 stimulation of CaM KI and ERK activity as well as cancer cell growth. Interestingly, inhibition of CaM KP via siRNA knockdown reversed the inhibitory effects of VitD. Prolonged VitD treatment of MDA cells increases CaM KP expression while decreasing ERK expression. These results suggest that VitD and may utilize CaM KP to antagonize calcium signaling through CaM KK in MDA and MCF-7 cells.

Protein fold wwitch in high-identity sequence space?

Andrew Muñoz[1,3], James O. Wrabl [1], Keila Sheetz [1], Miranda Russo [1,2], and Vincent J. Hilser [1,2] / [1]Department of Biology and [2] T.C. Jenkins Department of Biophysics, The Johns Hopkins University, Baltimore, MD, 21218 USA [3] Present Address: Department of Biology and Chemistry, George Fox University, Newberg, OR, 97132 USA

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Prevalence of *Wolbachia* in field collected coleoptera and carabid beetles in Oregon.

Janice Parks, and Joanne P. Odden, PhD / Department of Biology, Pacific University, Forest Grove, OR, 97116.

Wolbachia is an endosymbiotic bacterium that has a symbiotic relationship with insects, arthropods, and nematodes. It can cause male killing, cytoplasmic incompatibility, feminization, and parthenogenesis. These effects can potentially lead to speciation. Carabidae is a highly specious family of beetles and an ideal group to study the role of *Wolbachia* in host/symbiont evolution. Therefore, our goals were to (1) collect Carabid beetles from the Portland Metro area, (2) determine if *Wolbachia* is present in the species of Carabid beetles we collected, and (3) perform phylogenetic analyses of *Wolbachia* in infected specimens. We collected beetles by hand and pitfall traps. We PCR screened specimens for *Wolbachia* using *16S rDNA* primers specific to *Wolbachia* (WSpec), and the universal arthropod mitochondrial *cytochrome c oxidase subunit 1* (COI) primers to assess DNA quality. Subsequent analyses utilized *cytochrome c oxidase subunit 1 (coxA)* from *Wolbachia* and *filamenting temperature-sensitive mutant Z (ftsZ)*, two genes from the MultiLocus Sequencing Typing tool (MLST). We found three novel *Wolbachia* Coleopteran hosts, two from the family Carabidae and one from the family Cerambycidae. After creating a phylogenetic tree of *Wolbachia* strains that we have isolated and from the MLST database using the *ftsZ* gene, we found that the strains isolated from our two novel Carabid hosts were most closely related to *Wolbachia* strains isolated from other Carabidae.

Constructing a transgene reporter to understand endothelial heterogeneity

Garrett Yarter[1], Uchenna Emechebe[2], Jonathan Nelson[2], James Smart[1], and Anthony Paul Barnes[2] / [1]Department of Biology, George Fox University, Newberg, OR, 97132. [2]Knight Cardiovascular Institute, Oregon Health and Sciences University, Portland, OR, 97239

Endothelial cells can be found in arteries, capillaries, and veins throughout the body and have a number of functions including control of blood cell trafficking, permeability, adaptive immunity, and hemostatic balance. As a result of the variety of functions seen within the endothelial vasculature the cells exhibit remarkable heterogeneity in regard to phenotypes. With recent technological advancements, studying the heterogeneity of these cell types has become a possibility, and developing a tool to aid in these studies serves as a central focus of this project.
By generating a transcriptomic profile for these cells, they can then be categorized into groups by similar expression patters using computer algorithms. Through the use of the single-cell method, a particular gene named Plasmalemma vesicle associated protein (PLVAP) was found to mark a very distinct subpopulation of cardiac endothelial cells (Figure 1). This gene became a topic of interest for the project and dictated much of the experiments thereafter. The aim of this project was to generate a transgenic mouse that will express the jelly fish gene green fluorescent protein (GFP) in all cells that would normally express PLVAP. This was accomplished by replacing the coding sequence of PLVAP with GFP and allow us to use microscopy techniques that can see precisely where PLVAP is normally expressed within the heart and other organs. The resulting “reporter” animal will be very helpful in future studies of the function of the PLVAP-positive cells in blood vessels.

CHEMISTRY

Section Chair:

Angela Hoffman
University of Portland

ORAL PRESENTATIONS

Correction of evolving background in single-shot transient absorption measurements

Madelyn N. Scott, Kelly S. Wilson, and Cathy Y. Wong / Department of Chemistry and Biochemistry, University of Oregon, Eugene, Oregon 97403, USA

Organic semiconductors are electronically tunable, making them appealing alternatives to conventional semiconductors for use in optoelectronic technologies, including photovoltaics and light-emitting diodes. Aggregation of organic molecules during film formation directs their electronic properties. Understanding the excited state dynamics of evolving organic films provides insight into how target electronic properties can be attained by controlling molecular self-assembly. Transient absorption (TA) spectroscopy is an ultrafast pump-probe laser technique that measures the population of electron-hole pairs (excitons) at a series of time delays between the pump and probe pulses. However, TA is limited to structurally equilibrated samples, like solutions or films, because each measurement requires adjusting the probe arrival time by physically translating a retroreflecting mirror on a translation stage. We present a single-shot transient absorption (SSTA) spectrometer capable of measuring structurally non-equilibrated systems, like films forming from solution, by using tilted wavefronts to spatially encode time delays onto the sample plane. However, evolving samples have changing background signals attributed to pump-scatter and photoluminescence (PL) which can hinder spatially-dependent measurements of the exciton dynamics. In this work, we demonstrate a shot-to-shot correction of dynamic pump-scatter and PL for SSTA measurements. Introduction of an optical chopper into the path of the probe beam enables *in situ* collection of background pump-scatter and PL for use in calculating the excited state dynamics. This correction scheme improves the robustness of SSTA for measurement of materials during molecular aggregation. Excitonic characterization of organic semiconductors during self-assembly will facilitate the achievement of target electronic properties for use in optoelectronics.

Synthesis of organic ligands in luminescent solar concentrators

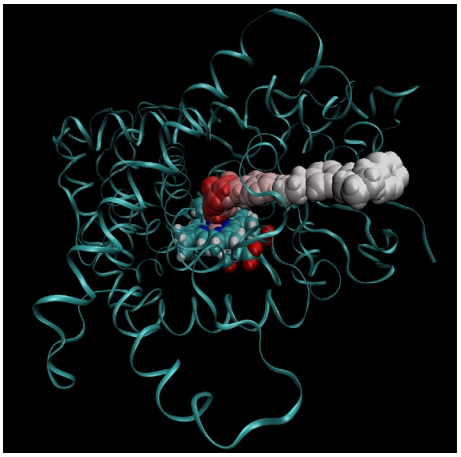
Mercie Hodges, Loveleen Brar, and R. Carlisle Chambers, PhD / George Fox University, Newberg, OR, 97132

Luminescent solar concentrators (LSCs) are sheet-like devices that absorb solar radiation and concentrate the energy to the edge of the device using a series of internal reflections. One route to prepare these devices uses nanocrystals as the absorbing and emitting species. The goal of this study was to increase the performance of CdSe nanocrystal based LSCs by modifying the organic ligand shell that surrounds the nanocrystal. We had two specific synthesis goals: 1) ligands that allow the nanocrystals to be covalently attached to the polymethacrylate matrix of the LSC and 2) ligands with an asymmetric perylene bisimide group to maximize light absorption. To complete the first goal, ω-terminated carboxylate molecules were synthesized through click chemistry. To create the asymmetric perylene bisimides, perylene-3,4-anhydride-9,10-di-(decyloxycarbonyl) was synthesized from commercially available 3,4,9,10-perylenedianhydride in a two step reaction. This molecule was then reacted with differing anilines to yield the asymmetric product. A family of anilines was synthesized to explore the impact of different functional groups on the behavior of the final nanocrystal-ligand complex.

Paths to quitting: Substrate trajectories and energetics out of cytochrome P450 2A6

Asela Chandrasinghe and Kevin E Johnson/ Department of Chemistry, Pacific University, Forest Grove, OR, 97116

Smoking tobacco has known health risks and quitting is problematic due to the addictive properties of nicotine. Cytochrome P450 2A6 (CYP2A6) metabolizes nicotine and thus, the inhibition of this protein has become of interest in the pharmaceutical industry as an alternative for smoking cessation. Inhibition of enzymes not only involves the binding of the inhibitor to the enzyme but also the ease with which the inhibitor reaches or leaves the binding site. In order to better characterize and screen potential inhibitors, this project models egress of nicotine and a known inhibitor using molecular dynamics. We report the substrate ingress pathways along with the associated work for transit.



Anti-fungal capabilities of *Callisia fragrans* and its translation to cancer therapy

Siva Ho, Kevin Truong, Alexys Bermudez, Mackenzie Brandon, and Angela Hoffman, PhD / Department of Chemistry, University of Portland, Portland, OR 97203

Callisia fragrans (basket plant), is found in many tropical regions, and is used by people in Vietnam as a medicinal herb. Leaves from the plant were extracted with methanol, followed by many chromatography steps to separate the soluble compounds from the plant and isolate active compounds. The samples were tested with *Pythium ultimum* to determine its activity. The active fractions from *C. fragrans* extracts were separated multiple times by flash chromatography on silica gel. Fractions that inhibited *P. ultimum* growth were eluted with a mixture of ethyl acetate and methanol. So far active fractions have been found in similar areas on the chromatogram after multiple separations using flash chromatography. Compounds that inhibit the growth of *P. ultimum* have a 90% chance of killing cancer cells.

Doping of green fluorescent protein into superfluid helium droplets: Size and velocity of doped droplets

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We have been developing a new method termed “serial single molecule electron diffraction imaging” (SS-EDI) to resolve protein structures. A unique feature of SS-EDI is the molecular goniometer consisting of superfluid helium droplet cooling and laser field alignment. To investigate the ability of helium droplet to contains large biomolecules, we studied the doping of green fluorescent protein from an electrospray ionization (ESI) source into superfluid helium droplets. From analyses of the time profiles of the doped droplets, we identify two distinct groups of droplets. The faster group has a smaller average size, on the order of 10^6 helium atoms/droplet, and the slower group is much larger, by at least an order of magnitude. The relative populations of these two groups depend on the temperature of the droplet source. We postulate that the smaller

droplets are formed via condensation of gaseous helium upon expansion from the pulsed valve, while the larger droplets develop from fragmentation of ejected liquid helium. Within the temperature range of our investigation, although the expansion condition changes from subcritical to supercritical, there is no abrupt change in either the velocity distribution or the size distribution of the condensation peak, and the most salient effect is in the increasing intensity of the fragmentation peak. Although the ion count of the doped molecular ions still needs further improving, the separation of the two groups of droplets in velocity is beneficial for size selection of only the smaller droplets for future experiments of electron diffraction.

MRM assay development for the quantification of proteins linked to neurodegenerative diseases in mouse brain tissue

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Mice are the most commonly used laboratory animals with >14 M mice used for research each year in North America. They are widely considered to be the prime model of inherited human disease and share 99 % of their genes with humans. The detailed characterization of mouse models on the protein level is time-consuming and challenging. A Multiple Reaction Monitoring (MRM) mass spectrometry (MS)-based assay was developed to precisely and accurately quantify proteins in mouse brain tissue. Each protein to be quantified was measured using peptides unique to the target protein. The development of the assay using synthetic, stable isotope labeled peptide standards ($^{13}C/^{15}N$-labeled) consists of three main steps. The first step was to determine the proteins of interest through literature research followed by the selection of tryptic peptides through *in silico* digestion using the PeptidePicker software (PMID: 24769191). The second step was to determine the parameters and instrument settings required for the sensitive detection and measurement of each peptide using purified peptide standards. In the third step, the labeled peptide standards were combined into mixtures of 50-100 peptides to allow multiplexing and were prepared in both a buffer solution and tissue sample. Interfering compounds were then identified by comparing the signals of the labeled peptide standards in buffer and in the tissue sample. Additionally, the inter-day variability was assessed at the lower end of the linear range established from the response curve. Furthermore, a response curve for each peptide was established, and the signal of the unlabeled endogenous peptide present in the tissue sample was measured and used to determine the concentration in the tissue.

Plasmon-free surface-enhanced Raman spectroscopy on TiO_2-graphene oxide inverse opal substrates

Luis Perez Morales, and Elizabeth J. O. Atkinson, PhD / Department of Chemistry, Linfield College, McMinnville, OR 97128

TiO_2-graphene oxide (GO) inverse opal materials were shown to be active plasmon-free surface enhanced Raman spectroscopy (SERS) substrates. The SERS activity of the substrates was analyzed using three different probe molecules: phenethylamine (PEA), methylene blue (MB), and 4-mercaptobenzoic acid (4-MBA). The morphology of the substrates was investigated by SEM and AFM. Prepared TiO_2-GO inverse opals substrates can be reused up to five times with minimal loss of signal, rendering them perfect candidates to be used as highly stable, low-cost, metal-free, recyclable SERS substrates.

Electron diffraction of pyrene and pyrene dimers in superfluid helium droplets

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In recent years, our group has been developing a method termed “serial single molecule electron diffraction imaging (SS-EDI)” as a means to solve the crystallization problem in atomic structure determination. The procedure of SS-EDI starts with ions produced by electrospray ionization, then the ions are doped into superfluid helium droplets for cooling, aligned by an elliptically polarized laser field, and subjected to coherent radiation by a high energy electron beam. The images from single molecules oriented from chosen projections are then used to determine the three-dimensional structure. In an effort to build a prototype of this instrument, we present results from electron diffraction of pyrene ($C_{18}H_{10}$) and pyrene dimer doped in superfluid helium droplets. Using a least squares fitting procedure, we demonstrate that under our doping conditions,

both monomer and dimer are present in the droplet beam. The estimated amount of dimers constitutes at least 1/3 of the overall pyrene population. Although given the experimental data range, we could not determine a unique structure for the dimer, we can definitively eliminate some structures from the fitting result. The interlayer distance of the dimer is determined to be 3.4 Å. This result offers promise in using statistics for obtaining molecular parameters from diffraction data. Most importantly, pyrene contains no heavy atoms, and the success of this experiment represents a major step-forward in using SS-EDI for structure determination of proteins.

Supercontinuum generation of UV wavelengths using fluoride crystals

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White light laser pulses are useful for collecting time-resolved spectroscopic data at a wide range of wavelengths simultaneously. Laser pulses on the order of femtoseconds long are required for measuring dynamics on that timescale. Pulsed white light is generated by focusing intense laser pulses of high energy and narrow bandwidth (in this work, 800 nm light from a Ti:Saph pulsed laser) into a transparent optical material. In a process called supercontinuum generation, the bandwidth of the input pulse is broadened significantly, visually indicated by the appearance of a white color. Sapphire crystals are commonly used as the generation medium, but the bandwidth of the resulting continuum does not extend to wavelengths shorter than approximately 420 nm. Calcium fluoride crystals have been used to generate white light with intensity at wavelengths extending into the UV, but the crystal must be kept in constant motion during use to avoid damage from the intense input energy. In this work, barium fluoride is shown to be a possible alternative to calcium fluoride due to its higher damage threshold and generated continuum that extends past 350 nm. The spectrum and stability of the generated white light is compared for the different fluorides under a variety of focusing conditions of the input pulse. The conditions and time required to damage each fluoride crystal are determined. Comparing these conditions for the different crystals aids in evaluating the potential of barium fluoride as a reliable source for white light pulses with intensity that extends into the UV wavelengths.

POSTER PRESENTATIONS

Shotgun APGC mass spectrometry analysis of sterols in native and commercial pollen samples.

Diana Oppenheimer[1], Jeff Morré[2], Priyadarshini Chakrabarti Basu[3], and Claudia Maier[2] / [1]Department of Biochemistry and Biophysics, [2]Department of Chemistry, [3]Department of Horticulture, Oregon State University, Corvallis, OR 97331

Sterols are the precursors for hormones critical to the healthy development of honey bees (*Apis mellifera*). Like other insects, the honey bee is unable to synthesize sterols, obtaining these essential nutrients from its diet. As nonvolatile compounds, sterols are typically derivatized and measured by gas chromatography-mass spectrometry (GC-MS) or liquid chromatography-mass spectrometry atmospheric pressure chemical ionization (LC-APCI-MS), which does not require derivatization. Derivatization is both time-consuming and complex – an undesirable technique that often results in the presence of artifacts, low recovery, and poor reproducibility. We propose a novel technique, "shotgun" atmospheric pressure gas chromatography (APGC) high resolution mass spectrometry (HRMS) for measuring sterols rapidly and without derivatization. The technique uses a short 1m fused silica capillary to achieve a 2-minute analysis time per sample. Shotgun APGC-HRMS was used to analyze 1µl injections of 5, 10, 50, and 75 µM standard sterol solution mixtures of cholesterol, campesterol, desmosterol, stigmasterol, β-sitosterol, campestanol, ergosterol, sitostanol, and 24-methylene-cholesterol, as well as five commercial and three native pollen samples. This method provides a fast, simple analysis of the sterol composition in samples of native and commercial pollens used to supply honey bee dietary requirements.

Comprehensive analysis of gangliosides from a porcine brain ganglioside extract by electrospray ionization ion mobility mass spectrometry

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The aging of the brain is associated with an increased risk of developing Alzheimer's disease. Gangliosides are glycosphingolipids that are found throughout the central nervous system. Gangliosides are involved in crucial processes of the nervous system, including neurogenesis and synaptogenesis. Previous research has shown that the ganglioside profile is age-dependent [1,2]. Currently, gangliosides are an underrepresented group of metabolites in untargeted lipidomic studies [3]. Thus, improved methods are needed to accurately detect and quantify gangliosides. For developing a mass spectrometric methods for determining ganglioside composition in brain tissue, we used initially a commercially available porcine total ganglioside extract. Ultra performance liquid chromatography coupled with mass spectrometry (UPLC-MS) was used to separate the gangliosides and obtain accurate masses for gangliosides present. Tandem mass spectrometry (UPLC-MS/MS) was used to obtain fragment ion information of distinct gangliosides. Over 10 different gangliosides were detected. As proof of concept, UPLC-MS/MS was selectively done on ganglioside GD1 (d18:1/18:0) with m/z of 917.5 ($[M-H]^-$). Fragment ions of sialic acid and hexose sugars were detected. Our intent is to create a spectral library that contains defining information of gangliosides (retention time, exact mass, and fragment ion spectral information) to aid the assignments of gangliosides in future larger studies. We plan to apply the optimized UPLC-MS/MS method for the analysis of brain extracts from mouse models of Alzheimer's disease. The ultimate objective is to determine whether or not ganglioside metabolism is associated with Alzheimer's disease.

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Purification and isolation of antibiotic compounds from archeological site soil

Anthony Gutierrez, and Angela Hoffman, PhD / Department of Chemistry, University of Portland, Portland, OR 97203

There has been a dramatic increase in antibiotic-resistant bacteria around the globe, resulting in higher levels of mortality directly from bacterial infections. Each year in the United States alone, about two million people are infected with antibiotic resistant bacteria, responsible for tens of thousands of deaths. Because of this, there is an urgent need to expand the arsenal of antibiotics currently available. To discover new compounds with antibiotic activity, bacteria from undisturbed soil at an early Roman archeological site on the Island of Mallorca, Spain were isolated, grown in liquid cultures, extracted, fractioned, and tested. Extracts able to stop the growth of *Staph aureus, E. coli* and *Pythium ultimum* were studied further with the goal of determining the molecular structure of the compounds. Once assayed, thin layer chromatography (TLC) and flash chromatography were used to fractionate the extracts. Resulting fractions with activity were studied further. In the future, we hope to get enough product to determine molecular structure and identify active antibiotics via mass spectroscopy, IR, ^{1}H and ^{13}C NMR spectroscopy. Two of the three crude bacteria samples tested so far show activity in antibiotic and anti-fungal assays. Future investigation will be necessary to determine structure of potentially undiscovered molecules holding antibiotic properties.

Investigation of an uncharacterized radical *S*-adenosyl-L-methionine enzyme from *Thermatoga neopolitana*

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Radical *S*-adenosyl-L-methionine (SAM) enzymes are part of a large and diverse superfamily with over 100,000 putative members, and their presence in all kingdoms of life underscores the importance of enzyme controlled radical chemistry. The Structure Function Linkage Database uses the specific enzyme sequences to predict the chemical functions of radical SAM enzymes and categorize them into subgroups, many of which remain unclassified. The characterization of these enzymes has led to the discovery of many novel reactions. To expand this growing area of study, an uncharacterized radical

S-adenosyl methionine (SAM) enzyme from subgroup 11, referred to as RadSAMsub11 was overexpressed and purified using a Ni affinity column. The purified protein was found to have an iron content of 3.5 irons per protein. Sodium dithionite was added to the purified enzyme and reduction was monitored using UV-vis spectrometry. The absorbance feature between 380 and 500nm was lower than that of the protein samples lacking sodium dithionite providing evidence that the uncharacterized RadSAMsub11 enzyme possesses an iron-sulfur cluster capable of being reduced to its active state. An enzymatic SAM synthesis reaction and purification was also carried out in the hopes of producing pure SAM in a cost-effective way; however, the purification method using gravity flow was not successful. Future research will include an optimization of SAM synthesis and purification, an activity assay to test the uncharacterized enzyme's ability to cleave SAM and produce a SAM based radical, and EPR spectroscopy to further characterize the cluster.

Purification and isolation of natural compounds from ancient soil

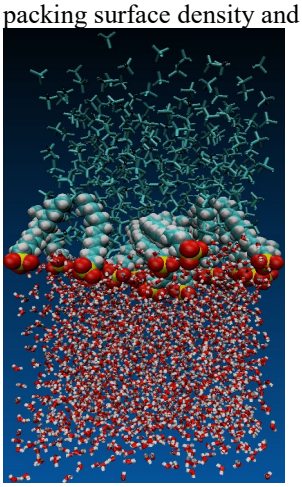
Cassandra Raul, and Angela Hoffman, PhD. / Department of Chemistry, University of Portland, OR, 97203

Bacteria can manufacture natural products in some of the harshest environments in the world. Of these products, some have been found to function as antibiotics and have been used to help treat various medical illnesses and infections. While a number of antibiotics have already been found and identified, such as penicillin, there are also many yet to be discovered. The purpose of this study is to identify new organic compounds made by actinomycete soil bacteria that can be used against harmful disease-causing bacteria, or fungal infections. In this project, three bacterial isolates were grown in liquid cultures, extracted and analyzed. Thin layer and flash chromatography were used to partially purify and isolate active compounds. Our goal was to isolate and purify fractions able to kill *E. coli, Staph aureus* and *Pythium ultimum*. Modern disease-causing bacteria may not have encountered products made by these microbes. The bacteria B4-2c and P11-3c showed activity and will be studied further. We also hope to identify the bacteria that make useful compounds through the use of spectroscopy and gram-staining.

Crowding or accommodation: How a surfactant's structure and orientation affect an organic-water interface

Shawn Opfer, and Kevin E. Johnson / Pacific University Department of Chemistry, Pacific University, Forest Grove, OR, 97116

Surfactant molecules play an important role in biological systems and industrial applications. Among other uses, surfactants are important in the remediation of oil spills. Molecular structure determines function, and through computational chemistry a more informed model of structure/property relationships in surfactants can be applied to the molecular design of new surfactant molecules. The focus of this study is to computationally model various surfactant molecules at an organic-water interface, and determine how their structures influence interfacial properties. Classical molecular dynamic simulations were run to evaluate interfacial properties such as how the presence or absence of a bulky group adjacent to the surfactant head group affects surfactant accommodation at the interface. Simulations at various concentrations of Dodecyl Sulfonate (DDS) and Dodecyl Benzene Sulfonate (DBS) surfactant molecules were run for 20ns then visualized and quantitatively analyzed. We performed a density
analysis that produced a plot of density as a function of depth to provide insight into interfacial width, as well as the average depth of headgroups. Radial pair distribution (RPD) analysis were also utilized in order to understand more about lateral packing surface density and structure at the interface.



Simulation of 25 Dodecyl Sulfonate molecules at an H_2O-CCl_4 interface

Synthesis of 4-Thiazolidinone small molecules as potential inhibitors of the Arp2/3 complex

Haley Smith,[1] Brad J. Nolen,[2] and Andrew W. Baggett[1] / [1]Department of Chemistry, Linfield College, McMinnville, OR 97128; [5]Department of Chemistry and Biochemistry, Institute of Molecular Biology, University of Oregon, Eugene, OR 97403

Life-essential cellular processes such as endocytosis, motility, and division rely on a cell's ability to precisely regulate construction of actin filaments in response to external factors and signals. Intrinsically involved in this process is the Actin Related Protein 2/3 (Arp2/3) Complex, a seven-subunit ATPase that functions by nucleating a daughter branch of actin from the side of a pre-existing microfilament. Active Arp2/3 complex is necessary for the proliferation of certain metastatic cancers, and inhibition of Arp2/3 complex is emerging as a potentially useful treatment strategy for such cancers. We describe synthesis and in vitro assays of 4-thiazolidinones predicted by computational methods to inhibit of Arp2/3 Complex strongly, and therefore serve as potential lead compounds for drug development. Known Arp2/3 inhibitor CK-869 serves as the starting point for derivative synthesis.3 We discuss the synthesis efforts towards the synthesis of new compounds and the biochemical data collected about their potency.

In vitro determination of potency of small molecule inhibitors of Arp2/3 complex

Katherine Andersen,[1] Shelby DeRocher,[1] Jordan Collins,[2] Christina Pierson,[2] Levent Cavas,[3] Zoe Cournia,[4] Brad J. Nolen,[5] and Andrew W. Baggett[1] / [1]Department of Chemistry, Linfield College, McMinnville, OR 97128; [2]Department of Chemistry, Bucknell University, Lewisburg, PA 17837; [3]Dokuz Eylul Universitesi, Izmir, Turkey; [4]Bioacademy of Athens, Biomedical Research Foundation, Athens, Greece; [5]Department of Chemistry and Biochemistry, Institute of Molecular Biology, University of Oregon, Eugene, OR 97403

Actin is a key protein building block of actin microfilaments, which are constructed and deconstructed in response to cellular signaling pathways to regulate cellular processes such as motility, division, and endocytosis. Arp2/3 Complex is a 7-subunit protein complex that is in involved in cellular construction of branched actin networks, functioning by attaching to the side of a pre-existing actin filament and nucleating a daughter branch. Overexpression of Arp2/3 complex has been linked to the ability of certain metastatic cancers to proliferate. This work describes the synthesis and *in vitro* biochemical testing of several molecules predicted by computational docking to be inhibitors of Arp2/3 Complex, and therefore of potential interest in clinical applications. A bulk actin polymerization assay is used as the key method to determine the potency of inhibitor candidates. Structure-activity relationships derived from these results are also discussed.

Synthesis of small molecule derivatives of CK-666 as potential inhibitors of the Arp2/3 complex

Atchara Sripeng,[1] Natalie Wade,[1] Brad J. Nolen,[2] and Andrew W. Baggett[1] / [1]Department of Chemistry, Linfield College, McMinnville, OR 97128; [2]Department of Chemistry and Biochemistry, Institute of Molecular Biology, University of Oregon, Eugene, OR 97403

The Actin-Related Protein (Arp) 2/3 Complex is an actin nucleating factor intrinsically involved in cellular regulation of actin networks during life-essential processes such as motility. Overexpression of the Arp2/3 complex has indicated as a factor allowing the proliferation of certain metastatic cancers. This work describes the synthesis and in vitro biochemical testing of several molecules predicted by computational docking to be inhibitors of Arp2/3 Complex, and therefore of potential interest in clinical applications. The molecules are designed based off of the structure of known Arp2/3 inhibitor CK-666, which was discovered via high-throughput screening. Details of the synthesis of the tryptamine derivatives are discussed, and the bulk actin polymerization assay used to determine potency of the new compounds is discussed.

Fluorescent detection of reactive oxygen species in *Saccharomyces cerevisiae* applied to chronological lifespan

Kelly Schultz, and Megan Bestwick / Department of Chemistry, Linfield College, McMinnville, OR 97128

During the course of normal aerobic metabolism, cells are exposed to a wide range of reactive oxygen species such as the superoxide anion, hydrogen peroxide, and the hydroxyl radical. These reactive oxygen species (ROS) are highly reactive metabolites of oxygen and can damage a wide range of macromolecules in the cell, including nucleic acids, proteins, and lipids. Normally, molecular oxygen is relatively unreactive and harmless in its ground state; however, it can undergo partial reduction to form both the superoxide anion and hydrogen peroxide, both of which can react further to form the dangerously reactive hydroxyl radical. To combat the toxic and potentially deadly effects of ROS, cells are equipped with various antioxidants such as enzymes like superoxide dismutase 1 (*sod1*Δ). Our objective is to observe these various reactive oxygen species using yeast (*Saccharomyces cerevisiae*) as a model organism and explore different biochemical staining

assays such as Amplex Red (AR) and Dihydroethidium (DHE). These stains can be used to track live cells and quantify ROS levels. This will allow us to study how ROS changes during chronological yeast lifespan. Our work thus far has aimed to track extracellular hydrogen peroxide via AR and superoxide generation in the mitochondria via DHE. Our initial results indicate that we are able to track superoxide production using DHE in wild type cell and *sod1*Δ yeast strains spectroscopically. Our results will provide insight into the role of ROS in aging as we quantify levels during yeast lifespan.

Separation and quantification of nucleic acids by ion-pair reversed-phase high performance liquid chromatography (IP RP HPLC)

Zachary McLeod, and Megan Bestwick / Department of Chemistry, Linfield College, McMinnville, Oregon 97128.

Ion-pair reversed-phase high performance liquid chromatography (IP RP HPLC) is shown to be an effective method to reliably analyze DNA. IP RP HPLC is much faster and safer alternative to conventional methods of DNA separation and quantification. The method described here utilized a two-buffer effluent system consisting of triethylammonium acetate (TEAA) and acetonitrile (ACN). The method reliably separated and quantified DNA samples of 54 and 58 nucleotides. This method will be used and optimized to separate similarly sized RNA samples. The ultimate goal is to separate mixtures of nucleotides generated from in-vitro transcription reactions.

Copper modulation to effect yeast lifespan

Zachary Sherlock, and Megan Bestwick / Department of Chemistry, Linfield College, McMinnville, Oregon 97128

The role of copper in yeast (*Saccharomyces cerevisiae*) chronological lifespan and the production of reactive oxygen species (ROS) in the mitochondria is not well characterized. The mitochondrial electron transport chain (ETC) machinery is the primary site of superoxide formation, a ROS associated with premature cell aging. A primary defense against ROS is the enzyme superoxide dismutase (Sod1p). This enzyme requires copper and zinc as metal cofactors in the conversion of superoxide to hydrogen peroxide, a less harmful ROS. The aim of this project is to determine the effect of exogenous copper treatment on strains of yeast lacking Sod1p and its copper chaperone, Lys7p. Our results indicate that low levels of exogenous copper (0.25 mM copper sulfate or less in restricted nutrient media) extend yeast chronological lifespan, especially in cells lacking Lys7p. All cell types see a dramatic reduction in lifespan when exogenous copper levels are increased to 2.0 mM copper sulfate or higher. This indicates that a small increase in the amount of copper in the media is beneficial for yeast in these restricted media conditions. Our current studies are to assess protein levels and gene expression of the yeast ETC machinery, as well as ROS levels, to mechanistically understand how exogenous copper in a small dose is contributing to lifespan extension.

GEOLOGY

Section Chairs:

Gregory Retallack
Portland State University

Jeff Myers
Western Oregon University

ORAL PRESENTATIONS

Late Neogene paleofloras of the San Francisco Bay region: Modernization of west coast vegetation

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Basins of the San Francisco Bay region (SFB) of California hold one of North America's most complete later Neogene paleofloral sequences, spanning the interval from the late Middle Miocene through the Late Pliocene. Reevaluation of the SFB assemblages documents geologically recent floristic and vegetational changes that produced modern CA plant communities. The oldest is the ~ 10 Ma Neroly flora, from the upper San Pablo Group in the Livermore Basin, which represents the most recent known west coast occurrence of *Taxodium-Nyssa* swamp vegetation, dominated by large-leaved thermophyls such as *Magnolia* that require a frost-free climate and moist summers. Floras of the overlying 6-8 Ma Mulholland Formation are dominated by a diversity of live and lobed oaks, along with genera that are, today, important in summer-dry chaparral and woodland vegetation, including *Rhamnus*, *Ceanothus*, *Rhus* (*Malosma*), and others. Some, including *Lyonothamnus* and *Heteromeles*, are similar to or conspecific with species found in middle Miocene assemblages of west-central Nevada, and which migrated westward and downslope in response to increasing summer drought. The Mulholland assemblage also contains ubiquitous relict genera from the warmer, wetter Middle Miocene, including *Platanus*, *Persea*, *Populus* and other mesic forms, here limited to perennially moist bottomlands. The ~ 3.5 Ma Sonoma Flora from the upper Sonoma Volcanics of the Petaluma Basin, north of the Bay Area, includes a diversity of cool temperate conifers including *Abies*, *Pseudotsuga*, *Picea*, *Tsuga*, and *Sequoia*, along with diverse broadleaved elements, including a few frost-sensitive taxa such as *Persea*. Conifer-rich forest of the Sonoma assemblages represents vegetational adaptation to a microthermal climate with increasingly dry summers, ultimately culminating in the rich conifer forest of the modern northwest coast. These climatic changes were a response to north polar ice buildup that produced an increasingly cold California Current, and resultant summer-dry Mediterranean climate, on the west coast. The SFB assemblages illustrate just how recently modern coastal west coast plant communities became established.

Upper Miocene to Quaternary Volcanic Series of the High Cascades in the Cascade Siskiyou National Monument

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Upper Miocene to Quaternary rocks of the High Cascades Volcanic Series unconformably overlie those of Lower Miocene Western Cascade Series in the Cascade Siskiyou National Monument of Southwestern Oregon. Geochemically, the lavas range from basalt to andesite subdivided into distinct units identified by topographic expression, flow features, petrography, and geochemistry. From youngest to oldest the units are: Basalt of Brush Mountain (Qpbbm, 1.98-2.22 Ma), Basaltic Andesite of Grizzly Creek (Tpbag, 2.73 Ma), Basalt of Moon Prairie (Tpbmp, 4.51 Ma) Basaltic Andesite of Green Creek ((Tpbagc, 4.79Ma), Basalt of Beaver Dam (Tmbab, 3.59-4.6 Ma) and the Andesite of Lily Glen (Tmbalg). Detailed mapping has revealed sources for these volcanic units. Typical triangular vent and radiating dike features are prominent in the Tpbmp and Tmbab. Some units issue from NNW-trending fissures. NNW-trending dikes are distinctive

features in all units except Tpagc, some exhibiting unique curves at their extremities. The basalt and basaltic andesite exhibit different flow structures ranging from massive to platy. The units are generally characterized by olivine phenocrysts comprising 2-10% of volume, <0.5-2mm in size, partially altered to iddingsite. Tpbmp, Tpbag, Tpbagc, and Tmbab all contain zero to varying percentages of pyroxene phenocrysts, though never more than 5%. The oldest but undated Tmalg is unique with its high volume of large (>4mm) euhedral plagioclase phenocrysts, lack of olivine, presence of hypersthene and boulder outcrops. Locally zoned basal flows in the Tpbmp exhibit features that resemble hydrothermal alteration, though they lack typical accompanying geochemical signature.

Volcanic rocks of the Lower Miocene Western Cascade Volcanic Series Heppsie Formation, Northeastern Portion of the Cascade-Siskiyou National Monument, Southwest Oregon

Jad D'Allura / STEM Division, Chemistry Department, Southern Oregon University, Ashland, OR, 97520

Volcanic rocks of the Heppsie Formation (21.73-19.6 Ma) of this year's research in SW Oregon extend from Hyatt Reservoir to Dead Indian Creek Canyon. The Heppsie is comprised of distinct lithologic units dominated by olivine-bearing basaltic andesite lava flows and an interval of trachyandesite, dacite, rhyolite lava and volcaniclastic rocks unconformably overlain by High Cascade olivine basalt and basaltic andesite flows. Early Heppsie rocks show a variety of compositions, have plagioclase phenocrysts, contain two pyroxenes (hypersthene, which always forms first, and augite), and may contain altered olivine phenocrysts. Succeeding lavas, and intervals of minor volcanic breccia, are separated from the underlying unit based on a basal red paleosol, more mafic compositions, ubiquitous olivine (mostly altered to iddingsite), and smaller, less abundant plagioclase and augite phenocrysts in a medium dark gray groundmass. These rocks represent shield volcano basaltic andesite flows tilted ~15° to the northeast. The lavas of this volcano are overlain by andesitic to rhyolitic tuff, likely issuing from a center to the southeast, then by basaltic andesites similar to those of the shield volcano. An abrupt change in composition and eruptive character is marked by platy trachyandesite lava flows, welded tuff, air-fall tuff, and matrix-supported breccia prior to a return to basaltic andesite volcanism. All rocks exhibit very low-grade zeolite facies alteration and are tilted gently (10° or slightly more) to the NE. Fractures form a prominent NNW-trending fabric associated with dikes and NNW-tending faults, a few of the latter suggesting some component of right-lateral movement.

World's oldest paleosol, 3.7 GA, Greenland

Gregory J. Retallack / Department of Geological Sciences, University of Oregon, OR 97403-1272

A lens of black schist within 3.7 Ga quartzites of Greenland may be Earth's oldest known paleosol. The putative paleosol is a bed of berthierine schist with large ripidolite poikiloblasts. It can be interpreted as a saponite clay soil with a salt-rich horizon of kieserite, similar to other acid-sulfate paleosols of the early Earth. It is deeply weathered and forms the culmination of a trend of chemical weathering seen in other metasediments of the Isukasia area. It also has the field appearance, crack fills, clods, desert roses, textural profile, mineral composition, molar ratio variations, and REE depletion of a well drained paleosol. Models for proton and electron consumption of soils applied to the putative paleosol reveal an atmosphere with only 36 ± 510 ppm O_2 and 820 ± 1 ppm CO_2, and humid, cool temperate paleoclimate. The paleosol profile has organic $\delta^{13}C_{PDB}$ consistently of -24.2 to -27.4 ‰, and modest Raleigh distillation up-profile. Similar consistent values and trends are found in modern living soils. In contrast, carbon isotopic composition of sediments is erratic from bed to bed, and meteorite carbon isotopic composition differs dramatically for each kerogen particle. Thus life in this very ancient soil is not precluded by our analyses.

HEALTH SCIENCES & KINESIOLOGY

Section Chair:

Bradley Cardinal
Oregon State University

ORAL PRESENTATIONS

Developing and sustaining the Health Science *and Kinesiology* section of the Oregon Academy of Science: Where do we go from here?

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For the 78th annual Oregon Academy of Science (OAS) conference, the OAS Council, under the leadership of OAS President Andrew Baggett (Linfield College, McMinville, OR), approved a section labeled "Health Science and Kinesiology" on a trial basis. The extension of the already existing "Health Science" section to include "and Kinesiology" was the result of a series of exchanges between President Baggett and Bradley J. Cardinal, a Professor in Oregon State University's Kinesiology Program and the 2018-2019 President of the National Academy of Kinesiology. There was a desire among the OAS leadership to revive the pre-existing but dormant "Health Science" section, which created an opportunity for Kinesiology. In part this harkens back the 19th century when departments of "Hygiene and Physical Culture" first emerged on college and university campuses (Cardinal et al., 2015; Cardinal et al., 2012). Today, Kinesiology is a field focused on physical activity and its impact on health, society, and quality of life. The National Research Council recognizes it as a Life Science discipline. It is most commonly organized around a sub-disciplinary/multi-disciplinary structure that is further ordered within three broad spheres (i.e., behavioral, biophysical, and sociocultural). The science and application of Kinesiology ranges from cell to society. It is also one of the largest academic majors in the United States (Thomas, 2014). In part this is because Kinesiology is viewed as a pathway degree into various allied health careers (e.g., Physical Therapy, Occupational Therapy, Physicians Assistant), including the study of medicine. As 2019 is a trial year for this section within the OAS, this session will focus on determining whether the current organizational structure is sustainable and, if so, how to attract even more widespread participation in the activities of the OAS among researchers, educators, and students.

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Pediatric physical and occupational therapists' disability model orientation

Winston Kennedy[1], Samuel W. Logan[1], Kathleen R. Bogart[1], Heather A. Feldner[1], Michele A. Catena[1], and Christina Cafferata[1] / [1]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331

Physical therapists (PTs) and occupational therapists (OTs) serve a critical role in increasing the physical function and mobility of people with disabilities of all ages, through targeted interventions or provision of mobility technology. Previous research has theorized that disability model orientation is related to attitudes toward people with disabilities, yet disability model orientation has not been examined in a sample of PTs and OTs. The purpose of this study is to examine the disability model orientation of OTs and PTs and to describe any differences between the two healthcare professionals. A sample of pediatric PTs (n=308) and OTs (n=83) from professional development workshops across the US was obtained. The workshops focused on recent advances in science, training, and technology related to mobility. Darling and Heckart's medical and social model subscales were completed prior to the start of the workshop. Higher social model alignment was found in the group compared to medical model alignment; medical model mean was 2.9 (SD= .47) and social model mean was 4.03 (SD=.41). PT medical model mean was 2.98 (SD=.48) compared to OT medical model mean at 2.91(0.46), PT social Model mean was 4.03 and OT social Model mean was 4.06 (.38). Comparisons were made using a Welch t-test and there was no significant difference between the groups. PTs and OTs seem to align with the social model of disability more than the medical model. The next step is to identify if the association to either disability model orientation predicts clinicians' attitudes towards people with disabilities.

What are effective ways to reduce obesity in children with disabilities? A literature review and critical commentary

Jory M. R. Ness[1], and Jafrā D. Thomas[2] / [1]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331

In the United States, there are more than 5.5 million children living with a disability. Obesity among children with disabilities shows higher prevalence compared to their age-matched peers living without a disability (Rimmer, 2011). Children with disabilities are more likely to not participate in regular activities, including physical activity of any kind, at home and in the community (Yazdani, S., 2013), which is why community and clinical programs are so important to target this specific population. Program implementers and proponents should be mindful of the reasons that hamper the reach and long-term effectiveness of their efforts. The more prominent reasons include the inability for children to adhere to physical demands of a program, transportation issues, program costs, and environmental and policy constraints. To generate insights into how these issues can be addressed by program implementers and proponents, a critical review of the relevant and primarily original research literature was undertaken to provide a research-informed commentary. Our review revealed two empirical and synergetic trends in the literature. First, "successful" community or clinical programs address one or more barriers to physical activity for children with disabilities, improve children's health markers, and consider ways to make activities fun for *all* participants. Second, multidisciplinary approaches show greater effectiveness than singular approaches and therefore should be carried out wherever possible. Our presentation will summarize the specific findings of our review using a case example of a model program. We then will conclude with suggestions for practice implications and future research.

Differences in perceived exercise benefits and barriers between normal weight and obese college students

Alexandra Szarabajko[1], James Larkin[2], Heather Adams-Blair[2], and Jonathan Gore[2] / [1]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331, [2] Department of Exercise and Sport Science, College of Health Sciences, Eastern Kentucky University, Richmond, KY 40475

The transition between high school and college is considered a critical time period due increased responsibility of making independent living and physical activity choices. Acquiring knowledge on healthy lifestyle adoptions and overcoming barriers to physical activity while in college is therefore crucial in shaping future physical activity habits. Despite evidence advocating for required college physical activity, less than 40% of American colleges require these courses for graduation. The aim of this study was to determine whether college students' perceived exercise benefits and barriers differed on the basis of their overweight, obese, and normal weight status. The data was gathered before the elimination of a physical

education graduation course requirement at a southeastern university in 2014. College students (n = 595) completed a perceived exercise benefits and barriers scale and had their body composition (BMI, waist circumference, and body fat percentage) measured. Significant differences in perceived exercise benefits and barriers were mostly found between normal weight and obese students. Overall, normal weight students perceived greater exercise benefits and fewer barriers than overweight and obese students; however, low effect sizes were found. At the time of the study, all participants were required to take a lifetime fitness and wellness course, which could be a potential explanation for the small effect sizes. Currently, there is a lack of research examining the impact of the course elimination on college student long-term health, well-being, and physical activity. Future research should focus on assessing potential drawbacks of eliminating physical education graduation course requirements in higher education.

An academic career in kinesiology? Our realization that it is a thing and our personal journeys towards one

Jafrā D. Thomas[1], and Jory M. R. Ness[1] / [1]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331

Kinesiology is an *academic* discipline that builds knowledge about how physical activity behaviors may impact people's quality of life, health, and social experiences in a variety of settings. Inclusive to this domain of study is how culture, politics and other societal activities may influence physical activity behaviors and the subsequent impact this may have upon life quality, health, and social experiences. Kinesiology represents an important knowledge base for a wide range of professions, such as allied health, athletics, physical education, medicine, and public health. Many undergraduates aspire to eventually land a career in one of these areas. A path less traveled is one towards an academic career in kinesiology. Why this path is less traveled would be interesting and beneficial to look into, but that is not the purpose of this presentation. Our purpose is to share our satisfying realization that one *could* pursue an academic career in kinesiology with the hope that others would find our stories informative and inspirational. We will share experiences that helped us discover the various reasons academic careers in kinesiology could be personally fulfilling and are worth exploring no matter what career stage you are in. Recognizing that not everyone would want an exclusively academic career in kinesiology, we will conclude with a survey of philosophical ideas on publicly engaged scholarship. This is done to help demonstrate ways individuals could *add* an academic element of kinesiology to non-academic occupations, and in doing so promote greater synergy between one's professional goals and sense of purpose.

Equal access to extracurricular school-based sports for students with disabilities

Joonkoo Yun[1], and Jaehun Jung[1] / [1]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331

On 2013, the US Department of Education published a "Dear Colleague Letter" to release a policy statement that promotes physical activity among children with disabilities through equal accessibility for extracurricular school-based sports participation. This was done in part to more clearly define schools' responsibilities, encourage implementation of the policy, and ensure all students an equal opportunity to participate in extracurricular athletics. Although a previous study indicated that the majority of physical education teachers are well aware of this federal policy (Sibert, 2017), the effects of the policy have not been studied. Therefore, the purpose of this study was to investigate the prevalence of extracurricular school-based sports participation among children with disabilities. The study employed a secondary data analysis using the 2015 - 2016 NHANES survey. This study exacted 2719 children (aged 5 to 18 years; 1369 boys and 1350 girls) from the survey. The results indicated that 31.32% of children with disabilities engaged in extracurricular school-based sports, whereas 38.95% of children without disabilities participated in sports. The logistic regression revealed children with disabilities are about 28% less likely to participate in school-based sports than children without disabilities (OR = .72; 95% CI = .54 – .95). Also, it is important to note that about 33% of children with disabilities aged between 12 – 16 years participated in sports in 2005 (GAO 2010), but approximately 35% of the same aged children participated in school-based sports during 2015-2016. More efforts are needed to ensure an equal opportunity to participate in the school-based sports participation.

POSTER PRESENTATIONS

The relationship between cardiorespiratory fitness and perceived interference of depression in daily activities

Hannah Busch[1], Sydney Reynolds[1], and Mary Imboden[1] / [1]George Fox University, 414. N Meridian Street, Newberg, Oregon, 97132

There is an established relationship between cardiorespiratory fitness (CRF) and poor mental health, including symptoms of depression. However, less is known about how CRF may influence how depression interferes with one's daily life. Therefore, the objectives of this study were to assess the influence of CRF on depressions interference with daily activities, as well as to examine the relationship between CRF and perceived happiness. Participants included 45 employees from George Fox University (mean age of 48.3 years). All participants underwent a health and fitness assessment, including a maximal exercise test, utilizing the Bruce treadmill protocol to measure CRF. A validated mental health questionnaire was administered, where participants provided self-reported feelings of depression and perceived happiness. There was a significant inverse relationship between CRF and interference of depression ($p<0.05$) symptoms in daily life. Further, a positive relationship was found between CRF and perceived happiness and satisfaction with life ($p<0.01$). These results further support the relationship between CRF and mental health. Specifically, the results suggest that those with higher CRF levels are less likely to experience feelings of depression that interferes with their day to day activities and are more likely to be happy and satisfied with their life.

Post-concussion history and mental health risk in collegiate athletes

Mackenzie Campbell[1], Rachel Fox[1], and Mary Imboden[1] / [1]George Fox University, Newberg, OR 97132

Symptoms which correlate with mental health disorders - such as anxiety, depression, and irritability - are common for patients experiencing concussions. This study aimed to show the relationship between mental health risk or diagnosis and affective concussion symptoms post-concussion in division III athletes. Using a survey composed of questions from validated mental health surveys (GAD-7, PHQ-9, and PCL-s), 64 collegiate athletes (45% female) provided self-reported scores and history of mental illness. Data on incidence of concussion history and symptoms were collected using George Fox University's SportsWare software. 80% of athletes with post-concussion history exhibited mental health symptoms. However, no statistical significance was found between the amount of symptoms reported by athletes who suffered a concussion versus athletes with no history of concussions. This non-significant finding may be a result of the small sample size. Therefore, future studies should study this relationship in a larger number of athletes who have experienced a concussion in attempt to enlighten the medical community of the need for a specialized concussion return to play protocol for athletes who specifically report pre-existing mental health conditions or symptoms.

Dance research from the mid-20th to early 21st century: A quantitative and qualitative synthesis

Marita K. Cardinal[1], and Bradley J. Cardinal[2] / [1]Division of Health and Exercise Science, Western Oregon University, Monmouth, OR, 97361, [2]Kinesiology Program, School of Biological and Population Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, OR 97331

The purpose of this study was to analyze dance research presentations given during the SHAPE America (*nee* AAHPERD) national convention, 1965-2014. Dance research abstracts were identified through a review of the *Abstracts of Research Papers* (1965-1991) and *Research Quarterly for Exercise and Sport* abstract supplemental issue (1992-2014). Content analysis was employed to identify the following variables: Number of presentations per year and overall; country of origin; research topics (i.e., dance education, dance science/health issues, choreography/creative process, sociocultural, research methods); audience of interest (i.e., dance-specific, non-dance specific); research design (i.e., experimental, non-experimental/descriptive); research approach (i.e., qualitative, quantitative, mixed methods). Data were analyzed descriptively. There were 232 total presentations over the 50-year time period, ranging from 0-15 per year with an average of 4.64 presentations per year. The majority of presentations were from the USA (86.64%) followed by Canada (8.62%), South Korea (3.02%), with the remaining 1.72% coming from France, Puerto Rico, Taiwan, and Turkey. The most frequent research topic was dance education (35.19%) followed by dance science/health issues (30.04%), sociocultural (18.88%), research methods (8.16%), and choreography/creative process (7.73%). The majority of presentations were aimed toward

dance-specific audiences (73.71%). The most frequently used research design was non-experimental/descriptive (81.90%). The research approaches were fairly evenly distributed between quantitative (50.43%) and qualitative (46.12%), with 3.45% using mixed methods. Additional nuances of the data will be shared, including the depth, breadth, and meanings of dance as more than mere physical activity.

Does minimalist footwear attenuate impact force and change lower extremity kinematics in a landing activity?

Brian L. Caster[1], Katherine R. Leino[1], and Daniel D. Wolf[1] / [1]Division of Health and Exercise Science, Western Oregon University, Monmouth, OR, 97361

Minimalist footwear is a trend in active footwear design that has purported health benefits, particularly with regard to running. Typical design elements include low cushion, little or no heel rise, and negligible arch support. The purpose of this study was to investigate whether minimalist footwear could be beneficial in other activities with ballistic impact phases, such as landing. The study included 10 healthy participants (5 men, 5 women), each performing 12 landing trials in each of two footwear conditions: self-selected footwear and identical minimalist footwear. Landings were performed onto a force platform from a 36cm height, with 48 hours rest between conditions. Kinematic variables included inclination angles of the thigh, shank, and foot segments, and joint angles at the knee and ankle, computed at touchdown, heel contact, and maximum knee flexion. Knee and ankle range of motion (ROM) were also computed from touchdown to max knee flexion. Kinetic variables included first, second and third peak vertical ground reaction forces. 12 trial means were computed for each participant and variable and used to assess group condition differences (two-tailed, correlated, paired t-test). Significance ($p<.05$) was found for ankle angle and foot inclination at heel contact and maximum knee flexion, and in ankle ROM. The force variable results were inconclusive, with a high degree of both within and between subject variability across all measures. Results suggest participants changed landing strategies with regard to lower leg and foot kinematics, although no concomitant force increase or attenuation was present as a group strategy.

The relationship between cardiorespiratory fitness and workplace performance

Chelsey Guhlke[1], Kayla Nielsen[1], and Mary Imboden[1] / [1]George Fox University, 414 N. Meridian Street, Newberg, OR 97132

A strong relationship has been shown between cardiorespiratory fitness (CRF) and cognitive function and attention, however less is known about the relationship between CRF and productivity and engagement at work. Further, physical activity is also thought to improve cognitive function, however no studies have assessed physical activity history with workplace productivity and engagement later in life. The objectives of this study were to evaluate the relationship between CRF, measured as maximal oxygen consumption(VO_2max) and workplace productivity, engagement, and energy level. Additionally, this study will assess past high school physical activity participation on the influence on the same workplace performance measures. Participants included 45 employees at George Fox University (31 women, 14 men; mean age: 48.3 ± 6.2 y). All participants performed an exercise test on a treadmill using a modified Bruce protocol. VO_2max (ml/kg/min) was measured directly using the PNOE system. Past high school physical activity history, as well as workplace performance measures including productivity, engagement, and perceived energy level at work were all self- reported on administered questionnaires. A significant relationship ($p<0.01$) was found between VO_2max and perceived energy level at work. Additionally, a significant relationship was found between VO_2max and productivity ($p<0.01$) and engagement in the workplace ($p<0.01$). In a separate analysis of 22 participants (mean age 48.4 ± 5.3), perceived level of physical activity during high school was significantly related to current productivity and engagement at work ($p<0.05$). These results suggest that one's current and past lifestyle behaviors, including CRF and physical activity may influence workplace performance.

HISTORY, PHILOSOPHY, ENVIRONMENTAL & SOCIAL STUDY OF SCIENCE

Section Chair:

Randall Smith
Western Oregon University

January 30, 2019

Dear Students, Friends and Colleagues,

Due in part to the Federal shutdown, the History & Philosophy of Science Section, which. includes Environmental Ethics and Social Science, will have an altered program in order to focus on a Panel and discussion of the impacts of the Federal shutdown and related matters on science, research and education. This shutdown is highly unusual, although these interruptions have happened before. We know that in a previous shutdown, US scientists doing Treaty obligation research in Antarctica had travel plans canceled, some having to turnaround in mid flight when enroute to Antarctica. This damaged US Science and our international standing in a big way. Similarly, we had an illegal occupation of Malheur National Wildlife Refuge near Burns, Oregon, which also impacted ongoing science at the refuge critically. Please join us at Linfield College, Saturday, February 23d, 2019, for a panel discussion.

This year, as we did with the Malheur Occupation, this section will have a panel to review and question Federal workers and representatives, or other involved individuals on the known and unknown impacts of a governmental conflict and shutdown on both science and education. Since this will be a last-minute change in the sectional program, we hope you will reach out to other students and researchers who have concerns, interest or knowledge and experience of this form of mismanagement.

Please go to the new website for OAS: oregonacademyscience.org for registration, schedules, rooms and further information.

Dr. Randall W. Smith, Ph.D., Section Chair; OAS, Portland State University.

MATHEMATICS, COMPUTER SCIENCE & PHYSICS

Section Chairs:

Corban Harwood
George Fox University

Scott Prahl
Oregon Institute of Technology

ORAL PRESENTATIONS

Development of a particle-in-cell model for studying neutron production rates in electrostatic fusion

Jeffrey Black, and Erik Sánchez / Department of Physics, Portland State University, Portland, OR 97207

Inertial electrostatic confinement fusion (IEC), is a method of producing fusion reactions by accelerating and recycling beams of light nuclei using primarily electrostatic fields. While IEC devices may not be capable of producing break-even fusion conditions due to the energy loss mechanisms inherent in their design, their ability to generate neutrons has been previously documented, and IEC devices are one of the more affordable and accessible methods of producing neutrons through fusion reactions. Because of this, IEC devices may be of interest as compact neutron sources for imaging and material activation for medical isotopes. In order to investigate the neutron production rate of various IEC configurations, a 3D particle-in-cell model with Monte Carlo collisions was developed. The basics of the simulation technique will be discussed, as well as how the results compare to two experimental devices.

What is the machine learning?

Layne Bradshaw, Spencer Chang, Tim Cohen, and Bryan Ostdiek / Institute of Theoretical Science, University of Oregon, Eugene, Oregon, 97403

Machine learning approaches are being heavily utilized across many branches of science. One powerful application of these techniques are classification problems. For example, neural networks are often able to determine rather complex discriminating features (so-called 'high-level variables') although they are only given access to much simpler inputs (so-called 'low-level variables'). As scientists, we want to make sure that we understand the tools we use to analyze data, rather than treating them as a black box. We propose an approach called *data planing*, which when combined with a bit of intuition, allows us to explore the question: what is the machine learning? We first consider a toy model to introduce the concept of data planing in a concrete setting, and then show the power of this technique by applying it to a semi-realistic resonance search at a particle accelerator. Flattening a distribution is a noisy process, and one that is exacerbated when attempting to remove multiple pieces of information simultaneously. This makes it difficult to determine if there is still information to remove, or if the machine is just learning the noise, especially when planing in higher dimensions. To combat this, we introduce a metric to tell us how accurately we planed, and use it to optimize our procedure given a fixed amount of data. We conclude with a brief discussion of how this metric could be incorporated when designing more sophisticated planing algorithms.

A method for objective symmetry classification in crystallographic image processing using geometric Akaike information criteria

Andrew Dempsey, Connor Shu, and Peter Moeck / Nano-Crystallography Group, Department of Physics, Portland State University, P.O. Box 751 Portland, OR 97207

Crystallographic image processing (CIP) is an averaging technique for improving the signal-to-noise ratio of images that are more-or-less periodic in two dimensions (2D). In CIP, an image (or selection from an image ideally containing over 50 repeats) is transformed to Fourier (reciprocal) space; this condenses the structural information in all pixels of the image into relatively few complex Fourier coefficients. These Fourier coefficients lie on the nodes of the reciprocal lattice, visible as an

array of bright spots on the power spectrum of the transformed image. CIP software enforces the strict mathematical conditions of the 16 higher-symmetry plane groups onto the Fourier coefficients, transforms them back into direct space generating symmetrized versions of the input image, and calculates Fourier coefficient amplitude and phase residuals to quantify deviation of each symmetrized version from the input. Interpretation of residuals for determining the closest plane symmetry to an input image is somewhat subjective, complicated by type I translationengleiche subgroup-supergroup relations among the 17 plane groups, and ill-suited for situations where metric specialization or Fedorov-type pseudosymmetry is present in addition to a relatively high amount of generalized noise. We present new, objective figures-of-merit for both Laue symmetry and plane symmetry based on geometric Akaike information criteria (G-AICs). G-AICs have been applied to problems of geometric inference for over two decades by the robotics and computer vision communities and are well-suited for applications involving inclusion relations. We present also a function to determine the number of unit cells in circular and elliptical selections from an input image.

Extending the introductory physics laboratory to free falling objects with drag forces

Paul R. DeStefano, Cora Seibert, Thomas Allen, and Ralf Widenhorn / Portland State University, Portland, OR 97207

Recently introduced, low-cost, local positioning and sensing technology have great potential for enhancing introductory kinematic laboratory activities [1]. One of the key benefits is quick and easy acquisition of position, acceleration, and rotation data. This enables students to access some of the physics of real-world application for example the modeling of trajectories including air resistance. Students can apply both a constant acceleration and drag-enhanced model to data sets obtained from drops or throws of foam balls or the launch of compressed-air rocket. The data analysis can span a range of complexity. Students may try to model the data using simple constant acceleration or model it with velocity dependent drag forces. Since acceleration data can be collected simultaneously, results from the modeling of position data can be compared to the direct measurement of the instantaneous acceleration.

[1] Cora Seibert, Thomas Allen, Paul DeStefano, Gabe Mukobi, and Ralf Widenhorn. Using a Local Positioning System as a Kinematics Lab. Poster presented at: AAPT 2018 Winter Meeting, 6-9 January 2018, San Diego, CA, USA

Building connection through community-based astronomy research.

Justin R. Hurworth and Todd L. Duncan / Department of Physics, Pacific University, 2043 College Way, Forest Grove, OR 97116

Looking at the night sky can help us feel more connected to our fellow humans – perhaps because it reminds us that what we have in common is far greater than our differences. In addition, the process of doing astronomy research can help us feel more tangibly connected to the larger universe. In this presentation we'll describe an attempt to combine the human and cosmic forms of connection through a summer research project observing variations in brightness of the star 27 Cygni. We'll summarize what we've learned from the process of bringing astronomy research out into public spaces to invite conversation and participation from anyone who happens to walk by our portable observatory.

Towards the Development of a High Field Enhanced Nanoscale Optical Antenna

Bao Nguyen[1], Jeffrey Black[2], Monte Kozell[2], Grace Yen[2], andErik Sánchez[2] / [1]Department of Electrical and Computer Science, Portland State University, Portland, OR, 97201. [2]Department of Physics. Portland State University, Portland, OR 97201

Raman spectroscopy is a non-invasive spectroscopic technique that is used to detect the vibrational and rotational states of a molecular system to study its chemical composition, molecular structures, crystallinity, and residual stress. Raman signals are extremely weak with only about one in every 10^6 excitation photons resulting in a Raman photon. Spatial resolution also poses a problem with Raman spectroscopy due to the limit of diffraction. Tip Enhanced Raman Spectroscopy (TERS) can be used to enhance the input signal and the spatial resolution in order to obtain a much faster signal and improve spatial resolution dramatically. Our goal is to develop a TERS system that can produce 10^4 to 10^6 field enhancement, and is capable of imaging on non-transparent substrates, not requiring a metallic substrate, and samples down to monolayer thicknesses.

Seeing through daylight fog

Scott Prahl / Electrical Engineering and Renewable Energy, Oregon Tech, Wilsonville, OR 97070.

Landing aircraft in a solar fog is challenging. The glare from the daytime fog inhibits our natural ability to discern small changes in luminosity across a visual field. This talk presents a method for improving detection of airport runway lights in daylight fog conditions. The method relies on LED runway lights that are synchronously timed with the frame capture by a camera on an aircraft. The camera captures successive images with and without illuminated landing lights. By subtracting these frames with a field programmable gate array, a video stream with just the landing lights can be generated. Our system was tested in a fog tunnel at Sandia National Laboratories as well as in the laboratory with a scattering tank. The influence of pulse timing, background illumination, and optical density of fog are shown to match theoretical expectations.

Development of an affordable educational electron microscope

Erik Sánchez, Chris Halseth, Alex Smith, and Abdul Almetairi / Department of Physics, Portland State University, Portland, OR 97207

Most electron microscopes are large, requiring a large footprint and infrastructure. Recently, the fabrication of miniature electron microscopes has had some degree of success. Many of th/ese microscopes have the goal of achieving the best resolution possible in the smallest footprint but essentially without regard to cost. Although the smaller microscopes could be very beneficial for educational and research purposes, they are cost prohibitive. Our group has recently developed a low-cost prototype educational electron microscope, the EDUSEM. The EDUSEM system is the first electron microscope that students can build from individual components in order to learn all aspects involved in making a complex imaging system. The skills which students learn by building the EDUSEM are in great demand by high tech industries and researchers yet are rarely included in standard curricula. Several new technologies were developed in order to make this possible; a very low cost and efficient electron source that won't burn out like normal electron sources, an inexpensive and extremely sensitive electron detector and a novel form of electron microscope column capable of performing as a transmission electron microscope (TEM) or changing into a Scanning Electron Microscope (SEM) within minutes. The system can be operated by an Android, iPhone, or a desktop computer system if desired. The EDUSEM allows students to build a functional electron microscope from base components promoting learning and understanding of the essentials of physics, electron microscopy and instrumentation in general.

Confinement-deconfinement transition via information theory

Brian Smith, and Mohamed Anber / Department of Physics, Lewis and Clark College, Portland, OR, 97219

We have conducted a series of Monte Carlo simulations on a 2-dimensional magnetic lattice, for both the Ising and XY models of a magnet, to investigate the more complex mathematical system that is QCD, or the strong nuclear force. We have used the distinct phase transition that occurs in a magnetic lattice as it is heated to glean information about the confinement-deconfinement phase transition for a set of confined quarks in a proton or neutron. This relationship is further explained through a web of dualities, mapping the 2-dimensional results of our computer simulations to the 4-dimensional space which the quarks live in. Through this research we have become interested in a quantity called Renyi Mutual Information, an information-theoretical quantity that describes how much information is being exchanged between two disjoint regions on our lattice. Through further investigation of this quantity we have been able to use it as an order parameter for the system.

Philosophical challenges and o+pportunities for the mathematical sciences

Corban Harwood[1], and Peter Otto[2] / [1]Department of Mathematics, George Fox University, Newberg, OR, [2]Department of Mathematics, Willamette University, Salem, OR

This panel will share perspectives on philosophical issues in how the mathematical sciences interact with and are perceived by the public. Panelists will highlight challenges, as well as opportunities, in mathematics, statistics, and computer science related to current trends in education and industry. For instance, the increased development of algorithms to utilize large quantities of data (Big Data) brings both a frontier in efficiently solving difficult problems, but can also distance the user from responsibility, such as the automatic rankings of people for firing purposes in urban public schools. Alongside, the trend in mathematical education has shifted away from algebra towards statistical analysis and simulation, especially in lower level and general education courses. This trend can better prepare graduates for working in a computational, data-

driven world and being knowledgeable in public discussions involving statistics. On the other hand, a focus on data analysis can distance them from knowing that the mathematical foundation is understandable, leading to fear of mathematics. In both cases, opportunities for outreach allow positive interactions for the public and students alike.

Classification of longitudinal trajectories

Kruti Pandya[1], Bruno Jedynak[1] / Department of Mathematics and Statistics, Portland State University, Portland, OR, 97201

We present a method for classifying longitudinal trajectory data into distinct groups. This type of data can arise in biomedical studies where repeated measurements on individuals are taken as a function of time. Longitudinal data can be either missing at certain time points or can be sampled at unequal time points for different subjects. The traditional classification techniques cannot be applied directly since those techniques require the sequences to be of the same lengths with the measurements acquired at the same times. Instead, we use Gaussian Processes (GP) regression to convert each individual sequence into a GP. Applying kernel based Support Vector Machines to GPs provides a classification. We present results on a synthetic dataset, as well as a real dataset, from the Alzheimer's Disease Neuroimaging Initiative.

Using machine learning to enable job-aware scheduling for high performance computing

Ben Glick, Jens Mache / Department of Mathematical Sciences, Lewis & Clark College, Portland, OR

The problem of job-scheduling is of particular importance in High Performance Computing (HPC). The order in which jobs are executed can drastically affect their performance and the overall HPC system's usage. Traditionally, HPC scheduling systems decide what order to run jobs using a priority queue, allowing users to set priority of their tasks and otherwise choosing using a first-come, first-served approach. A novel approach is to describe the behavior of an HPC job, and using the results of that analysis, set the execution schedule. We accomplish this by using a machine learning model to predict how a task will be resource constrained. This might tell us, for example, that a task is likely to be memory constrained, network constrained, or processor constrained. After that, we establish a set of rules for what types of tasks should be executed together in order to maximize overall HPC machine throughput. This new scheduling methodology is a new paradigm, using predicted constraints to schedule jobs rather than relying on user reporting of priority and timing.

A brief history of fusion technology: The road towards the clean energy source of the future

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Global warming has been a major concern worldwide. The search for a clean energy source is now a national challenge. Fusion technology is one of the most promising candidates to be the energy source of the future. For the past 50 years, fusion technology research has been taking off and making progress. In this project we are studying the science and history behind the technology in order to gain a better understanding of the process by which energy is produced from fusion. We are investigating the factors contributing to a sustainable fusion reaction, with our focus centering on magnetic confinement. This is the technology used in ITER, which is currently considered as the largest fusion research program in the world. For our future work we will explore Low Energy Nuclear Reactions (LENR), also known as Cold Fusion, as a novel method of energy generation. Our goal is to prepare a proposal to start a research program on this new science at the University of Portland.

Analysis of numerical oscillations in using the semi-implicit Crank-Nicolson method to solve the Fisher-KPP equation

Ellen Pearson / Department of Mathematics, George Fox University, Newberg, OR

In numerically solving partial differential equations, it is essential to predict and identify irregular behavior including error amplification and numerical oscillations. With the Fisher-KPP equation, commonly used to identify the advance of advantageous genes in a population, it is important to understand the boundaries where the solution becomes unstable and when numerical oscillations occur. We examined solution behavior around three major conditions on the time step of the semi-implicit Crank-Nicolson method: keeping all eigenvalues non-negative, matching the magnitudes of the most negative and most positive eigenvalues, and the stability condition via von Neumann analysis. Effects of spatial step on stability and the creation of the numerical oscillations were also examined. Through our analysis of these boundaries, numerical oscillations were predicted and related directly to specific conditions on the spatial and time step (Figure 1).

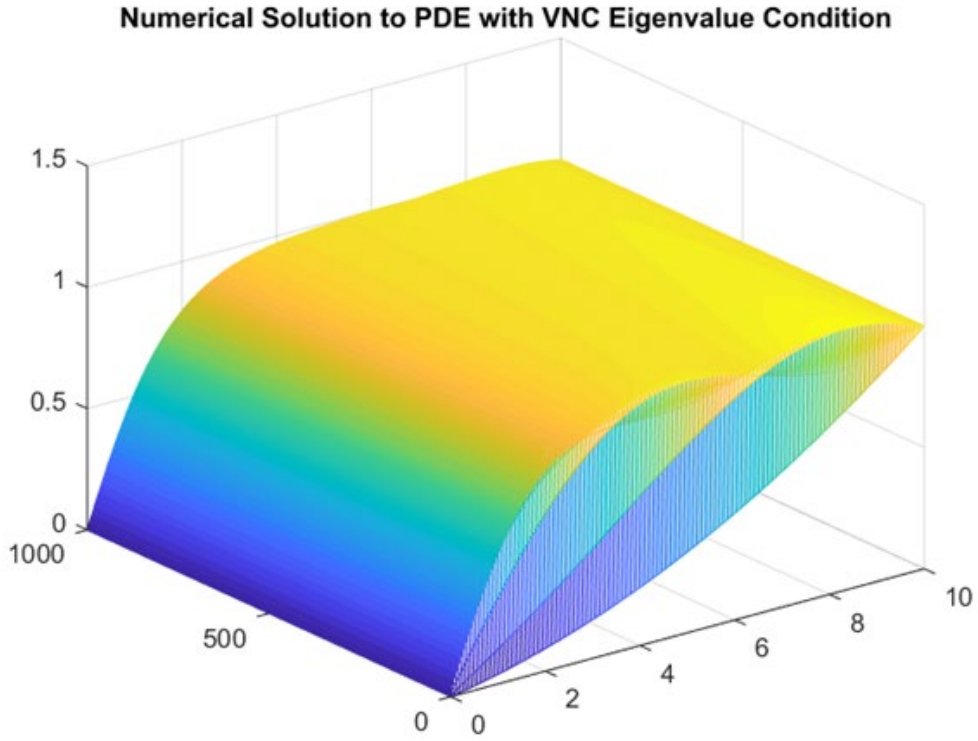

Figure 1

POSTER PRESENTATION

Straightforward routes to 3D-printed models of molecules, crystal structures, crystal morphologies, and anisotropic physical properties of crystals

Paul DeStefano[1], Werner Kaminsky[2], Trevor Snyder[3], and Peter Moeck[1] / [1]Nano-Crystallography Group, Department of Physics, Portland State University, Portland, OR 97207-0751, [2]Department of Chemistry, University of Washington, Seattle, WA 98195, [3]3D Systems Corporation, Wilsonville, OR 97207

A straightforward route from crystallographic information framework files (CIFs) at the Open-Access Crystallography project (nanocrystallography.research.pdx.edu) websites to 3D print files for atomic-level crystal and molecule structure models is described in [1]. Only the exported 3D print files are downloaded from the website as no local installation of any supporting program or applet is necessary. A Windows™ executable stand-alone program for the creation of 3D print files for atomic-level crystal and molecule structure models from CIFs is freely downloadable from a website (http://cad4.cpac.washington.edu/donations/donations.htm) that is run by Werner Kaminsky [2]. That website allows also for free downloads of (Windows™ executable) programs with which one can create 3D print files of models of crystal morphologies and tensor representation surfaces of anisotropic crystal properties [3].

[1] P. Moeck and T. Snyder, Preparing 3D print files for nano-tech/science education from entries of large open-access crystallographic databases at dedicated websites, Proc. 13th Nanotechnology Materials and Devices Conference (NMDC 2018), DOI: 10.1109/NMDC.2018.8605880
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[3] W. Kaminsky, T. Snyder, J. Stone-Sundberg, and P. Moeck, 3D printing of representation surfaces from tensor data of KH_2PO_4 and low-quartz utilizing the WinTensor software, Zeitschrift für Kristallographie – Crystalline Materials 230 (2015) 651–656.

PSYCHOLOGY

Section Chairs:

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PSYCHOLOGY- ORAL PAPERS

Death anxiety in older adults: Application of acceptance and commitment therapy

Meghan Walls and Björn Bergström / Pacific University School of Graduate Psychology, 222 SE 8th Ave., Hillsboro, OR 97123

It is estimated that 10 to 15% of the population experiences death anxiety (Noyes et al., 2000). Death anxiety is often triggered by the loss of a loved one or increasing health disparities, both situations that are more prevalent in older adults (Lau & Cheng, 2011). Furthermore, residing in care institutions increases an individual's risk for elevated death anxiety (Missler et al., 2011). Death anxiety triggers a dual process model of proximal and distal defenses that act to mitigate death anxiety (Iverarch et al., 2014). Proximal defenses occur in reaction to the conscious awareness of death-related thoughts and may lead to strategies focused on death-thought suppression, denial of one's eventual death, or promoting one's health in order to remove death cues from one's conscious attention. Distal defenses occur in reaction to the unconscious thoughts of death and may lead to strategies focused on protecting the symbolic self by aligning with cultural worldviews, developing interpersonal relationships to increase self-worth, and promoting personal significance. It is the author's position that the standard treatment for death anxiety, cognitive-behavior therapy (CBT), is effective in addressing proximal defenses in treatment but falls short of addressing distal defenses. Acceptance and Commitment Therapy (ACT) provides an existential framework that is more adept at addressing the distal defenses that are triggered by death-related cues. The present study seeks to answer the question: In older adults with death anxiety, how does Acceptance and Commitment Therapy (ACT) compared with Cognitive-Behavior Therapy (CBT) affect level of psychological distress?

Double jeopardy in suicide rates of veterans

Meghan Walls and Bjorn Bergstrom / Pacific University's School of Graduate Psychology, Hillsboro, OR 97123

Double jeopardy theory states multiple memberships in disadvantaged groups have a cumulative effect on a person's health and general well-being. Veterans experience higher incidences of mental health conditions compared to their non-veteran counterparts in PTSD (25.7% vs. 12.6%), depression (33.1% vs. 19.5%), and suicide ideation (19.2% vs. 10.6%; Fortney et al., 2016). Data from the veteran health administration (VHA) is provided because VHA-utilizers are more likely to have significant mental health symptoms, be chronically ill, disabled, and economically disadvantaged. Due to these higher risk factors, VHA-utilizers are at increased risk for suicide (Katz, McCarthy, Ignacio, & Kemp, 2012). In the context of double jeopardy, veterans who are older adults, female, or racial minorities should be at an increased risk for negative outcomes including suicide. The purpose of this study is to determine if current research on veteran suicides supports the double jeopardy theory.

Autonomous sensory meridian response (ASMR): The phenomenon, its correlates, and a word of caution.

Natalia Kazakova and Shawn Davis / School of Graduate Psychology, Pacific University, Hillsboro, OR. Pacific University Health Professions Campus, Hillsboro, OR 97123

Autonomous sensory meridian response (ASMR) is a unique condition in which individuals experience pleasant, tingling sensations in their neck, scalp, and spine following the presentation of certain auditory and visual triggers (Barratt, Spence, & Davis, 2017). The experience of ASMR seems to stem from an atypical wiring of the default mode network (DMN) compared to non-ASMR individuals (Smith, Fredborg, & Kornelsen, 2017), and there are distinct neurological (Lochte, Guillory, Richard, & Kelley, 2018) and personality (Fredborg, Clark, & Smith, 2017) profiles among people who experience ASMR. Media that elicits ASMR includes YouTube videos and short clips on apps like Snapchat titled, "Oddly Satisfying." Motivations for the use of ASMR media include a desire to cope with stress, promote relaxation, induce sleep, and manage chronic pain, and people report noticeable changes in these variables following ASMR exposure (Barratt & Davis, 2015). But how do people decide when and for how long to view ASMR media? Within the framework of cognitive behavioral therapy (CBT), self-soothing techniques may temporarily facilitate emotion regulation; however, consistent reliance on avoidance of distress as a coping strategy may actually reinforce anxiety in the long-term (Hofmann, 2007; McManus, Sacadura, & Clark, 2008). Due to paucity of research on ASMR, it would be helpful to understand the rationales for people's use of ASMR as a tool to manage distress. I will propose a study aimed to examine this issue and offer suggestions for clinicians working with clients who use ASMR to regulate distress outside of the therapy room.

The science of neuroeducation: Theory and applications from neuroscience, psychology, and language

Christopher Merideth, Ellyn Arwood, and Annie Cole / School of Education, University of Portland, Portland, OR. 97203

The field of neuroeducation explores how humans learn by triangulating research from the fields of neuroscience, cognitive psychology, and language studies. This emerging discipline uses inductive inquiry to propose a contemporary grounded theory, the Neuro-Semantic Language Learning Theory (NsLLT), to explain how the brain uses language to name the thinking that the mind produces. In addition, the NsLLT translates knowledge from three scientific lenses to formulate educational practices that best match the way humans learn new concepts. For example, findings from neuroscience confirm that students acquire sensory information most efficiently when neurobiological input connects to visual and motor pathways in the brain. Therefore, information is maximally meaningful when it is presented using visual-motor strategies such as drawing concepts in real-time and overlapping motoric input via hand-over-hand movements. Similarly, studies in cognitive psychology demonstrate that 95% of students think using visual cognition where information is depicted in the mind as moving images related semantically by spatial relationships. Educators can devise instructional strategies for their students to harness these mental strengths by semantically representing visual ideas using cartooning, flowcharting, and pairing drawn concepts to written symbols. Lastly, the NsLLT informs that language represents and mediates our thinking; therefore, practitioners can sample visual, written, or oral language samples from students to determine their linguistic and socio-developmental levels of functioning. This oral presentation will provide an overview of how and why neuroeducation draws from three scientific lenses to explain human learning and thinking, and will provide illustrated teaching applications of the aforementioned pedagogical strategies.

Validation of a new measure of creative behavior

Stephanie Kurz, Courtney Lee Hau, Jessica Murfin, and David A. Foster / Psychological Sciences Department, Western Oregon University, Monmouth OR 97361

Psychometric measures of the creative process, used extensively to quantify creativity (Plucker & Makel, 2010) have focused primarily on divergent thinking. In contrast, theoretical models of the creative process proposed by various researchers (e.g., Amabile, 1996; Mumford, Mobley, Reiter-Palmon, Uhlman, & Doares, 1991) posit that creative behavior is more than just divergent thinking. For example, Amabile (1996) proposed creativity consisted of four distinct behaviors: (a) problem or task identification, (b) preparation, (c) response generation, and (d) response validation and communication. Furthermore, tests of divergent thinking assess the outcomes of the ideation processes as opposed to the full spectrum of creative behavior in which a person engages. This limited approach, focusing primarily on measuring divergent thinking, does not allow researchers the ability to examine the full spectrum of creative behavior occurring within the creative process. The Creative Behavior Survey (CBS) was developed to assess a range of creative behaviors including: 1) problem finding and formulation (anticipating problems; identifying problems where none are apparent; and structuring an ill-defined problem); 2) information gathering (gathering and reactivating relevant information); 3) ideation (engaging in cognitive processes such as insight; knowledge reorganization; and conceptual combination); and 4) evaluation (choosing/specifying evaluation criteria; forecasting/predicting the likely outcomes and consequences of implementing an idea; and appraising those outcomes or consequences relative to key criteria). An online administered study of fully-employed college graduates and a study of current college students collected responses to the CBS and measures of creative potential, processes, and outcomes. The results and implications will be discussed.

Prospective associations between Oregon boys' substance use and problem behavior histories and their facial trustworthiness in adulthood

Zoe M. Alley[1], David C. R. Kerr[1], John-Paul Wilson[2], and Nicholas Rule[3] / [1]School of Psychological Science, Oregon State University, 97331, [2]Department of Psychology, Montclair State University, 07043, [3]Department of Psychology University of Toronto, M5S

Although those who appear facially untrustworthy are more likely to receive negative social evaluations, such as harsh criminal sentencing, it is unclear whether one's facial trustworthiness accurately reflects one's behavior. We investigated whether facial trustworthiness can be predicted by the problem behavior histories of a sample of Oregon youth. Boys (n=206) recruited from schools with higher juvenile crime rates in Oregon were assessed repeatedly from ages 10-24 years, including arrest records and self-reported delinquency and substance use. Coders blind to the study's purpose rated participants' facial trustworthiness from photographs taken at ages 13 and 24. Facial trustworthiness at age 24 (but not age 13) was negatively correlated with all measures of problem behavior. Yet, it was self-reported tobacco use occasions from ages 12-23 that had the strongest association with facial trustworthiness at age 24, a relation that persisted (β = -.29, 95% CI [-.42, -.15], $p < .001$) when controlling for arrests and delinquency from ages 12-23, other substance use, parent-reported childhood family income, and ratings of age 24 positive facial affect and age 13 facial trustworthiness. Although boys' early facial trustworthiness was not associated with their later problem behavior, those who engaged in more delinquency and substance use—particularly tobacco use—appeared less trustworthy at adulthood. The development of an untrustworthy appearance may hinder desistence of stereotypically untrustworthy behaviors. In addition, appearance-related biases may have forensic and healthcare implications for young men in Oregon. Finally, prevention efforts may leverage information about the early impacts of tobacco use on appearance.

The influence of mating context on women's appearance enhancement strategies

Morgan M. Haskett[1], Jaime M. Cloud[1], and Carin Perilloux[2]/ [1]Western Oregon University, Monmouth, OR 97361, [2]Southwestern University, Georgetown, TX 78626

Research suggests that men prioritize a potential mate's facial cues of attractiveness over bodily cues in long-term mating contexts, but shift their priorities toward bodily cues in short-term mating contexts. The purpose of the current research program was to test whether women's appearance-enhancement practices show corresponding shifts. We hypothesized that women pursuing short-term relationships would report engaging in more appearance-enhancement tactics that increase the attractiveness of their bodies (e.g., exercise) than their faces (e.g., wearing makeup), whereas the opposite would be true for women pursuing long-term relationships. We conducted an act nomination procedure using a national sample (N = 106) to identify the most common practices women engage in to enhance the attractiveness of their faces and bodies. From this list, a separate national sample of women (N = 130) selected the 10 appearance-enhancement tactics they found most important to increasing their overall attractiveness; they also reported how much time, money, and effort they spend increasing their facial and bodily attractiveness. Results partially supported our hypothesis. There was a positive correlation between women's sociosexual orientation scores – a measure of participants' inclination to pursue short-term relationships – and the percentage of tactics chosen that were body-related. But there were no correlations between women's sociosexual orientation scores and the amount of time, money, or effort they reported spending on appearance-enhancement. Thus, an effect only emerged in the forced-choice method, indicating that the investment short-term oriented women make in body appearance-enhancement tactics might only appear when forced to prioritize face or body attractiveness.

Forced connectivity: Environmental choice and potential outcomes

Mackenzie Ratliff, Maxwell Grimsrud, Cody Welty, Christopher Frost, and Ethan A. McMahan / Western Oregon University, Monmouth, OR 97361

Scholars have stated that being in nature positively influences psychological health. Recent empirical research documented this marked improvement in emotional and psychological functioning following exposure to natural environments. We examined the role of environmental choice on emotional responses to natural versus built environments. In essence, we addressed whether choosing or being assigned to a certain environment impacts how individuals respond to environments. Previous research is mixed, finding that choice improves emotional wellbeing via a heightened sense of autonomy and self-determination, but can also detract from well-being due to disappointment associated with a potential missed opportunity. Using a between-subject research design, participants were assigned to one of three conditions: 1) assigned natural environment 2) assigned built environment or 3) choice. Participants were exposed to simulated urban and natural environments. Emotional responses were measured using the Positive and Negative Affect Schedule, and the Connectedness with Nature Scale was used to determine whether participants' subjective sense of natural connectedness was impacted. It was predicted that regardless of choice, participants would respond more positively and feel more connected to nature when exposed to natural environments. Initial preliminary results (N = 20) indicate a trend towards more positive affective responses and higher levels of nature connectedness in those exposed to natural environments versus built environments. A trend is also observed between being assigned to nature, versus choosing nature, and higher levels of nature connectedness, implying that being assigned produces more benefits than choice. Discussion will focus on the implications of these results.

Umnderstanding coping styles to deal with mental health concerns in people with diabulimia

Nicole Antoniadis and Ruth Zúñiga / School of Graduate Psychology, Pacific University, Hillsboro, OR 97123

Diabulimia refers to an eating disorder in a person with diabetes, typically type I diabetes, wherein the person purposefully manipulates or omits insulin in order to lose weight. Due to the inherent necessity of people with type 1 diabetes to be acutely attuned to their food intake, this population is highly predisposed to the development of an eating disorder, at almost three times the rate of the non-type-1-diabetic population. Research has indicated that anxiety and depression are common comorbid mental health concerns in people with diabulimia, but despite the increased chance of poor outcomes in those with comorbid diabulimia and mental health, little has been studied to identify productive coping strategies for people with these conditions. The researchers conducted a systematic literature review on the coping styles used in people with diabulimia and co-morbid anxiety and/or depression in preparation for a research endeavor to identify coping strategies of this population. The review revealed a range of coping strategies that are commonly utilized, narrowed them into the operationalized categories of "problem-focused" and "emotion-focused," and identified that problem-focused strategies are more effective than emotion-focused coping strategies and produce better health outcomes for patients with type 1 diabetes. This purpose of this discussion is to present contemporary and relevant information regarding the current evidence surrounding effective coping strategies for people dealing with comorbid anxiety, depression, and diabulimia, to identify gaps in the literature that could lead to further study research and for attendees to gain knowledge and strategies regarding diabulimia and mental health concerns.

Actual vs. perceived drinking behavior among graduate and undergraduate students

Makenzie Irrgang, Paige Reohr, and Peter Vik / Pacific University Oregon School of Graduate Psychology, 190 SE 8th Ave. Hillsboro, OR 97123

Literature suggests undergraduates (UGS) overestimate alcohol consumption among peers (Martens et al., 2006; Young & Weerman, 2013). Peer drinking estimations have not been studied among graduate students (GS). The current study examined actual and perceived drinking among GS and UGS. We hypothesized that GS would be more accurate than UGS in perceptions of peer drinking. UGs and health profession GSs from a private university in the pacific northwest completed a questionnaire on their drinking behavior and their estimation of alcohol use among their peers. For analysis, participants were grouped by academic level. Results revealed that GS underestimated both regular and heavy drinking by their peers. Specifically, two-thirds (67%) of GS drank regularly, yet students estimated only half (54%) drank regularly. Similarly, although 59% of GS drank heavily at least once in the past month, GS estimated that only 18% of peers drank heavily. UG overestimated regular but underestimated heavy drinking by peers. UGs estimated that 40% of peers drank regularly when in fact only 23% drank regularly. In contrast, UGs estimated that 23% of peers drank heavily, yet 41% of UGs reported at least one heavy drinking episode. Social pressure predicted how many days GS drank in the past month ($F(2, 177)=3.654$, $p=.028$); however, social pressure was not related to typical or maximum alcohol consumption in the past month. Findings will be discussed from a developmental perspective.

Drinking rates, heavy drinking rates, and negative consequences among graduate health profession students

Paige Reohr, Makenzie Irrgang, and Peter Vik, Pacific / University, Hillsboro, OR, 97123

There is no current literature examining drinking behavior and related consequences in graduate health profession students. The current study is intended to examine alcohol use rates, heavy drinking rates, and alcohol-related consequences within this population. Previous findings support that undergraduate campus environments may promote heavy drinking and that drinking-related consequences are found to be more bothersome as young adults age (Colby et al., 2012; White & Ray, 2014). Thus, we expect to see fewer rates of heavy drinking in graduate health profession students compared to undergraduate students. Further, we expect that graduate health profession students who engage in heavy drinking will also report more negative consequences.
Method: Health profession and undergraduate students from Pacific University completed the Rutgers Alcohol Problems Index (RAPI) and a questionnaire about drinking behavior over the previous 30 days. For analysis, students were grouped by academic level.
Results/Discussion: Our findings show that 90.2% of graduate students and 49.7% of undergraduates reported drinking at all. 34.2% of graduate students and 12.4% of undergraduates reported having one or more drinks per week and 33.2% of graduate students and 10.3% of undergraduates reported having two or more drinks per week. Further, 59.3% of graduate students and 42.1% of undergraduates reported one or more episodes of heavy drinking within the last month. Episodes of heavy drinking predicted consequences in both academic groups, however, graduate students who did not report heavy drinking were also more likely to report frequent consequences compared to non-heavy undergraduate drinkers.

Odor-color association Stroop-task and the tmportance of an odorant in an odor imagery task

Jonathan Ham and Christopher Koch, George Fox University, Psychology Department, Newberg, OR, 97132

There are associations between odors and colors and between the ability to imagine visual objects and imagine odors. This study seeks to understand the relationship between odor imaging, color associations, and visual attention. A Stroop-task was designed using three fruits with odor-color associations: lime with green, strawberry with red, and lemon with yellow. When the word matched the color it was congruent, otherwise it was incongruent. In Experiment I ($n = 34$), participants were asked to imagine the odor of the fruit presented and identify the color of the stimulus. Each word-color combination was presented 20 times (180 trials: 60 congruent, and 120 incongruent). Response times and error rates were recorded. There was no significant difference between conditions with either measure. In Experiment II, participants ($n = 18$) followed the identical procedure with the presence of an odorant in the room. The odorant (orange) was related to citrus fruit, but not the same as the fruit names used in the experiment. There was significant interference ($t(1, 17) = 4.15$, $p < 0.01$) with incongruent trials ($M = 755.919$, $SD = 239.854$) producing longer response times than congruent trials ($M = 690.626$, $SD = 198.822$). In Experiment III ($n = 40$), the identical procedure was followed but the odorant (lavender) was changed to a non-fruit scent. Similar to Experiment I, no interference was found. These experiments suggest that odor can affect visual attention to colors but when task-related odorant is present.

Electrophysiological markers of distractibility when selecting targets for perception and goal-directed action

Dan McCarthy[1,2], James Wilmott[2], Bethany Hung[2], Joo-Hyun Song[2] / [1]Department of Psychological Sciences, Western Oregon University, Monmouth, OR, 97361, [2]Department of Cognitive, Linguistic & Psychological Sciences, Brown University, Providence, RI, 02912

Humans perform countless goal-directed actions every day. Despite our best intentions, we often find ourselves at the mercy of irrelevant distractions that can disrupt behavior and have serious consequences. For instance, distracted driving is one of the leading causes of death in the United States. Perceptual research using traditional keypress tasks has supported the intuition that highly salient distractors interfere with performance than weak ones (e.g., a bright, flashing billboard more readily attracts attention compared to a stationary sign). Conversely, however, more salient distractors cause less interference during goal-directed reaching (Moher, Anderson, & Song, 2015). Here, we used EEG to investigate the neural mechanisms underlying this salience-driven perception-action dissociation. Selective markers of attention and inhibitory control reliably predicted target selection performance prior to the motor response. Importantly, the neural dynamics of these processes differed according to distractor saliency, target predictability, and action demands.

Experiences of transgender identity-Beyond the binary

Nikolai Guimaoutdinov and Jane M. Tram / School of Graduate Psychology, Pacific University of Oregon, Hillsboro, OR, 97123

While the existence and experiences of transgender individuals has become a hot button issue, there has been a lack of research into transgender people's diversity of experiences. The existing literature focuses primarily on the experiences of binary (male or female) transgender people and will occasionally include non-binary individuals as a footnote or after-thought. For example, the first criterion for Gender Dysphoria in children and the fourth criterion for Gender Dysphoria in adults/adolescents in the DSM-5 is, "a strong desire to be of the other gender (or some alternative gender different from one's assigned gender)". Because these two communities share a transgender status, they tend to become conflated and the differences between their experiences are not only ignored, but not even acknowledged to exist. The aim of this proposed study is to investigate the differences between binary and non-binary transgender individuals' experiences of transgender identity via the Transgender Identity Survey (TIS). The TIS conceptualizes transgender identity along four factors: passing, pride, alienation, and shame. In this presentation we will discuss the proposed study, the limitations of the Transgender Identity Survey, and additional factors that should be considered when conducting research on binary and non-binary transgender individuals.

A step in a new direction: Modern adaptations of biofeedback in clinical psychology practice

Hanna Bosse, Caitlin Hines, Jake Perry, and Björn Bergström / School of Graduate Psychology, Pacific University, Hillsboro, OR

Biofeedback is widely regarded by the field as a useful, evidenced-based clinical tool and intervention (Goessl, Curtiss, & Hofmann, 2017; Schoenberg & David, 2014). The use of traditional biofeedback devices is limited by price, availability to consumers and a lack of information. With the growth of current technology, individuals have increased access to devices (i.e., health tracker watches) which have been shown to reliably measure relevant physiological data that is captured by traditional biofeedback devices currently being utilized by clinicians and researchers. The recently gained capacity for individuals to own and utilize biofeedback devices for long-term use presents new opportunities for the field of clinical psychology. This intersection between technology, physiology and psychology is an area that now, more than ever, warrants further exploration and creative implementations in clinical practice. The current presentation will showcase a brief background of biofeedback within the therapeutic setting, the validity of less-traditional biofeedback devices, a discussion of potential clinical applications and finally, prospective avenues of future research.

Effect of parenting style on subsequent relationship quality

Nandita Kumar, Jane M. Tram, and Alexandra Lawall / Pacific University, Hillsboro OR 97123

As parents may transmit life lessons and foster growth in their children, research has shown that parents may also transmit their style of parenting from one generation to the next. This idea, called intergenerational transmission of parenting, has spurred research in other areas of parenting such as relationship quality. This study focuses on Authoritarian, Authoritative, and Permissive parenting styles, and the relation each style has to the child's subsequent relationship quality with romantic partners. We also examine which parenting style is associated with the highest relationship quality with romantic partners. Participants who are over the age of 18 who have romantic relationship experience will complete an online survey about their parents' parenting style and the quality of their current relationship or most recent relationship. If supported, this research will provide support for the idea that parenting style extends beyond the parent-child relationships and may impact other relationships. It is important to recognize the compounding nature of behavior and its possible impact on future generations.

Program evaluation of a mental health agency

Abegail Millard and Jane Tram / Pacific University Graduate school of Psychology, 190 se 8th Ave, Hillsboro, OR 97123

The health professions' increased emphasis on empirical validation of psychotherapeutic treatment effectiveness highlights the need to assess treatment outcomes at local community mental health agencies. Providers in these agencies have the opportunity to significantly impact their communities by ensuring that the therapeutic needs of underserved and low socioeconomic populations are met. Researchers have shown that individuals benefit greatly from receiving various types of effective treatments; however, very few researchers have explored the effectiveness of treatment at individual agencies. Specifically, the need for mental health resources in Portland, Oregon is at an all-time high. In this study, a standardized measure was used to track progress and outcome for clients seen at a community mental health agency in Portland, Oregon. This study aims to examine the effectiveness of mental health services at an agency that does not impose insurance limitations on clients. The results from this study indicate that there is a significant improvement in client scores from the beginning of treatment to the end of treatment when we examine the total score as well as the subscale scores of the OQ-45. These significant findings highlight the importance of evaluating effective treatment outcomes within our community mental health agencies and the services they provide to lower income individuals.

Intergenerational transmission of parenting styles to sons

Alexandra Lawall, B.S., Jane M. Tram PhD., and Nandita Kumar, B.A. Pacific University, Department of Psychology, Hillsboro, OR, 97123

Many researchers have investigated intergenerational transmission of parenting from parents to their children. Research has shown that there is a continuity in maladaptive parenting from one generation to the next. It has also been found that children, whose mothers used warmth and affection, will use more constructive and positive parenting techniques. Children, whose mothers were controlling, were more likely to use negative parenting techniques. Research has studied whether positive or negative parenting techniques have been passed down from one generation of parents to the next. However, there has been a lack of research on the specific types of parenting styles that have been passed down. More specifically, little research has examined the intergenerational transmission of specific parenting styles among sons. The purpose of this study is to examine the types of parenting styles that are passed down from parents to their sons. Through a questionnaire, males will indicate how they were parented and how they do (or would) raise their children. This study has important implications for young men who are interested in becoming fathers.

Familial ethnic socialization and parenting

Kayla Wojda, M.A., Jane M. Tram, Ph.D, and Arthur Truong, B.A. / School of Graduate Psychology, Pacific University, Hillsboro, OR, 97123

Researchers have identified the important influence family has on ethnic socialization. Most of the existing research focuses on the influence that family has on children but does not expand into adulthood. This study addresses the gap in the literature by examining whether the way in which one is parented impacts one's parenting style. This question is examined for current and prospective parents. First, is parental ethnic socialization different for current rather than prospective parents? We found that there is not a significant difference between current parents and prospective parents with regard to parental ethnic socialization. Second, is there a relation between familial ethnic socialization and parental ethnic socialization? We found that greater familial ethnic socialization is significantly correlated with a stronger parental ethnic socialization for both current and prospective parents. These findings encourage individuals to make more conscious decisions to incorporate their ethnic background(s) when raising children if they want it to be carried on. It is especially relevant for anyone who may be concerned with how acculturation may impact future generations.

NOTES

AUTHOR INDEX